SEVENTH FRAMEWORK PROGRAMME

THEME [INFRA-2011-1.1.17.]
[Infrastructures for Neutron Scattering and Muon Spectroscopy]

Grant agreement for: Combination of CP & CSA*

Annex I - "Description of Work"

Project acronym: NMI3-II

Project full title: " Neutron Scattering and Muon Spectroscopy Integrated Initiative "

Grant agreement no: 283883

Version date: 2011-08-16

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Part A

Workplan Tables

Atg

A1:
Project summary

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per project

General information			
Project title [3]	Neutron Scattering and Muon Spectroscopy Integrated Initiative		
Starting date [4]	01/02/2012		
Duration in months [5]	48		
Call (part) identifier [6]	FP7-INFRASTRUCTURES-2011-1		
Activity code(s) most relevant to your topic [7]	INFRA-2011-1.1.17.: Infrastructures for Neutron Scattering and Muon Spectroscopy		
Free keywords [8]		Neutron Scattering, Muon Spectroscopy, User Access, European Spallation Source, Innovative Methods & Techniques, Imaging, Nanoscale, Biomaterials, Detectors, E-learning, Data Standards, Training	

Abstract [9]

Advanced solutions to the challenges that confront our technology-based society – from energy and environment to health – are crucially dependent on advanced knowledge of material properties down to the atomic scale. Neutron and Muon spectroscopy offer unique analytical tools for material investigation. They are thus an indispensible building block of the European Research Area and directly address the objectives of the Innovation Union Flagship Initiative. The knowledge creation via neutron and muon spectroscopy relies on the performance of a closely interdependent eco-system comprising large-scale facilities and academic and industrial users.
The Integrated Infrastructure Initiative for Neutron and Muon Spectroscopy (NMI3) aims at a pan-European integration of the main actors within this eco-system. The NMI3 coordination effort will render public investment more efficient by harmonizing and reinforcing the services provided to the user community. It will thus directly contribute to maintaining Europe's world-leading position.
NMI3 is a comprehensive consortium of 18 partners from 11 different countries that includes all major providers of neutrons and muons in Europe. NMI3 exploits all tools available within I3s to realize its objectives.
- Transnational Open Access will build further capacity for European users. It will foster mobility and improve the overall creation of scientific knowledge by providing the best researchers with the opportunity to use the most adapted infrastructures.
- Joint Research activities will create synergies in innovative instrument development that will feed directly into improved and more efficient provision of services to the users.
- Networking activities will reinforce integration by harmonizing procedures, setting standards and disseminating knowledge. Particular attention is given to train young people via the European Neutron and Muon School as well as through an e-learning platform.

A2: List of Beneficiaries

Project Number [1]	283883	Project Acronym [2]	NMI3-II

List of Beneficiaries

No	Name	Short name	Country	Project entry month [10]	Project exit month
1	INSTITUT MAX VON LAUE - PAUL LANGEVIN	ILL	France	1	48
2	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	STFC	United Kingdom	1	48
3	TECHNISCHE UNIVERSITAET MUENCHEN	TUM	Germany	1	48
4	FORSCHUNGSZENTRUM JUELICH GMBH	Jülich	Germany	1	48
5	PAUL SCHERRER INSTITUT	PSI	Switzerland	1	48
6	HELMHOLTZ-ZENTRUM BERLIN FUR MATERIALIEN UND ENERGIE GMBH	HZB	Germany	1	48
7	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	CEA	France	1	48
8	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	HZG	Germany	1	48
9	MAGYAR TUDOMANYOS AKADEMIA KFKI ATOMENERGIA KUTATOINTEZET	BNC-AEKI	Hungary	1	48
10	SZILARDTESTFIZIKAI ES OPTIKAI KUTATOINTEZETE - MAGYAR TUDOMANYOS AKADEMIA	BNC-RISP	Hungary	1	48
11	IZOTOPKUTATO INTEZET - MAGYAR TUDOMANYOS AKADEMIA	II HAS	Hungary	1	48
12	TECHNISCHE UNIVERSITEIT DELFT	TUD	Netherlands	1	48
13	NUCLEAR PHYSICS INSTITUTE OF THE ASCR VVI	NPI	Czech Republic	1	48
14	CONSIGLIO NAZIONALE DELLE RICERCHE	CNR	Italy	1	48
15	Københavns Universitet	UCPH	Denmark	1	48
16	DANMARKS TEKNISKE UNIVERSITET	DTU	Denmark	1	48
17	UNIVERSIDAD DE ZARAGOZA	UNIZAR-ICMA	Spain	1	48
18	EUROPEAN SPALLATION SOURCE ESS AB	ESS	Sweden	1	48

A3: Budget Breakdown

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One Form per Project

Participant number in this project [11]	Participant short name	Fund. % [12]	Ind. costs [13]	Estimated eligible costs (whole duration of the project)						Total receipts	Requested EU contribution
				RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	Total A+B+C+D		
1	ILL	75.0	T	738,560.00	1,098,080.00	0.00	731,400.00	0.00	2,568,040.00	0.00	2,019,661.00
2	STFC	75.0	A	842,909.00	40,100.00	1,402,446.50	0.00	0.00	2,285,455.50	0.00	2,074,728.25
3	TUM	75.0	T	824,960.00	1,013,600.00	1,630,833.22	0.00	0.00	3,469,393.22	0.00	2,892,208.46
4	Jülich	75.0	A	854,874.00	6,000.00	0.00	0.00	0.00	860,874.00	0.00	647,155.50
5	PSI	75.0	F	488,400.00	56,520.00	1,219,651.93	0.00	0.00	1,764,571.93	0.00	1,625,071.93
6	HZB	75.0	A	679,250.00	5,000.00	869,009.00	0.00	0.00	1,553,259.00	0.00	1,383,446.50
7	CEA	75.0	A	495,500.00	5,000.00	999,218.74	0.00	0.00	1,499,718.74	0.00	1,375,843.74
8	HZG	75.0	A	0.00	28,333.00	0.00	0.00	0.00	28,333.00	0.00	19,944.80
9	BNC-AEKI	75.0	F	0.00	6,000.00	272,371.00	0.00	0.00	278,371.00	0.00	274,202.60
10	BNC-RISP	75.0	T	89,000.00	0.00	0.00	0.00	0.00	89,000.00	0.00	66,750.00
11	II HAS	75.0	A	26,400.00	0.00	0.00	0.00	0.00	26,400.00	0.00	19,800.00
12	TUD	75.0	A	146,703.00	6,000.00	200,387.30	0.00	0.00	353,090.30	0.00	316,414.30
13	NPI	75.0	A	26,250.00	8,000.00	124,485.72	0.00	0.00	158,735.72	0.00	149,523.22
14	CNR	75.0	S	66,835.00	0.00	0.00	0.00	0.00	66,835.00	0.00	50,126.00
15	UCPH	75.0	T	0.00	289,600.00	0.00	0.00	0.00	289,600.00	0.00	193,670.00
16	DTU	75.0	S	0.00	37,720.00	0.00	0.00	0.00	37,720.00	0.00	19,688.00
17	UNIZAR-ICMA	75.0	T	115,520.00	0.00	0.00	0.00	0.00	115,520.00	0.00	86,640.00
18	ESS	75.0	T	180,160.00	0.00	0.00	0.00	0.00	180,160.00	0.00	135,120.00
Total				5,575,321.00	2,599,953.00	6,718,403.41	731,400.00	0.00	15,625,077.41	0.00	13,349,994.30

Note that the budget mentioned in this table is the total budget requested by the Beneficiary and associated Third Parties.

*** The following funding schemes are distinguished**

Collaborative Project (if a distinction is made in the call please state which type of Collaborative project is referred to: (i) Small of medium-scale focused research project, (ii) Large-scale integrating project, (iii) Project targeted to special groups such as SMEs and other smaller actors), Network of Excellence, Coordination Action, Support Action.

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project, and it cannot be changed. The project number **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

2. Project acronym

Use the project acronym as indicated in the submitted proposal. It cannot be changed, unless agreed during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry info force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a detailed justification on a separate note.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Activity code

Select the activity code from the drop-down menu.

8. Free keywords

Use the free keywords from your original proposal; changes and additions are possible.

9. Abstract

10. The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

11. The number allocated by the Consortium to the participant for this project.

12. Include the funding % for RTD/Innovation – either 50% or 75%

13. Indirect cost model
A: Actual Costs
S: Actual Costs Simplified Method
T: Transitional Flat rate
F :Flat Rate

Workplan Tables

Project number

283883

Project title

NMI3-II—Neutron Scattering and Muon Spectroscopy Integrated Initiative

Call (part) identifier

FP7-INFRASTRUCTURES-2011-1

Funding scheme

Combination of CP & CSA

WT1
List of work packages

Project Number [1]	283883	Project Acronym [2]	NMI3-II

LIST OF WORK PACKAGES (WP)

WP Number [53]	WP Title	Type of activity [54]	Lead beneficiary number [55]	Person-months [56]	Start month [57]	End month [58]
WP 1	Management	MGT	1	36.00	1	48
WP 2	Dissemination & Outreach	COORD	2	63.00	1	48
WP 3	E-learning	COORD	3	81.00	1	48
WP 4	European Neutron & Muon Schools	COORD	1	8.00	1	48
WP 5	Integrated User Access	COORD	6	96.00	1	48
WP 6	Standards for data analysis software	COORD	1	60.00	1	48
WP 7	ISIS Neutrons	SUPP	2	1.00	1	48
WP 8	ISIS Muons	SUPP	2	1.00	1	48
WP 9	FRM II (TUM, Jülich, HZG)	SUPP	3	1.00	1	48
WP 10	SINQ (PSI)	SUPP	5	1.00	1	48
WP 11	SμS (PSI)	SUPP	5	1.00	1	48
WP 12	BER II (HZB)	SUPP	6	1.00	1	48
WP 13	LLB (CEA)	SUPP	7	1.00	1	48
WP 14	BRR (BNC-AEKI)	SUPP	9	1.00	1	48
WP 15	RID (TUD)	SUPP	12	1.00	1	48
WP 16	NPI	SUPP	13	1.00	1	48
WP 17	Muons	RTD	2	72.00	1	48
WP 18	Imaging	RTD	6	205.00	1	48
WP 19	Advanced methods and techniques	RTD	18	233.00	1	48
WP 20	Advanced Neutron Tools for Soft and Bio Materials	RTD	7	204.20	1	48
WP 21	Detectors	RTD	2	180.00	1	48
			Total	1,248.20		

WT2:
List of Deliverables

Project Number [1]	283883	Project Acronym [2]	NMI3-II

List of Deliverables - to be submitted for review to EC

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D1.1	Agenda General Assembly & Minutes of Board meeting	1	1	6.00	R	PU	3
D1.2	Agenda General Assembly & Minutes of the Board meeting	1	1	6.00	R	PU	14
D1.3	Agenda General Assembly & Minutes of the Board meeting	1	1	6.00	R	PU	30
D1.4	Agenda General Assembly & Minutes of the Board meeting	1	1	6.00	R	PU	44
D1.5	Report on innovation workshop	1	1	12.00	R	PU	28
D2.1	Newsletter summarizing the work in progress	2	3	8.00	O	PU	6
D2.2	Newsletter summarizing the work in progress	2	3	8.00	O	PU	18
D2.3	Newsletter summarizing the work in progress	2	3	8.00	O	PU	30
D2.4	Newsletter summarizing the work in progress	2	3	8.00	O	PU	42
D2.5	New Internet portal finished	2	3	15.00	O	PU	24
D2.6	Advertising material for conferences and journal advertising	2	3	4.00	O	PU	36
D2.7	Evaluation of possible presentations on conferences, workshops	2	2	1.00	R	PU	6

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D2.8	Brochure for target group 1	2	2	1.00	O	PU	16
D2.9	Report on outreach activities	2	2	1.00	R	PU	12
D2.10	Report on outreach activities	2	2	1.00	R	PU	24
D2.11	Report on outreach activities	2	2	1.00	R	PU	36
D2.12	Report on outreach activities	2	2	1.00	R	PU	48
D2.13	High field developments website	2	5	1.00	O	PU	4
D2.14	High field publicity material	2	5	1.00	O	PU	8
D2.15	Workshop on aspects of Functional Materials	2	5	2.00	R	PU	18
D2.16	Workshop on aspects of Soft Matter	2	5	2.00	R	PU	30
D3.1	Specification about technical functionalities needed for the e-learning platform	3	3	1.00	R	PU	3
D3.2	Advancement report on functionalities development	3	3	6.00	R	PU	12
D3.3	e-learning neutron scattering platform	3	3	26.00	O	PU	48
D3.4	Content analysis of neutron course	3	1	1.00	R	PU	12
D3.5	Didactical course material	3	15	10.00	R	PU	48

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D3.6	Lecture material	3	1	16.00	O	PU	48
D3.7	Definition of Instruments to be simulated	3	15	1.00	R	PU	12
D3.8	Virtual Instruments	3	15	20.00	R	PU	48
D4.1	Brochure of the different schools and their technical specificities and dates	4	1	1.00	R	PU	6
D4.2	Brochure of the different schools on the NMI3 web portal	4	1	1.00	O	PU	2
D4.3	Minutes of “Directors of Schools” meeting	4	1	1.00	R	PU	18
D4.4	Minutes of “Directors of Schools” meeting	4	1	1.00	R	PU	36
D4.5	Report of schools held in this period	4	1	1.00	R	PU	12
D4.6	Report of schools held in this period	4	1	1.00	R	PU	24
D4.7	Report of schools held in this period	4	1	1.00	R	PU	36
D4.8	Report of schools held in this period	4	1	1.00	R	PU	48
D5.1	Report on requirements	5	8	4.00	R	PU	12
D5.2	Software package prototype I	5	3	12.00	P	PU	24
D5.3	Software package prototype II	5	3	12.00	P	PU	48

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D5.4	Harmonized proposal forms	5	5	4.00	R	PU	36
D5.5	Requirements for web based review process	5	12	2.00	R	PU	12
D5.6	Prototype of web based review process	5	3	12.00	P	PU	36
D5.7	Requirements for cross facility beam time access	5	8	4.00	R	PU	24
D5.8	Feasibility study on software prototype	5	3	12.00	R	PU	48
D6.1	Report on current software and practices	6	1	7.00	R	PU	2
D6.2	Report on solutions for developing a common software infrastructure	6	1	7.00	R	PU	4
D6.3	Prototype software in chosen solution	6	1	7.00	P	PU	18
D6.4	Report on evaluation of prototype software	6	1	7.00	R	PU	24
D7.1	Transnational access provision	7	2	1.00	O	PU	48
D8.1	Transnational Access provision	8	2	1.00	O	PU	48
D9.1	Transnational access provision	9	3	1.00	O	PU	48
D10.1	Transnational Access Provision	10	5	1.00	O	PU	48
D11.1	Transnational access provision	11	5	1.00	O	PU	48
D12.1	Transnational access provision	12	6	1.00	O	PU	48

WT2:
List of Deliverables

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D13.1	Transnational access provision	13	7	1.00	O	PU	48
D14.1	Transnational access provision	14	9	1.00	O	PU	48
D15.1	Transnational access provision	15	12	1.00	O	PU	48
D16.1	Transnational access provision	16	13	1.00	O	PU	48
D17.1	Document outlining specification of software routines	17	2	3.00	R	PU	8
D17.2	Software routines implemented and released within the Mantid framework	17	2	3.00	R	PU	36
D17.3	Document considering integration of simulation codes	17	2	3.00	R	PU	18
D17.4	Report of an application of linked analysis and simulation	17	2	3.00	R	PU	48
D17.5	Report of concept study	17	2	6.00	R	PU	48
D17.6	Document discussing target technologies	17	2	3.00	R	PU	24
D17.7	Document considering options for a muon facility at the ESS	17	2	3.00	R	PU	36
D17.8	Design document for an APD detector array	17	2	3.00	R	PU	12
D17.9	Prototype APD detector array for an ISIS spectrometer	17	2	3.00	R	PU	30

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D17.10	Results on beam array evaluation	17	2	6.00	R	PU	48
D18.1	Implementation of grating interferometry for visualization of residual stresses	18	6	10.00	O	PU	36
D18.2	Publication and Interim report	18	6	6.00	R	PU	36
D18.3	Grating interferometry experiments performed with university partners	18	3	3.00	O	PU	48
D18.4	Optimization of high-resolution detector system	18	6	6.00	O	PU	18
D18.5	Adapting of high-resolution detector system	18	5	6.00	O	PU	36
D18.6	High-resolution experiments performed with university partners	18	3	10.00	O	PU	48
D18.7	Optimization of monochromator parameters for high wavelength resolution	18	6	6.00	O	PU	18
D18.8	Bragg-edge mapping and energy-selective experiments	18	5	6.00	R	PU	36
D18.9	Extending the technique towards ToF-imaging	18	5	8.00	O	PU	48
D18.10	Evaluation of the PASANS	18	7	6.00	R	PU	18
D18.11	User friendly sample environment	18	4	6.00	R	PU	36

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D18.12	User friendly platform for PASANS	18	2	5.00	O	PU	48
D18.13	Evaluation of the Precessionnal spectroscopy techniques possibilities	18	7	6.00	R	PU	18
D18.14	Precession spectroscopy measurements	18	7	6.00	R	PU	36
D18.15	User friendly platform for the exploitation of precession data	18	2	5.00	O	PU	48
D18.16	Imaging of magnetic structures in bulk samples with high resolution	18	6	5.00	R	PU	18
D18.17	Direct magnetic imaging experiments	18	5	5.00	R	PU	36
D18.18	Data processing platform	18	3	5.00	R	PU	48
D18.19	Wiki pages on NMI3 portal	18	7	12.00	R	PU	48
D19.1	Report on performance of prototype guide	19	1	20.00	R	PU	48
D19.2	Report on performance of prototype KB mirrors	19	18	18.00	R	PU	48
D19.3	Report on design of long-pulse diffractometer for extreme environments	19	18	18.00	R	PU	48
D19.4	Report on design of long-pulse crystal-analyser instrument	19	18	18.00	R	PU	48

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
	for extreme environments						
D19.5	Report on performance of prototype Multiple-beam SANS experiments	19	1	22.00	R	PU	48
D19.6	Design report	19	3	10.00	R	PU	24
D19.7	Performance report	19	3	10.00	R	PU	36
D19.8	Report on the requirements	19	3	10.00	R	PU	24
D19.9	Report on the measurement strategies and the design of data analysis system	19	3	10.00	R	PU	36
D19.10	Report on the proof of principle measurements	19	2	20.00	R	PU	48
D19.11	Report on mechanical layout and FE-calculation	19	4	12.00	R	PU	36
D19.12	Report on Neutronic layout of single rotor	19	4	12.00	R	PU	36
D19.13	Report on conceptual design	19	4	12.00	R	PU	42
D19.14	Delivery of the prototype, following design and procurement	19	12	10.00	R	PU	30
D19.15	Report and publication of the test results	19	12	7.00	R	PU	38
D20.1	Optimization of model bilayer systems including natural membrane lipids	20	1	1.00	R	PU	36
D20.2	Set up a lipid extraction facility	20	1	1.00	R	PU	18

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
	to extract and fractionate membranes from real cells						
D20.3	Protocols for reliable reconstitution of membrane proteins	20	2	1.00	R	PU	48
D20.4	Characterization of biomembranes	20	1	1.00	R	PU	48
D20.5	Designs of new stop flow observation heads for SANS	20	1	1.00	R	PU	18
D20.6	Conception and design of MA-LS setup	20	4	1.00	R	PU	18
D20.7	Design an electric field cell for SANS	20	7	1.00	R	PU	18
D20.8	Conception and design of a pressure cell for NSE	20	4	1.00	R	PU	36
D20.9	Tests of MA-LS prototype setup	20	4	1.00	R	PU	24
D20.10	Tests of new stop flow observation heads for SANS.	20	1	1.00	R	PU	30
D20.11	Prototype of pressure cell for NSE. Tests	20	4	1.00	R	PU	48
D20.12	Prototype of EF for SANS. Tests. Design of EF for TOF.	20	7	1.00	R	PU	48
D20.13	Specifications	20	6	1.00	R	PU	36
D20.14	Assembly of the humidity chamber. Tests	20	6	1.00	R	PU	48
D20.15	Design and performance estimations	20	1	1.00	R	PU	36

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D20.16	Drawings of the cryostat	20	1	1.00	R	PU	48
D21.1	ISIS detector hardware produced	21	2	10.00	P	PU	24
D21.2	Jülich detector hardware produced	21	4	10.00	P	PU	24
D21.3	Report on STFC and JÜLICH detector hardware	21	2	15.00	R	PU	24
D21.4	ISIS electronics system completed	21	2	10.00	P	PU	24
D21.5	Jülich electronics system completed	21	4	12.00	P	PU	36
D21.6	Report on STFC and JÜLICH detector electronics hardware	21	4	10.00	R	PU	36
D21.7	Report on signal processing development	21	4	10.00	R	PU	36
D21.8	Interim report on Si PMT Detector performance	21	14	12.00	R	PU	24
D21.9	Report on scintillation detector performance	21	2	10.00	R	PU	48
D21.10	Report on production parameter and substrate optimization	21	6	12.00	R	PU	36
D21.11	Report on exploration of alternative production techniques	21	3	10.00	R	PU	36

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D21.12	Small size test detector produced	21	3	10.00	P	PU	12
D21.13	Experimental Report on converter investigation	21	3	10.00	R	PU	36
D21.14	Concept study for large area detector based on extruded tubes	21	6	12.00	R	PU	48
D21.15	Concept study for large area detector based on micromegas	21	7	12.00	R	PU	48
			Total	836.00			

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP1	Type of activity [54]	MGT
Work package title	Management		
Start month	1		
End month	48		
Lead beneficiary number [55]	1		

Objectives

Lean, efficient and effective management by a experienced project coordination team. The project will be able to complete its objectives with the support of the project manager and the different governance (Board, general Assembly, Scientific Advisory Committee, International Observers) instances. The smooth organisation of regular meetings of the governance, as well as workshops related to innovation & economic matters are part of this work package. The project manager will work closely together with the information manager on outreach activity (see WP2).

Description of work and role of partners

Task 1.1 Management
Main task is coordinating the consortium and leading the project management. The project manager ensures a continuous monitoring of project progress and accompanies the consortium members in their contractual obligations. This implies the financial and administrative management of the consortium with regards to reporting to the EC. The management team will stay in close contact with the scientific officer at DG Research in Brussels. They will also ensure presence at important European policy events and liaise with other I3 projects and ESFRI projects.
The project manager of the current NMI3/FP7-I project will be maintained and will manage both projects in the year's overlap. Therefore she is only accounted for 36 MM in this project.
The dissemination manager (see WP2) will take care of the various communication channels, mainly the web site, but also paper brochures and other dissemination tools.
Furthermore a innovation workshop will be held, where supplier firms of the different facilities will be invited together with EC representatives. These workshops intend to highlight the economic impact of the research facilities on these industries. Invited companies will not only have the possibility to present their offer but also their needs in terms of policy, man power, technical expertise etc. The workshop needs preliminary reflection together with some key industries and the EC representatives.

Task 1.2 Annual reports
Collection and elaboration of periodic reports and financial statements are a major task and demand thorough preparation via the management. At the end of the project the management will take care of the implementation plans and seek to continuously publish outstanding project results to the broader public. This implies constant collection of information from the work package coordinators of the JRAs as well as the Transnational Access coordinators.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	36.00
	Total	36.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D1.1	Agenda General Assembly & Minutes of Board meeting	1	6.00	R	PU	3
D1.2	Agenda General Assembly & Minutes of the Board meeting	1	6.00	R	PU	14
D1.3	Agenda General Assembly & Minutes of the Board meeting	1	6.00	R	PU	30
D1.4	Agenda General Assembly & Minutes of the Board meeting	1	6.00	R	PU	44
D1.5	Report on innovation workshop	1	12.00	R	PU	28
		Total	36.00			

Description of deliverables

D1.1) Agenda General Assembly & Minutes of Board meeting: Agenda of General Assembly & Minutes of the Board meeting [month 3]

D1.2) Agenda General Assembly & Minutes of the Board meeting: [month 14]

D1.3) Agenda General Assembly & Minutes of the Board meeting: [month 30]

D1.4) Agenda General Assembly & Minutes of the Board meeting: [month 44]

D1.5) Report on innovation workshop: The Innovation workshop will be held at around mid term of the project in order to give the consortium a chance to prepare well such kind of meeting in order to be able to tackle the bottlenecks and evtl new procedures or practises to follow. This would therefore require preparation meetings with the industry and the EC representatives. [month 28]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3: Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP2	Type of activity [54]	COORD
Work package title	Dissemination & Outreach		
Start month	1		
End month	48		
Lead beneficiary number [55]	2		

Objectives

The objectives of this work package are twofold: (i) provide the consortium with all the web-based tools necessary for organizing an efficient work flow of the project and (ii) disseminate information to the outside world. Special attention will be given to reach out to the Muon user community.

Description of work and role of partners

The tasks of this work package are centred to a large extent on the internet portal of the consortium (Neutron and Muon Portal at www.neutron-eu.net). This portal has a dual role to play. On one hand it has to provide the coordinators of work packages within NMI3 with the necessary web-based administrative tools that allow an efficient workflow. This comprises assistance with the organization of meetings, a platform for exchange of information. On the other hand the portal is the main communication channel of the consortium towards the outside world. It has gained high reputation within the neutron and muon community. The fast evolution of internet technology paired with the requirement of new functionalities make it necessary to modernize the portal using Web 2.0 solutions. An increasing volume of information will make it necessary to review the portal's architecture. This will facilitate navigation and increase its attractiveness to the user community. Despite its importance NMI3 does not want to rely exclusively on the internet dissemination channel. Brochures, newsletters and posters and talks at conferences will complete the spectrum.

Task 2.1 Internet portal as internal and external communication tool (TUM)
The current internet portal needs a major adaptation to the current and future needs of the community. The information manager will accompany this development and be the driver of the new structure and its increased user friendliness. The portal will also have to provide the possibility of a future common user entry (WP5). Particular attention will be given to provide detailed information about the access offered by the European neutron centres paired with information on neutron scattering and muon spectroscopy in general. Minutes of NMI3 meetings and news on recent NMI3 achievements will be accessible on this site. Tools for the exchange and management of information and data will be supplied to the groups collaborating within NMI3 on specific tasks. Access to these internet platforms will be provided by personalised login. The platforms include organization tools for regular meetings and workshops. Whereas this part of internal communication mainly addresses the beneficiaries, additional information shall be provided to the neutron users as they are the ones who finally benefit from the developments. Deliverables and progress reports of the NMI3 work packages will be used as input for regular newsletters. This newsletter will be distributed by e-mail to those having subscribed to the newsletter on the internet portal and will be made equally available for download and targeted mailings to groups of specific interest (non-European observers, European Commission, National Ministries etc).

Task 2.2 Scientific and public outreach (STFC, ILL, TUM)
It is essential to widely publicize the successful outcome of activities supported by NMI3. This publicity has to be targeted to the audience that one intends to address. Four potential groups have been identified. Targeted outreach material will be supplied that should help to communicate the value of research, science and technological developments carried out within NMI3.
First target group - Funding organisations and politicians
To this non-specialist but highly influential audience research has to be presented using non-technical language. It has to be placed into the context of thematic priorities of societal importance (grand challenges).

The projects' research activity will feed into a brochure displaying the successes of neutron and muon science in Europe. The brochure will be structured thus as to be re-useable in multiple contexts, e.g. to produce brochures, webpages, and presentations.
A mailing list will be established to which journalists and other interested public can subscribe on the web portal. It will serve to distribute neutron and muon news releases. The NMI3 news page will partly publish news from other neutron sources just like shutdowns, proposal rounds etc. This will help to build wider awareness of the research contributions coming from neutron and muon facilities.
Second target group - Future neutron and muon researchers
To advertise the access program and increase the awareness of the Integrated Infrastructure Initiative supported by the European Union, face-to-face contact is the most effective method of reaching new neutron and muon users.
A detailed analysis of European conferences, workshops and other events will be made at the start of the project to identify opportunities to reach new groups of researchers. Advertising materials building on the basic information from the newsletter and the brochure will be produced. Advertising in appropriate science journals will be used where it is proven to be effective. Selected researchers will be encouraged to write articles to scientific journals and technical trade magazines for scientists not familiar with neutron and muon techniques.
Third target group - Existing neutron and muon research community
We will produce training and guidance notes for researchers on how to describe their research to different audiences, and to ensure that they can contribute positively to meet the requirements.
We will also ensure that press officers at each of the facilities have regular contact and can learn about science communication practice in different EU countries and share good practice with each other. This network will be essential in motivating researchers to contribute to the outreach programmes, and will build a network of media connections that can be exploited commonly across the network.
Fourth target group - General public
We will encourage participation of neutron and muon facilities in their regional and national science fairs for successful outreach ideas for communicating the value of neutron and muon research to non-specialists. Materials developed for the other tasks in this task will naturally cascade to this audience.

Task 2.3 Developing the Muon user community (PSI, STFC)
The muon spin rotation technique continues to develop and attract new users. It remains, however, a technique to which researchers are in general less exposed, and therefore it is of particular importance that opportunities are taken to publicise the method to the wider condensed matter and molecular physics community. The awareness and potential of this technique will be promoted to the wider community through publicity material, dedicated workshops and symposia at international conferences. Both PSI and ISIS have recently made a significant investment (totalling in excess of 4M EUR) in developing novel and complementary high field spectrometers, with much of the technological innovation required for these instruments being supported by previous NMI3 joint research activities. The potential that these unique facilities offer for new and innovative science will be presented to a broader scientific community; applications are envisaged in many areas of solid state research. This coordinated initiative goes beyond the outreach and promotion of the access program of the Muon beam facilities at ISIS and PSI (WP05 and WP09). This outreach activity includes partners from Coimbra (lead by J. Gil) and East Anglia (lead by N. Clayden) who will focus on applications in soft matter, while groups at Orsay (lead by P. Mendels) and Fribourg (lead by C. Bernhard) will work in the area of functional materials. These strong Muon groups are already active in these fields as part of their ongoing research activities and their output will serve to demonstrate the broad application of the technique. Furthermore, their specialist knowledge will be valuable during the development of publicity material and for defining the scope of workshops. These actions will be undertaken in collaboration with the International Society of Muon Spectroscopy – Europe (ISMS–E).

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	0.00
2	STFC	6.00
3	TUM	51.00
5	PSI	6.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
	Total	63.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D2.1	Newsletter summarizing the work in progress	3	8.00	O	PU	6
D2.2	Newsletter summarizing the work in progress	3	8.00	O	PU	18
D2.3	Newsletter summarizing the work in progress	3	8.00	O	PU	30
D2.4	Newsletter summarizing the work in progress	3	8.00	O	PU	42
D2.5	New Internet portal finished	3	15.00	O	PU	24
D2.6	Advertising material for conferences and journal advertising	3	4.00	O	PU	36
D2.7	Evaluation of possible presentations on conferences, workshops	2	1.00	R	PU	6
D2.8	Brochure for target group 1	2	1.00	O	PU	16
D2.9	Report on outreach activities	2	1.00	R	PU	12
D2.10	Report on outreach activities	2	1.00	R	PU	24
D2.11	Report on outreach activities	2	1.00	R	PU	36
D2.12	Report on outreach activities	2	1.00	R	PU	48
D2.13	High field developments website	5	1.00	O	PU	4
D2.14	High field publicity material	5	1.00	O	PU	8
D2.15	Workshop on aspects of Functional Materials	5	2.00	R	PU	18
D2.16	Workshop on aspects of Soft Matter	5	2.00	R	PU	30
		Total	63.00			

Description of deliverables

D2.1) Newsletter summarizing the work in progress: Newsletter will be disseminated electronically to those who subscribe to it on the web. For special occasions print version may be provided. [month 6]

D2.2) Newsletter summarizing the work in progress: Newsletter will be disseminated electronically to those who subscribe to it on the web. For special occasions print version may be provided. [month 18]

D2.3) Newsletter summarizing the work in progress: Newsletter will be disseminated electronically to those who subscribe to it on the web. For special occasions print version may be provided. [month 30]

D2.4) Newsletter summarizing the work in progress: Newsletter will be disseminated electronically to those who subscribe to it on the web. For special occasions print version may be provided. [month 42]

D2.5) New Internet portal finished: The modernized and more user friendly "easy to navigate" web portal, which will also be the user portal can be seen on the web under the projects' URL. [month 24]

D2.6) Advertising material for conferences and journal advertising: Advertising material is continuously improved and updated and adapted to the target public. This action will done throughout the whole project and the different items can be found on the web portal. [month 36]

D2.7) Evaluation of possible presentations on conferences, workshops: [month 6]

D2.8) Brochure for target group 1: [month 16]

D2.9) Report on outreach activities: [month 12]

D2.10) Report on outreach activities: [month 24]

D2.11) Report on outreach activities: [month 36]

D2.12) Report on outreach activities: [month 48]

D2.13) High field developments website: Establish a website describing high field developments at PSI and ISIS, regular updates will be made throughout the project. [month 4]

D2.14) High field publicity material: Publicity material describing potential applications of high field μSR, the different items will be available on the web page as downloadable pdf files. [month 8]

D2.15) Workshop on aspects of Functional Materials: Report on the workshop will be available on the web pages in due time after the workshop. [month 18]

D2.16) Workshop on aspects of Soft Matter: Report on the workshop will be available on the web pages in due time after the workshop. [month 30]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

ASG

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP3	Type of activity [54]	COORD
Work package title	E-learning		
Start month	1		
End month	48		
Lead beneficiary number [55]	3		

Objectives

Educating students and young scientists in the area of neutron scattering is a key for sustaining neutron research in Europe. As the curriculum of master courses in physics, chemistry or other related natural sciences does generally not include neutron scattering in any depth, it is essential to dispense such training via additional dedicated actions. The task of this networking initiative is to profit from modern web-based pedagogical tools and to setup an e-learning portal to promote neutron science in Europe.
Several specialized neutron courses organized by research centres and universities exist which provide a comprehensive introduction to neutron techniques often accompanied by hands on training at neutron sources. Access to these training courses is supported by NMI3 in the present project in the work package dedicated to The European Neutron and Muon School. The continuing success of this training is one of the components that maintain Europe as the leading region for neutron research around the world.
However, especially for the practical courses the number of participants is strongly limited. An open access e-learning platform will diminish this restriction. In addition e-learning is able to provide teaching in neutron research without the constraints imposed by the venue and dates of a neutron school. This is important especially for PhD students starting their research and depending right from the beginning on neutrons for their investigations. Furthermore web-based courses will help to prepare students better for the neutron schools. They will equally provide in-depth learning units to be used by lectures of graduate schools in condensed matter science. Finally they will assist undergraduate students attending lectures on neutron scattering or neutron research related courses.
The teaching of neutron scattering will address especially young people starting from about a bachelor level in natural sciences or engineering. A well chosen structure will guide more experienced students with a Master of Science or PhD degree to find the appropriate level to start the training. This early education in neutron scattering shall promote the use of neutrons for a Master thesis or PhD work even though it might not be the only or even major research tool.

Description of work and role of partners

The networking activity on e-learning neutron scattering will consist of three main tasks closely linked together.

Task 3.1, e-learning platform (TUM)
Well-established and professionally used software for e-learning is freely available. An overview is given at www.campussource.de/org. It ranges from the preparation of training material to the organisation of an entire virtual university.
Task 3.1.1 (TUM, UCPH, ILL)
The first issue will be to analyze in detail the existing platforms and to select the most appropriate one. The decision will be based on a detailed specification of the requirements for such a neutron e-learning platform. An essential criterion is the ease of use and performance of the overall performance of the platform both for the students and the lecturers.
Task 3.1.2 (TUM)
The technical realization and configuration of the system has to be done in accordance with the specified requirements. In view of the continuous development of the system during the project phase, the system will be modified and maintained in accordance with the needs expressed by the partners.
Task 3.1.3 (TUM, ILL, UCPH)

Dedicated courses on various aspects on neutron research will be developed. The courses will provide the students with a systematic training including the possibility to select special topics for scientists already familiar with basic neutron scattering. The training courses will be based on the lecture material developed within task 3.2 of this work package. In specialised workshops and meetings the content of the courses will be defined and subsequently revised (additional lectures to be invited to the workshops).

Task 3.2, Dedicated lecture material (UCPH, ILL, TUM)
E-learning relies on different information sources. The material will be made openly available without any charge to the attending students and scientists. The lecture material task will cover the needs for training at different levels.
Task 3.2.1 (UCPH, ILL)
A wiki-type presentation will be an entry point for interested students to inform themselves on the basics of neutron research. This development relies on the existing work by Linda Udby in the group of Kim Lefmann (UCPH). It covers all basic aspects of neutron scattering and provides necessary theoretical background. It is suited to train scientists on a profound basic level to use neutron scattering as a tool within their research portfolio. Undergraduate student will get an overview of the wide range of applications of neutron research. The content of this material will be extended to neutron techniques and components of instruments. Developments of the Joint Research Activities supported by the FP6 and FP7 frame work program will be included to present up-to-date information on recently developed components. Special emphasis will be given to the pulsed neutron sources in view of training scientists to use the future ESS. This lecture material will be available as well in the form of pdf-files.
Task 3.2.2 (TUM, ILL)
The second sub-task is to integrate existing material from neutron schools, specialized workshops and university lectures. Especially topical workshops and schools supported by NMI3 in the framework of the European Neutron and Muon School will be asked to provide additional information material. All the material will be reformatted for easy access in form of pdf-files or more modern style mobile formats (mobile readers, epub, OPF and others). As these lecture materials exist all around the world, a close collaboration and exchange with e-learning initiatives in North America will enlarge the amount of specialised courses offered. The entire e-learning work package will use English as the major language. However, to facilitate the access to neutron related courses to undergraduate students, lecture material in other European languages will be provided if available.
Task 3.2.3 (TUM)
Neutron books which are not available in print form any longer should be made available on the platform. This includes negotiations with authors and publishers. In addition the platform will provide a collection of neutron research related education material in form of topical review articles on methods and instrumentation (task supported by other partners of the consortium).

Task 3.3 Learning experimental neutron scattering on virtual instruments (UCPH, DTU)
The great success of the neutron schools in Europe is based on the combination of lectures and hands on training at the scattering instruments. To catch up this success story the practical experience should be included in the e-learning platform by using virtual instruments. Based on the McStas software simulation package, dedicated instruments representing all major neutron techniques will be configured. The student will select a sample material with defined structural or dynamical properties. Tuning the instrument parameters, the student will see the changing signals as registered by the detectors. The outcome of the simulation will be a data-set comparable to a real neutron scattering instrument. Subsequent analysis of this data files will train the student on the interpretation of the experimental outcomes. Dedicated workshops will be organized to setup the simulation packages.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	16.00
3	TUM	32.00
15	UCPH	30.00
16	DTU	3.00

WT3: Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
	Total	81.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D3.1	Specification about technical functionalities needed for the e-learning platform	3	1.00	R	PU	3
D3.2	Advancement report on functionalities development	3	6.00	R	PU	12
D3.3	e-learning neutron scattering platform	3	26.00	O	PU	48
D3.4	Content analysis of neutron course	1	1.00	R	PU	12
D3.5	Didactical course material	15	10.00	R	PU	48
D3.6	Lecture material	1	16.00	O	PU	48
D3.7	Definition of Instruments to be simulated	15	1.00	R	PU	12
D3.8	Virtual Instruments	15	20.00	R	PU	48
		Total	81.00			

Description of deliverables

D3.1) Specification about technical functionalities needed for the e-learning platform: Specification about technical functionalities needed for the e-learning platform and evtl optional functions for future development [month 3]

D3.2) Advancement report on functionalities development: Advancement report on functionalities development in the e-learning software [month 12]

D3.3) e-learning neutron scattering platform: The platform will be available via the web portal of the project. [month 48]

D3.4) Content analysis of neutron course: [month 12]

D3.5) Didactical course material: Didactical course material for neutron scattering covering basic theory to specialized applications. The material will be available via the web portal of the project and downloadable pdf documents. Requires preliminary analysis of the content of the neutron course. [month 48]

D3.6) Lecture material: Lecture material to support the neutron courses [month 48]

D3.7) Definition of Instruments to be simulated: [month 12]

D3.8) Virtual Instruments: Definition of instruments to be simulated. Virtual neutron scattering instruments, report on the setup and documentation. [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP4	Type of activity [54]	COORD
Work package title	European Neutron & Muon Schools		
Start month	1		
End month	48		
Lead beneficiary number [55]	1		

Objectives

Integrating and supporting a distributed training facility for neutron and muon scattering in Europe based on existing periodic high-quality schools.

Description of work and role of partners

Task 1 will ensure that there is a regular exchange of information between the individual schools of the ENMS to foster best practices and to increase coherence in the pedagogical offer. The coordination effort will equally include publicizing the ENMS internally and externally. The coordinator of the ENMS will in particular provide the information manager with the material necessary to advertise the ENMS properly on the NMI3 web site. He will make sure that reports are obtained in due time and orchestrate the evaluation process through the NMI3 SAC. He will equally link the ENMS to neutron and muon schools at the international level with the aim to increase the ENMS's visibility and to attract international students. The ENMS is closely related to the E-learning Work package. The ENMS and E-learning coordinators will work hand in hand to obtain the maximum level of synergy. In particular they assure that teaching material developed within ENMS can find its use within E-learning and vice versa.
Detailed description of each individual course see Annex A.

Task 2: HERCULES courses (main module)
Organizing organizations: Grenoble Scientific and Technical Universities
Frequency: annual over 4 years
Task 3: Bombannes summer school
Organizing organizations: Grenoble Scientific and Technical Universities
Frequency: biannual over 4 years
Task 4: Les Fan du LLB
Organizing organizations: LLB
Frequency: annual over 4 years
Task 5: ISIS Muon Spectroscopy Training School
Organizing organizations: ISIS
Frequency: biannual over 4 years
Task 6: Jülich Laboratory Course in Neutron Scattering
Organizing organizations: FZJ
Frequency: annual over 4 years
Task 7: Oxford School on Neutron Scattering
Organizing organizations: ISIS
Frequency: biannual over 4 years
Task 8: PSI Summer School on Condensed Matter Research
Organizing organizations: PSI
Frequency: annual over 4 years
Task 9: JACA
Organizing organizations: University of Zaragoza
Frequency: biannual over 4 years
Task 10: Berlin Neutron School
Organizing organizations: HZB

AG

Frequency: annual over 4 years
Task 11: Central European Training School on Neutron Scattering (CETS)
Organizing organizations: BNC-AEKI
Frequency: annual over 4 years
Task 12: SISN School
Organizing organizations: SISN
Frequency: annual over 4 years
Task 13: The Autumn School on "Application of Neutrons and Synchrotron Radiation in Engineering Materials Science"
Organizing organizations:
Frequency: biannual over 4 years
Task 14: Fullprof
Organizing organizations:
Frequency: annual over 4 years
Task 15: Baltic School on Application of Neutron and Synchrotron Radiation in Solid State Physics and Materials Science
Organizing organization: Institute of Solid State Physics (ISSP), University of Latvia.
The ISSP is an independent organisation of the University of Latvia, concentrating its activity on research, but also participating in the educational activities at the University and providing graduate and post-graduate students with an access to modern laboratories and the possibility to conduct high level research within the national and international projects.
Frequency: biannual over 4 years

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	6.00
2	STFC	2.00
	Total	8.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D4.1	Brochure of the different schools and their technical specificities and dates	1	1.00	R	PU	6
D4.2	Brochure of the different schools on the NMI3 web portal	1	1.00	O	PU	2
D4.3	Minutes of "Directors of Schools" meeting	1	1.00	R	PU	18
D4.4	Minutes of "Directors of Schools" meeting	1	1.00	R	PU	36
D4.5	Report of schools held in this period	1	1.00	R	PU	12
D4.6	Report of schools held in this period	1	1.00	R	PU	24
D4.7	Report of schools held in this period	1	1.00	R	PU	36
D4.8	Report of schools held in this period	1	1.00	R	PU	48
		Total	8.00			

Description of deliverables

D4.1) Brochure of the different schools and their technical specificities and dates: [month 6]

D4.2) Brochure of the different schools on the NMI3 web portal: [month 2]

D4.3) Minutes of "Directors of Schools" meeting: [month 18]

D4.4) Minutes of "Directors of Schools" meeting: [month 36]

D4.5) Report of schools held in this period: [month 12]

D4.6) Report of schools held in this period: [month 24]

D4.7) Report of schools held in this period: [month 36]

D4.8) Report of schools held in this period: [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP5	Type of activity [54]	COORD
Work package title	Integrated User Access		
Start month	1		
End month	48		
Lead beneficiary number [55]	6		

Objectives

Easy and open access to large scale neutron and muon facilities by national and international external scientific users is a general mission of all public funded scientific institutions in Europe. Peer reviewed proposal systems are established in most facilities to organize the access of the scientific user in a structured and transparent way. Regular calls for proposals for beam time at each individual facility serve the scientific request. Very positively programs like NMI3 have significantly increased the user base but that fact also demonstrated clearly the drawbacks of the fragmentary structure of individual user access at the various facilities. Users, in order to ask for beam time, have to redo similar registration procedures at each facility, to fill in similar proposal forms and to provide very similar information on legal and safety requests. Facilities with large numbers of proposals (e.g. more than 600 per year at TUM) have to invest increasing time and administrative resources in organizing this task. New large facilities as ESS with potential high throughput beam lines may deal with even more severe administrative efforts.
In order to structure and harmonize an integrated access format to European national neutron and muon facilities for the scientific users an 'Integrated User Access (IUA)' Networking Activity should consider and develop strategies and forms for a common integrated user registration, harmonized proposal forms and templates, optimized peer review processes and possible platforms for cross source beam time access. In addition, better statistical survey on European user access could be possible.

The work package consists of the following main objectives:
• Task 5.1: Organization and management of the networking activity.
• Task 5.2: Development of a generalized integrated user registration. Technical and legal requirements for a common NMI3 based single electronic user ID to access individual facility digital user office (DUO) systems will be analyzed and the best possible solution will be evaluated and established as a prototype.
• Task 5.3: Harmonized proposal forms and templates. Forms and templates of proposal submissions at existing DUO applications will be compared and a harmonized proposal template adopted for the individual requirements will be proposed and prepared for implementation.
• Task 5.4: Web based proposal peer review process. A framework will be developed to allow peer reviewing of submitted proposals within NMI3 web applications for small facilities, which do not operate an individual DUO.
• Task 5.5: Platforms for cross source independent beam time access. Platforms to submit proposals for access by the combination of instruments at the NMI3 facilities and platforms for cross source proposals for the complementary use of instruments, laboratory services or infrastructures using different probes (e.g. neutron, muons, x-rays, facility based AFM or electron microscopy) will be considered and developed. These platforms are intended to increase the efficient use of suites of instruments for users independent of the local institute, e.g. by block allocation strategies or send in sample programs across sources.

Description of work and role of partners

Task 5.1 Evaluation of a generalized integrated user registration.
Technical and legal requirements for a common NMI3 based single electronic user ID to access individual facility digital user office (DUO) systems will be analyzed and the best possible solution will be evaluated and established as a prototype. Requirements for this are:
- Survey and assessment of systems existing or planned within NMI3 or by other communities, e.g. IRUVX (EUROFEL), PanData, CRISP etc.
- Definition of the working rules of the NMI3 system and of procedures to exchange data between facilities.

- Development and distribution of a software package prototype and tools to setup a user system that operates with the rules defined enabling the procedures for submission and reviewing of proposals.
- Development of a common NMI3 information portal for participating users that will facilitate them to submit and transfer proposals between participating sources. Options for survey of statistical data on user requirements by the information portal.
- Option to register to workshop, schools and other activities within the NMI3 consortium.
The task is coordinated by partner HZB
Task 5.2: Harmonized proposal forms and templates
Presently each neutron or muon facility uses different forms and templates to gather the information that is required in a proposal form. On the other hand this information is quite similar and typically consists of (i) a scientific description and justification of the proposed experiment typically with a couple of figures, (ii) an experimental part with the justification for a certain required instrument and the description of the requested instrumental parameters, (iii) a detailed description of the samples. In many cases (iii) must be complemented by additional information regarding (iv) safety aspects of the samples under investigation and/or the experiment itself (e.g. delicate sample environment devices like furnaces, pressure cells etc).
Whereas the latter information and procedure might differ between various facilities (e.g. local safety regulations and national safety rules are different) the required information described in (i)-(iii) is quite similar and often only differs formally. These parts are therefore well suited to be harmonized between the participating NMI3 facilities. Therefore the aim of Task 3.3 is to compare the existing proposal forms and to aim for a common set of information that is used as standard at the participating facilities. A suggestion for such a harmonized proposal template will be developed.
The task is coordinated by partner PSI.
Task 5.3: Web based proposal peer review process
A framework will be developed to allow peer reviewing of submitted proposals within NMI3 web applications for small facilities, which do not operate an individual DUO.
The task is coordinated by partner TUD.
Task 5.4 Platforms for cross source independent beam time access.
Platforms to submit proposals for access by the combination of large scale instruments at dedicated NMI3 facilities and platforms for cross source proposals for complementary use of instruments using different probes (e.g. neutrons, muons or x-rays) will be considered and explored. The complementary use requested is not restricted to large scale instruments operated by the NMI3 facility but would also allow users to apply for use of special lab services (additional x-ray equipment, AFM, electron microscopy, etc.) available in and offered by the NMI3 partner.
These platforms are intended to increase the efficient use of suites of instruments for users by the participating facilities, e.g. by block allocation strategies or send in sample programs across sources. Advice for the most appropriate instrument could be given to the users by instrument scientists. A feasibility study to implement appropriate platforms within NMI3 will be prepared. Results will take into account comparable efforts by other communities (e.g. CRISP).
The task is coordinated by partner HZG (former GKSS).

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	4.00
2	STFC	4.00
3	TUM	48.00
4	Jülich	4.00
5	PSI	4.00
6	HZB	8.00
7	CEA	8.00
8	HZG	8.00
9	BNC-AEKI	4.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
12	TUD	2.00
13	NPI	2.00
	Total	96.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D5.1	Report on requirements	8	4.00	R	PU	12
D5.2	Software package prototype I	3	12.00	P	PU	24
D5.3	Software package prototype II	3	12.00	P	PU	48
D5.4	Harmonized proposal forms	5	4.00	R	PU	36
D5.5	Requirements for web based review process	12	2.00	R	PU	12
D5.6	Prototype of web based review process	3	12.00	P	PU	36
D5.7	Requirements for cross facility beam time access	8	4.00	R	PU	24
D5.8	Feasibility study on software prototype	3	12.00	R	PU	48
		Total	62.00			

Description of deliverables

D5.1) Report on requirements: Survey on existing comparable systems and report on requirements and framework for common data exchange [month 12]

D5.2) Software package prototype I: Software package prototype to handle integrated user registration [month 24]

D5.3) Software package prototype II: Software package prototype to handle proposal submission and reviewing between facilities [month 48]

D5.4) Harmonized proposal forms: Report on suggestion on harmonized proposal forms and appropriate templates [month 36]

D5.5) Requirements for web based review process: Report on requirements for web based review process [month 12]

D5.6) Prototype of web based review process: [month 36]

D5.7) Requirements for cross facility beam time access: Report on requirements for cross facility beam time access and strategy for implementation [month 24]

D5.8) Feasibility study on software prototype: Feasibility study on software prototype for cross facility beam time access [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP6	Type of activity [54]	COORD
Work package title	Standards for data analysis software		
Start month	1		
End month	48		
Lead beneficiary number [55]	1		

Objectives

To determine how to develop, deploy and operate a common data analysis software infrastructure to facilitate joint software development in the neutron scattering community.

Description of work and role of partners

The scientific output of neutron scattering facilities is determined by a production line which starts from the neutron source and finishes with published results. There are many links in this chain like neutron guides, detectors and sample environment, many of which have been or are supported by NMI3 activities. Any weak link jeopardises the whole production line. Facilities rarely have the resources to adopt a holistic approach to the production of scientific results and effort tends to be committed sequentially along the production line leaving data analysis, as the ultimate step before publication, under-funded. Instrument scientists are therefore left to find specific software solutions, as has traditionally been the case, leading to a pluralistic, heterogeneous provision of software. This ad hoc solution has worked in the past but new, high resolution detectors, higher data rates make, etc make new demands on software that require professional software solutions. In particular, new instruments constitute a considerable challenge for software provision and failure to address this issue leads to a delay in the scientific impact of new investment.
The importance of data analysis is now being realised and is becoming a focal point of efforts to optimise scientific production. In facilities which have scientific computing groups with responsibility for data analysis (less than half), a more rational approach to data analysis has been pursued leading to multi-functional, software platforms like LAMP [1] at the Institut Laue Langevin (France), DAVE [2] at NIST Centre for Neutron Research (USA) and, most recently, Mantid [3] at ISIS (the Rutherford Appleton Laboratory, UK). But at a European and world-wide level, these software solutions still constitute a duplication of effort, using a range of methods, practices and languages, for what are mainly standard data analysis tasks.
Broader, multi-centre approaches are therefore being pursued. The construction and now operation of the Spallation Neutron Source (SNS) in the USA prompted the DANSE project [4], which has collected together and wrapped a wide range of software, accessible via a web portal, to facilitate science peformed with neutrons. This software initiative has not however addressed the need for primary data analysis directly on the instruments and SNS is now collaborating with ISIS in the development of Mantid, both facilities operating similar types of instruments.
In Europe, more than ten central facilities for neutron and photon (X-ray) science are starting to join forces within the FP7-funded, PaNdata initiative [5] to address the management and flow of information from users and proposals through to publications. Data analysis is one of the major workpackages in this support activity, the goal being to determine a strategy for sharing software. The model being pursued is a repository of mainly existing, inter-operable software, which takes into account the diversity of software at a wide range of existing and new facilities. Centralising software will facilitate access for all users, encourage best software practices and allow tracking of software use.
Finally, within the High Data Rate Initiative (HDRI) project in Germany, all Helmholtz centres contributing to the Photons, Neutrons and Ions Research Programme (PNI [6]; i.e. HZB, FZJ, HZG for neutrons; DESY, KIT, GSI) are working together to make substantial progress in the efficiency of use of new sources. This includes agreement on common tools for data management, the development of software and hardware for real-time data processing and the provision of user software for further data analysis and simulation.
In this context, the support activity proposed here will explore "standards for data analysis" to prepare the next step in collaborative software provision within the neutron scattering community, the goal being to define the

requirements of a common data analysis platform. While the PaNdata workpackage on data analysis aims to bring together a wide range of neutron and photon software in a central repository without any attempt to rationalise content, in this project we want to make important steps towards optimising software development within a unique software infrastructure, which will also give users of neutron scattering facilities a common look-and-feel as they move between instruments and facilities. The two projects are however complementary in that the tracking of software use via a centralised repository will define the most useful neutron scattering related codes that should ultimately be integrated in a common software environment.
Defining a new, unique software environment for data analysis would be a formidable task, beyond the scope of the support activity proposed here. However, existing facility-based software, mentioned above, constitutes an advanced starting point and possibly a solution. In particular, Mantid is the most recent project, it is based on open source software (C++ and Python) and it is already a multi-facility collaboration (ISIS and SNS), involving also an external company (Tessella [7]) for software engineering. Mantid is therefore a possible solution, the challenge being to extend the existing functionality for instruments at spallation sources to those at reactor sources, which constitute the majority of the partners in this project.
Mantid is, however, not necessarily the only solution. The project will therefore begin with two review tasks: review existing data analysis software and practices of software developers and review existing solutions for a common data analysis infrastructure. Based on the reports from these tasks, the key phase of the project will be to develop a small number of prototype software solutions (probably 2) in areas chosen by the partners. The goal will be to deploy functionality that exists at some facilities in the common framework thereby making it accessible to and optimised for all partners. The goal will NOT be to develop new functionality. The final task will be to evaluate and report on the prototypes, thereby defining the software solution for integrating existing software into a common infrastructure and developing new software on an efficient, collaborative basis in the future.
Ten facilities will participate in this support activity, each contributing 1 man-month per year to the reviewing and evaluation tasks. The majority of the resources will be used to employ a software scientist for two years at the lead facility to investigate prototype software solutions.

Tasks:
Task 6.1: Review existing data analysis software and practices of software developers
Task 6.2: Review existing solutions for a common data analysis infrastructure
Task 6.3: Develop prototype software in chosen solution for representative applications
Task 6.4: Evaluate prototype software

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	28.00
2	STFC	4.00
3	TUM	4.00
4	Jülich	4.00
5	PSI	4.00
6	HZB	4.00
7	CEA	4.00
8	HZG	4.00
18	ESS	4.00
	Total	60.00

WT3:
Work package description

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D6.1	Report on current software and practices	1	7.00	R	PU	2
D6.2	Report on solutions for developing a common software infrastructure	1	7.00	R	PU	4
D6.3	Prototype software in chosen solution	1	7.00	P	PU	18
D6.4	Report on evaluation of prototype software	1	7.00	R	PU	24
		Total	28.00			

Description of deliverables

D6.1) Report on current software and practices: [month 2]

D6.2) Report on solutions for developing a common software infrastructure: [month 4]

D6.3) Prototype software in chosen solution: [month 18]

D6.4) Report on evaluation of prototype software: [month 24]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP7	Type of activity [54]	SUPP
Work package title	ISIS Neutrons		
Start month	1		
End month	48		
Lead beneficiary number [55]	2		

Objectives

Provision of transnational access

Description of work and role of partners

The ISIS Pulsed Neutron Source, the only such facility in Europe, is situated at the Rutherford Appleton Laboratory, near Oxford, UK. ISIS is the most productive source of its kind in the world. ISIS produces beams of pulsed slow neutrons which are used by scientists from higher education institutions, research laboratories and from industry, from both the UK and abroad. Slow neutron scattering provides unique information of the structure and dynamics of condensed matter at the atomic and molecular level, complementary to that provided by other probes such as synchrotron radiation, electron diffraction, NMR and optical spectroscopy. ISIS is equipped with 24 state of the art neutron instruments (http://www.isis.stfc.ac.uk/instruments/), the majority of which are recognised world leaders in their field and the benchmark for similar instrument developments in the USA and Japan.

The suite of neutron instruments facilitates both pure and applied science across a broad range of scientific fields, from physics and chemistry, through biological and material sciences to earth sciences, pharmacology and engineering. The present mode of operation is 150 days running for the scientific user programme per year, during which time ~ 700 different experiments, each lasting a few days, are performed by small teams of researchers.

The ISIS Second Target Station (TS2) is a new major development at ISIS. TS2 is qualitatively different from the original target station, offering an enhanced flux of long-wavelength, low-energy neutrons. Seven 'Day One' instruments have become operational during 2009 and 2010. These are enabling an enhanced programme in technologically significant areas such as soft matter, advanced materials, bio-molecular systems and nanoscience. For more details see http://www.isis.stfc.ac.uk/about-isis/target-station-2/.

ISIS is the largest facility within STFC's multidisciplinary Rutherford Appleton Laboratory (RAL), whose raison d'être is to provide large central facilities for researchers. Space Science, Particle Physics, High Power Lasers, Electron Beam Lithography and High Power Computing programmes thrive within the Laboratory. Each of these programmes is intimately involved in European and global collaborations.
The RAL site also hosts the new UK 3rd generation synchrotron – Diamond – which started operation in January 2007. The co-existence of neutrons and x-rays in close proximity is stimulating the exchange of scientific ideas and 'synergising' the science communities.

Services currently offered by the infrastructure:
This project offers access to all of the ISIS neutron instruments, including the new TS2 instruments, and the whole scientific and technical infrastructure. ISIS was designed as a user facility from the beginning and great emphasis is placed upon the needs of the visiting researcher. This is reflected in the provision of purpose-built support facilities, sample preparation laboratories, a User Office and a new Guest House with 60 comfortable and well-equipped bedrooms on site. With over 1500 individual users working on the instruments every year, the atmosphere is lively and stimulating and attracts scientists from all over the world. The majority of experiments are multi-disciplinary and multi-national, bringing together experts from all over the world. Some 25% of the ISIS user base are researchers from outside the UK. The European neutron community is large (~5000 researchers), well qualified, internationally respected and, whilst it pursues a diverse programme covering many scientific

disciplines, it is coherent as a community. Because of its unique capabilities, ISIS has attracted international users since it became operational some twenty five years ago. The demand is high. The oversubscription factor for EU sponsored access for the first part of NMI3/FP7 has been >5 in terms of proposals submitted.

Neutron scattering methods are applied to the materials of everyday life and provide the necessary knowledge base to underpin manufacturing industry and to support sustainable development, competitiveness and quality of life within Europe. Multinational collaborations and networks are flourishing.
Research using neutron scattering techniques is continuously expanding in terms of complexity and diversity. Recent newcomers to the field include pharmacology, planetary science and some areas of archaeology and cultural heritage. Any list of scientific highlights can only be indicative of the breadth and variety of scientific research at ISIS. For details of the current science programme please see e.g. recent case studies which demonstrate the impact of ISIS science (http://www.isis.stfc.ac.uk/about-isis/isis-impact/) or the recent ISIS Annual Report 2009 (http://www.isis.stfc.ac.uk/about-isis/annual-report/2009/isis-annual-report-20099121.html).
Recent scientific highlights include:

Environmental and Earth science: Studies of atmospheric oxidation of organic pollution in cloud droplets; suspension of mineral and organic particles in river water and runoffs from agricultural fields; water dynamics relating to the presence of cations in clay; aggregation of asphaltene in the presence of clay.

Technological materials: studies of the bound state of hydrogen in carbon nanohorns; microscopic magnetic ordering of exchange biased interfaces; the effect of mechanical tensioning for controlling residual stresses in friction welds; patterning of sodium ions and the control of electrons in sodium cobaltate; species absorbed on to heterogeneous catalysts use in industrial processes.

Molecular and polymeric materials: studies to optimise drug nanodispersions; interfacial structures in conjugated polymers; magnetic order in the quasi-one-dimensional spin ½ molecular chain compound copper pyrazine dinitrate; molecular ordering relevant to pharmaceutical materials; organic spin valves for spintronics applications; organic solar cell polymers and organic materials used in display screens; hydrogels for treating cleft palates.

Disordered materials: Studies of the local environment of ferric iron in a silicate glass; strain at a phase transition in perovskite suppressed by cation disorder; perturbation of water structure by dissolved ions; spin glass order induced by dynamic frustration.

Fundamental magnetic and superconducting systems: double exchange from valence fluctuations in magnetite; spin liquid physics; charge order in magnetic model systems; Pinch points and Kasteleyn transitions in Kagome ice; time-reversal symmetry breaking in non-centrosymmetric superconductors; magnetic interactions within pnictide superconductors; frustrated magnetism in superconducting fullerides; quantum melting of magnetic order in an Ising spin chain.

Modality of access under this project:
Access to the ISIS instruments is achieved through applying to the twice yearly 'Call for Proposals', with fixed submission deadlines of 16 April and 16 October. Once the review panels have recommended a proposal, the experiment is scheduled as part of the standard scheduling process. Experiments last typically between 1 to 10 days. Additional time may be required prior to the experiment for sample and sample environment preparation and after the experiment for data reduction and analysis. Throughout the whole process (often already starting during the proposal preparation process) users work closely with ISIS scientists and technical staff to ensure an efficient delivery of the experiment. Special attention is given to new users who may be unfamiliar with the specific measuring techniques and who may also require support with data analysis and interpretation.

Support offered under this project:
ISIS has a well-developed infrastructure which is fully able to manage and co-ordinate the activities of new users. Some 60 professional research scientists at ISIS are responsible - as local contacts – for the user getting the best out of the experiment. Teams of instrument technicians operate from a purpose-built Technical User Support Centre. Seven well-equipped support laboratories are available for the user programme. An extensive computer network is readily accessible from around Europe for data analysis. Up to date information about the facility, including the current status of the beam and many of the instrument manuals, is available on the ISIS Web pages (http://www.isis.stfc.ac.uk).

Accommodation and local transport is arranged through the ISIS User Office. A brand new Guest House is within a few minutes walking distance from the facility. Meals are provided in the RAL's restaurant seven days a week. Travel and subsistence costs for EU supported researchers are administered through the ISIS User Office. As with the previous FP supported users, all researchers supported by the FP7 programme will be fully integrated in the user system and will have all the rights and will receive all the support as any other user.

Outreach to new users:
The essence of attracting new users is visibility in its widest sense. This is achieved at ISIS in several ways. Scientific output is via high quality journals, talks at conferences and seminars. Information on ISIS instruments and their capability is broadcast via the internet, the ISIS Annual Report, at meetings of the seven Instrument User Groups and the annual Neutron and Muon User Meeting (NMUM).
The twice yearly 'Call for Proposals' is posted to past, present and potential future users together with a Newsletter – ISIS Information. This call is also broadcast electronically and announced on the ISIS Web site. Access to ISIS is also regularly advertised at major relevant international conferences and – very effectively – spread by word of mouth by ISIS scientists in their contact with the European science community. Access to ISIS is also publicised in Neutron News, the journal of the neutron community.

These calls result in the order of 1300 proposals each year. The ISIS website has a special page dedicated to information of how to apply to the EU Access to ISIS Neutrons and Muons programmes (http://www.isis.stfc.ac.uk/apply-for-beamtime/eu-funding-for-experiments-at-isis9834.html).
The effectiveness of all these measures is demonstrated in the interest the ISIS FP access programmes have attracted since FP3.

Review procedure under this project:
Proposals for experiments on the ISIS instruments – including proposals seeking EU support - are submitted to twice yearly deadlines in April and October. Applicants under the EU sponsored programme are required to tick the appropriate box on the Experiment Proposal form. The EU proposals are assessed – together with all other proposals - on the basis of scientific excellence and timeliness by seven international Facility Access Peer Panels. These peer review panels include a balanced representation of scientists of established reputation from the UK, Europe and the rest of the world. For an "EU Proposal" the relevant Panel is asked to peer review the proposal, taking into consideration the additional criteria of new user, new research group and geographical distribution. The strength and quality of the EU sponsored programme is closely connected to the fact that EU applications are peer reviewed at the same time as the other proposals, leading to a competition at the highest level. The ISIS peer review procedures are conducted under the terms of the UK research councils which set standards for a transparent, impartial and fair assessment of research proposals.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	STFC	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D7.1	Transnational access provision	2	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D7.1) Transnational access provision: Min. quantity of access to be provided: 77 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

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WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP8	Type of activity [54]	SUPP
Work package title	ISIS Muons		
Start month	1		
End month	48		
Lead beneficiary number [55]	2		

Objectives

Provision of transnational access

Description of work and role of partners

This project concerns the scientific exploitation of the ISIS Pulsed Muon Facility, the world's most successful source of pulsed muons. This facility is unique in that it is the only pulsed muon source within Europe. It is one of only two pulsed muon sources in the world (the other is at the J-PARC project in Japan), which complement the two continuous muon sources (at PSI, Switzerland, and TRIUMF, Canada).

Spin polarised muons are an important probe of the structure and dynamics of condensed matter; the technique is called ☐SR (muon spin rotation, relaxation or resonance). The muon can be implanted into any material and acts like a sensitive microscopic magnetometer, providing detailed information on local magnetic structure and dynamics in a very wide variety of systems. The muon mass is approximately one-ninth that of a proton, and in many experiments muons are used as a mimic to determine proton or hydrogen sites and dynamics, for example in semiconductors. Research applications of the technique therefore include studies of magnetic, superconducting, metallic, semiconducting, ion-conducting, amorphous and molecular materials. Increasingly, the technique is being applied to polymeric and chemical systems.

ISIS is one of two muon sources in Europe, the other being at the Paul Scherrer Institut in Switzerland. The different time structures of the muon beams at these two sources (pulsed at ISIS, continuous at PSI) make them complementary in terms of the science that can be performed. The pulsed nature of the ISIS beam also makes the facility particularly suitable for studies requiring a pulsed environment, such as E-fields, B-fields or light. ISIS is the best muon facility in the world for studies using pulsed techniques, which have seen significant recent development.

The ISIS Pulsed Muon Facility consists of three experimental areas. Two of these are occupied by the EMU and MuSR muon spectrometers; in the third, a new, state-of-the-art muon spectrometer, HiFi, has just been constructed. This instrument provides applied fields an order of magnitude higher than on the existing spectrometers and was commissioned in early 2010. European researchers also have access to the ARGUS muon spectrometer on the Japaneses-run RIKEN-RAL muon facility at ISIS.

The Muon Facility is part of the ISIS Pulsed Neutron and Muon Source, which annually sees some 1500 visiting researchers come to perform over 700 separate experiments. The Muon Facility benefits from all of the support services offered by ISIS, together with wider facilities available at the Rutherford Appleton Laboratory (RAL) such as dedicated researcher accommodation, restaurant and library. RAL itself has an exceptionally strong scientific culture and is home to a variety of other scientific departments including the new DIAMOND X-ray source.

Services currently offered by the infrastructure:
Muon Spectrometers
Access will be provided to the three ISIS muon instruments, including the new high-field spectrometer, plus the ARGUS RIKEN-RAL spectrometer, together with associated sample environment equipment (temperatures from 25 mK to 1500 K, gas and liquid handling, pulsed environments). The radio-frequency ☐SR (RF-☐SR)

technique in particular has been developed at ISIS over recent years and is ideally suited to a pulsed muon source, adding a variety of new experimental capabilities.

Science achievements
The unique nature of the ISIS muon facility enables the performance of excellent science. Since 2000, research at the facility has resulted in around 450 publications, many in high-quality journals such as Physical Review Letters or Nature. Studies performed under the FP6 Access and first FP7 contracts covered a very wide diversity of science including the relationship between magnetism and superconductivity in high-Tc superconductors; heavy Fermion systems; low-dimensional, spin-glass and frustrated magnetic materials; molecular magnets including high-spin and spin-crossover materials; modelling hydrogen behaviour in wide band-gap, oxide and organic semiconductors; dynamics in molecular glass-forming systems; molecular radical studies; light particle diffusion in metals; novel superconductors; and magnetic nanoparticles. During FP6, 36 publications have been produced by sponsored European research teams under the Access contract (from 56 separate experiments), 7 in Physical Review Letters, and EC-sponsored research has featured as science highlights in each of the last three ISIS Facility Annual Reports. To date: during the current FP7, whilst with only 11 experiments, in the past 18 months, we have 3 publications

FP 7 highlights include:

Critical behaviour of molecule magnets
M Czapla et al (Polish Academy of Science, Poland): Publication: M. Czapla et al Phys. Rev. B 82 09446 (2010)
Molecule-based magnets have a number of striking features such as room-temperature molecular magnets, single molecule, single-chain magnets, photoinduced magnets and magnetic spongelike behaviour. Czapla et al have shown with a combination of the muon technique and susceptibility measurements that a molecular magnet consisting of weakly coupled layers whilst adding extra copper leads to a unique magnetic network.

Probing non-centrosymmetric superconductivity in BaPtSi3
E Bauer et al (TU Wien, Austria): Publication: E Bauer et al Invited Speaker publication for Strongly correlated electron conference, USA.
Time reversal symmetry provides the necessary conditions for superconductivity. However, removing a centre of inversion can lead to an anti-symmetric coupling. Using muons the nature of the superconducting ground state has been determined.

Interest in using the ISIS Pulsed Muon Facility from users in other countries
The uniqueness of the ISIS Muon Facility means there is strong interest from researchers outside the UK. There is a well-established, experienced and dynamic European muon community who have developed and exploited the ISIS muon facilities since their conception. The experimental infrastructure of the Facility was constructed under funding from EC Framework Programmes 1 and 3 together with EC partners, and the Facility has run successful Access contracts under Framework Programmes 4, 5, 6 and 7. Under the FP6 contract, researchers from 12 EC countries (Austria, Belgium, France, Germany, Greece, Israel, Italy, Poland, Portugal, Spain, Sweden, Switzerland) were supported to use the Facility. 63 separate scientists visited the facility to perform 56 different experiments, and 142 individual visits were made. Of the 63 researchers who have visited, 36 (57%) had not used the Facility before FP6. These include new research groups (for example, new groups from Poland, Switzerland, the Netherlands, France and Austria), together with doctoral students using the Facility for the first time. Under the current FP7 contract, 24 separate scientists have visited performing 9 different experiments. Of those scientists, 13 (54%) were new users from Slovakia, Poland, Austria, Italy and France. Unfortunately, due to the severe reduction in funding this time we had a rejection percentage of about 60%.

Modality of access under this project:
Researchers using ISIS Muons travel to the Rutherford Appleton Laboratory and stay for the duration of their experiment. Typically experiments last from two to six days. Researchers will often come for additional days for sample preparation and data analysis. During their visits, researchers have full access to one or more of the ISIS muon spectrometers, together with all associated experimental infrastructure. They will take muon data from one or more samples over a variety of temperature and magnetic field conditions. Subsequent analysis provides an insight into the atomic level behaviour of the material under investigation, results which will be published in the open scientific literature and presented at relevant conferences.
Access to ISIS Muons for European researchers will be via the normal ISIS application procedures. There are two calls for proposals annually, with deadlines in April and October. Proposals are submitted electronically using an on-line proposal system. Six weeks after the proposal application deadline, the ISIS Muon Facility

Access Panel will meet to review the proposals (see below) and make recommendations regarding beamtime allocation. Successful applicants are then asked to specify dates during the ISIS run cycles when they would be able to take their allocated time. The scheduling of the muon instruments is dealt with by the relevant instrument scientists; EC experiments are placed into the schedule alongside those from other sponsors. EC proposals are therefore integrated into the normal Facility scheduling procedures.
Support offered under this project:
ISIS has a highly developed organisational structure which is fully able to co-ordinate the activities of visiting researchers. This is demonstrated by the fact that every year the facility is able to handle some 1500 scientists who come to use ISIS beams.

The ISIS Muon Facility has eight PhD-level scientists who provide full scientific and technical support to visiting researchers. They can give advice before proposal submission, and once an experiment has been awarded Facility time a scientific 'local contact' is assigned whose role is to assist with all aspects of an experiment. In addition, ISIS has teams of dedicated staff who support the experimental infrastructure: cryogenics, detectors, electronics and computing. It is widely accepted that the service given to users by ISIS scientists and technicians is exceptionally good and professional, and is one of the reasons for the Facility's success. The presence at ISIS of over 60 staff scientists, plus visiting researchers on 32 instruments, creates a stimulating intellectual environment and fosters collaboration between researchers. The Facility is particularly adept at handling new or inexperienced researchers. The support offered under this project is the same as that offered to all ISIS muon users regardless of their mechanism of support.

Outreach of new users:
Under Framework Programmes 6 and 7, a variety of means has been used to publicise the access programme which would continue in the new contract. They include:
• Permanent notices on the ISIS muon Web pages and on the main ISIS Website;
• Notice in the literature accompanying calls for proposal distributed to the user community;
• Notice in the ISIS Muon Group newsletter which is sent to all Facility users;
• A section in the ISIS beamtime application system to request Access funding;
• Advertisements in 'Neutron News';
• Mention in the ISIS Facility Annual Report;
• Advertisement at international conferences;
• Personal contact with researchers.

The European muon community is heavily dependent upon EC funds for access to ISIS Muons, and the Facility would see a significant reduction in groups applying if funds were not available. Over half of the researchers who visited the Facility under FP6 were new users and EC funds have been vital for their support. In 2010, the new high-field muon spectrometer became available. This has opened up new science areas to the muon technique at ISIS, and therefore has attracted new users to the Facility. Access funding is essential to enable some of these new groups to use this state-of-the-art spectrometer. Interest from European researchers therefore continues to be strong with demand for Access funds significantly greater than available supply.

Review procedure under this project:
The ISIS Muon Facility Access Panel is convened twice per year. This Panel reviews all of the proposals submitted to the Muon Facility, including those requesting EC funding. The essential criterion for selection is scientific merit. In order to encourage new research groups, proposals from inexperienced workers are dealt with more favourably. Feedback is always given of the Panel's findings to applicants, and collaborations between experienced and inexperienced researchers are encouraged. ISIS provides complementary facilities to those at the PSI muon source, and comments are given to applicants if part of a proposal would better suit PSI capabilities. Facility Access Panel members are expected to work under the 'Seven Principles of Public Life' endorsed by the UK Parliament, which include integrity, objectivity, accountability, openness and honesty.

The ISIS Muon Facility Access Panel is composed of 9 experts in the muon technique or its applications (plus advisors from the Facility who do not take part in the selection process). It presently includes 6 members from the UK, one from Europe, one from Japan and two from the USA.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	STFC	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D8.1	Transnational Access provision	2	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D8.1) Transnational Access provision: Min. quantity of access to be provided: 16 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP9	Type of activity [54]	SUPP
Work package title	FRM II (TUM, Jülich, HZG)		
Start month	1		
End month	48		
Lead beneficiary number [55]	3		

Objectives

Provision of transnational access

Description of work and role of partners

The Forschungs-Neutronenquelle Heinz Maier-Leibnitz (FRM II) is operated as a central facility of the Technische Universität München (TUM) which started routine operation in May 2005. In 2006 the possible maximum of 260 days of reactor operation were achieved during 5 reactor cycles. On average the FRM II runs 4 reactor cycles of 60 days each per year. The compact fuel element of the FRM II provides the world's best ratio of neutron flux per thermal reactor power. This optimal design allows placing the secondary sources, cold and hot source in the maximum of the thermal neutron flux. In addition a converter facility provides a unique fast neutron beam with energies from 1-2 MeV. An ultra cold neutron source is under construction.

With closure of the neutron sources in FRJ-2 in Jülich and FRG-1 in Geesthacht, the access provision of the FRM II, JCNS and GEMS (formerly GeNF) have been joint in Garching. In a close collaboration the complementary expertise of the three centers form a powerful symbiosis to even provide a better and more versatile offer for the European research area.

At FRM II neutrons are provided via 10 horizontal beam tubes to the experimental and the neutron guide hall (solely cold neutrons). A suite of various instrument stations are operated either by scientific departments of TUM or other German universities or research institutions. State of the art neutron guides and focusing optics optimize the use of the neutron beams for all of the 23 instruments in operation in 2010. 2 additional instruments were in the commissioning phase and 4 instruments were under construction at the end of 2010. Due to the strong demand to build further instruments, a second guide hall was inaugurated in May 2007. In the new guide hall it is planned to operate 6 instruments, of which two are new constructions projected by the Jülich Centre for Neutron Science and collaborators. In the year 2013 in total 29 instruments should be in full operation. Out of these 29 instruments 10 will be operated solely by the Jülich Centre for Neutron Science (JCNS) and 2 by the German Engineering Materials Science Centre (GEMS).

In addition to neutrons one inclined beam tube at FRM II incorporates a positron source. The positrons are created by pair conversion of high energy gamma-rays originating mainly from neutron capture in a cadmium foil located at the tip of the beam tube. Moderated positrons with a flux of 5•108/s are guided to 4 different experimental stations.

The FRM II is located in the centre of one of the leading scientific areas in Europe. The campus in Garching covers the science and engineering faculties of the TUM, institutes from the LMU Munich, 4 Max-Planck-Institutes and the ESO as well as institutes from the Bavarian academy of science. It hosts one of the largest computing facilities in Germany at the Leibnitz computing centre.

JCNS
In 2006 the FZ Jülich founded the Jülich Centre for Neutron Science (JCNS) in order to strengthens the experimental neutron scattering activities at the Institute for Neutron Scattering and the Institute for Scattering Methods at IFF, FZ Jülich, at external neutron sources after shutdown of the research reactor FRJ-2 in May 2006. The JCNS serves the in-house research with neutrons, the instrument and method development and

organizes the instrument operation and user programs at the JCNS instruments based at the FRM II reactor in Munich, the SNS Spallation Source in Oak Ridge and the ILL high-flux reactor in Grenoble.

The instruments in operation and in planning and construction cover all areas of neutron science ranging from magnetism, strongly correlated systems, superconductivity, colloids, polymers, glasses, surfaces, interfaces, biology and material sciences, allowing unique measurements in many fields of current research.

GEMS
After shut down of the FRG-1 research reactor at the Helmholtz-Zentrum Geesthacht in June 2010, the German Engineering Materials Science Centre (GEMS) operates and constructs outstanding neutron scattering instrumentation at the FRM II in Garching. GEMS is a major point of access for users in engineering materials research with neutrons and photons (instrumentation at the HZG Outstation at DESY), also allowing for the complementary use of the two probes.
The TOF reflectometer and GISANS instrument REFSANS operated by GEMS is optimized for a horizontal scattering geometry and serves especially research for soft condensed matter. The unique expertise in materials research for engineering applications of GEMS provides support on the stress and texture instrument STRESS-SPEC and the new small-angle scattering instrument SANS-1, which will be jointly operated by GEMS and TUM after commissioning in 2011.

Services currently offered by the infrastructure:
The FRM II represents a multi-purpose user facility. In addition to the neutron scattering instruments positron beams and irradiation facilities are available for scientific use. All instruments are maintained by collaboration groups from various German universities, Max-Planck Institutes or research groups of the German Helmholtz Gemeinschaft. These broad collaborations ensure a continuous development of the competitive and state of the art instrumentation at the FRM II. All instrument groups are supported by the in-house technical departments of the FRM II with regards to sample environment, detectors and electronics, neutron optics and software and IT services.

Each experiment is supported by a local scientist in charge of the technical and scientific concerns. This covers the support to prepare the proposal, the performance of the experiment and data evaluation if necessary.

FRM II, JCNS and GEMS also offer a broad option of on-site infrastructure for sample preparation and analysis by dedicated laboratories to perform physical, chemical and biological work. Equipped with standard instrumentation and devices users are able to perform complementary measurements and checks of samples to be measured at the instruments improving much the efficiency in beam time usage by having proper characterised samples.

In addition to the assistance during the experiment, software for data analysis and access to scientific data bases is provided during the stay at the FRM II either by TUM or the collaborating institutions. Where ever possible, software developed at the FRM II, JCNS or GEMS is available free of charge for the users.

Right from the beginning of routine operation, the requests for access come about 60% from users working in German institutes and 40% from other countries. In total 30% of the proposals were eligible for funding in the NMI3/FP6 and FP7 programs. The rate of successful proposals follows comparable percentages.

Modality of access under this project:
About 2/3 of the available beam time at the FRM II is distributed through a biannual call for proposals. Access to the instruments maintained is granted for external users by a web supported proposal system and an international user selection panel. Proposals can be submitted any time via the internet based user office online system at https://user.frm2.tum.de. Selection of proposals for beam time allocation is solely based on scientific merit by the scientific committee.

The beam time is offered free of charge under the condition that the results are published in a peer-reviewed journal. A list of publications is included in the annual report of the FRM II or the collaborating institutions of JCNS or GEMS. For each proposal an experimental report is requested which is published annually on the Internet pages of the FRM II.

Support offered under this project:

Technical and administrative support to perform experiments at the FRM II is given by the user office. During the registration process for an experiment the user can request support for organizing hotel and transport. Technical support for the experiment is already offered during the proposal submission. It includes provision of a large variety of sample environments, laboratory space for sample preparation and characterization. This support is organized by the local contact responsible for the experiment and free of charge to the user.
The local contact will set up the instrument for the experimental purpose including the sample environment, train the users on the instrument and explain to them the possibilities of data processing. The users work autonomously on site at the FRM II. For that purpose the user office applies for the users to obtain all necessary clearances to enter the site and radiation areas.

Outreach of new users:
Detailed information about the instruments and access is given through the internet pages of the institute under www.frm2.tum.de . In addition the electronic user office at https://user.frm2.tum.de informs about the details of proposal submission and technical concerns. The call for proposals is distributed through international mailing lists as well as to subscribed users at the FRM II. Print advertising is placed in Neutron News on a regular basis by FRM II, JCNS and GEMS. The FRM II as well as JCNS and GEMS are presented at national and international conferences on neutron scattering (ICNS, ECNS and German conference on neutron scattering). In addition FRM II organizes or co-organizes scientific topical workshops and meetings, e.g. in 2010 the 6th International Workshop on Sample Environment was hosted by FRM II.
The JCNS organizes a regular annual JCNS Workshop on Modern Trends in Neutron Scattering and topical workshops on neutron related topics, e.g. in 2010 a workshop on Modern Trends in Production and Application of Polarized 3He was held.
HZG is in charge of organizing a bi-annual school for scattering techniques in the context of engineering materials science with experiments at FRM II (Autumn School "Application of Neutrons and Synchrotron Radiation in Engineering Materials Science").
User meetings are organized every 18 month, where new users are especially invited to participate.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
3	TUM	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D9.1	Transnational access provision	3	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D9.1) Transnational access provision: min quantity of acces to be provided: 520 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP10	Type of activity [54]	SUPP
Work package title	SINQ (PSI)		
Start month	1		
End month	48		
Lead beneficiary number [55]	5		

Objectives

Provision of transnational access

Description of work and role of partners

Paul Scherrer Institute
The 'Paul Scherrer Institut (PSI)' is the largest national research institute in Switzerland. PSI uses 70% of its budget to develop, build and operate the National Swiss Large Scale research facilities. The strategic emphasis of PSI is on condensed matter, energy, and biological research based on research at these facilities, with strong emphasis on international co-operation and user-lab function. As a major part in the ETH-domain of the Swiss government it participates in the education at the Ph.D. level. At present approximately 300 graduate students from the ETH Zürich and other universities are working at PSI for their degree. The total number of staff is 1350.
Spallation neutron source SINQ
The continuous spallation neutron source SINQ - the only one of its kind worldwide - is a modern and state-of-the-art user facility for neutron scattering and imaging experiments. It is in full user operation since 1998. SINQ is powered by a 590 MeV cyclotron with a proton current of 2200 □A (world's most intense proton accelerator). The thermal neutron flux close to the SINQ target is in the order of 1.5•1014 n/cm2/s. Further upgrades (increase of the proton current to 2500 □A, optimization of the present solid Pb-target or future installation of a liquid metal target for routine operation) will provide a further flux increase. SINQ was optimized for the delivery of cold neutrons: supermirror coated neutron guides plus a cold D2-source located in the flux maximum result in a cold neutron flux exceeding that of other sources with comparable thermal flux. SINQ has an operation cycle of 8-9 months per year. During that period neutron production is active for 3.5 weeks intervals interrupted by 0.5 week periods for maintenance purposes.
SINQ as part of a larger ensemble:
A unique feature of PSI is that it is one of the very few places worldwide where the users find the three complementary probes neutrons (SINQ), X-rays (Swiss synchroton light source SLS) and muons (PSI-SµS facility) together on one site. There is an intense cooperation and know-how transfer between management, the staff scientists, engineers and users of the three facilities documented e.g. by a growing number of experiments using combined methods. Even a joint proposal submission for combined powder diffraction experiments using neutrons and synchrotron X-rays is enabled. Joint seminars, meetings and the traditional PSI summer schools on condensed matter research further enhance synergy effects and make PSI a highly attractive place to do science.
SINQ instrumentation
SINQ offers a full suite of modern instrumentation for neutron scattering and imaging experiments.
Detailed descriptions of the SINQ instruments can be found on the SINQ web pages:
http://sinq.web.psi.ch/sinq/instruments.html. Below just find a summary of the unique, new and outstanding features:
a) Diffractometers:
DMC is one of the very few powder diffractometers worldwide using cold neutrons and hence being very well suited for solving magnetic structures. The second powder diffractometer HRPT uses thermal neutrons and is a high-resolution instrument competitive to world-class instruments at the ILL. It is the only high-resolution powder diffractometer with an automatic sample exchanger at temperatures below to 1.7K. TriCS is the only thermal neutron single crystal diffractometer that can switch between a tiltable 2-dimensional and a tiltable single

detector as well as between long and short wavelength mode. The thermal strain scanner POLDI is designed as multiple pulse overlap time-of-flight diffractometer dedicated to internal strain and stress measurements.
b) Spectrometers:
FOCUS is a hybrid time-of-flight spectrometer covering a continuous energy range from 0.3 to 25 meV. Its open geometry allows for high flexibility in instrumental settings and sample environments (T≥50mK, H≤9.5T, P≤1.2GPa). In the framework of the cooperation with Risø National Laboratory the cold triple-axis spectrometer RITA-II was installed. With a multidetector it makes use of several analyser reflections simultaneously, which causes a significant intensity gain. TASP is a highly versatile triple-axis spectrometer (at the end position of a cold guide) equipped for polarization analysis. The new thermal triple-axis spectrometer EIGER is soon entering into the commissioning phase (operational in 2011) and will extend the accessible energy range to about 100 meV. The MUPAD option allows polarimetry, which is a quality step in magnetic structure determination.
c) SANS/Reflectometry:
The SANS-I facility (2x20m) is mechanically a twin instrument of D22/ILL. Beside its unique non-magnetic sample surrounding that allows for magnetic fields of 11T the instrument offers the option to polarize the incident beam and to perform time resolved experiments. Many other special features such us a rheometer are available. The new detector electronics of the SANS-II facility provides a gain factor of 7 in the acceptable total count rate. Recently, a Halbach magnet (1T, permanent), in-situ Dynamic Light Scattering and a solvent evaporation cell have been successfully introduced as sample environment for users. The reflectometer AMOR can be operated either in a time-of-flight or in an angle-dispersive mode. Special features are polarization analysis, the vertical scattering plane and focusing for small samples.
d) Imaging facilities:
The NEUTRA facility is a thermal neutron radiography and tomography beamline with various CCD based detectors, imaging plates, or a flat panel detector. A 320 kV X-ray tube is available for dual modality (neutron and X-ray) investigations. Two beam positions allow neutron tomography for objects with sizes between 4 cm and 30 cm. The cold neutron imaging beamline ICON can be optimized in a wide range of beam collimation and intensity by changing the inlet aperture from 1mm to 80 mm. Narrow energy bands can be obtained by a turbine type selector or with a Be filter. This highly flexible facility is equipped with a micro-tomography setup with highest possible spatial resolution and a macro position with a sample table for up to 500 kg load. The large experimental room enables to install even complicated and expanded infrastructure (like fuel-cell test racks). A grating interferometer is available as an optional insert for the study of phase contrast effects in imaging.
e) Sample environment:
The available temperature range starts at 50 mK and goes up to 1800 K. Vertical magnetic fields are available up to 15 Tesla, horizontal fields up to 11 Tesla, even in combination with the lowest possible temperatures. The maximal pressure (100 kbar) may be achieved with the compact Paris-Edinburgh cell, which can be used at temperatures down to 4 K.

Services currently offered by the infrastructure:
Approximately 100-130 publications appear each year based on SINQ experiments. A dedicated website with selected highlights is available: http://num.web.psi.ch/highlights. Below just find a brief selection of recent high ranking publications from various fields based on SINQ experiments:
• Magnetic flux lines in type-II superconductors and the 'hairy ball' theorem,
Nature communications 1, 45 (2010)
• Neutron optical beam splitter from holographically structured nanoparticle-polymer composites, Phys. Rev. Lett. 105, 123904 (2010)
• The preparation and structure of salty ice VII under pressure,
Nature Materials 8, 405 (2009)
• Giant superconductivity-induced modulation of the ferromagnetic magnetization in a cuprate–manganite superlattice,
Nature Materials 8, 315 (2009)
• Quantitative Radiography of Magnetic Fields Using Neutron Spin Phase Imaging,
Phys. Rev. Lett. 102, 145501 (2009)

There is a widespread and strong interest in beamtime at SINQ. Annually the PSI user office counts approximately 600-800 visits of users from typically 20-25 different countries. Approximately 50% of the use is national (PSI in-house and Swiss universities) but typically 35-40% of the users come from EU countries and associated states. The remaining 5-10% come from overseas (mainly USA, Japan, India) and from Russia. The number of experiments is between 400-500 per year and the number of new proposals is in the order of 300-350 per year. SINQ instruments are strongly overbooked: The overbooking factor averaged over all instruments varied between 1.8 and 2.9 during the 2006-2009 period.

Modality of access under this project:
Users submit their beam time requests either as regular proposals (two proposal submission deadlines per year) or as requests for urgent beamtime (submission at any time in case of very urgent projects, restricted lifetime of important samples, etc). 75% of the available beamtime is scheduled within these categories, 25% is reserved for development and maintenance of the instruments and dedicated in-house projects. The full process of proposal submission is handled electronically through a web interface (Digital User Office, DUO, https://duo.psi.ch), which is identical for the users of all three major user facilities at PSI. All proposals are evaluated by the external SINQ scientific committee and the review process is entirely based on scientific merit. After the committee meetings (twice a year) the proposal authors are informed about the result of the evaluation by the central user office and are then contacted by the instrument responsibles to accommodate and fix the dates for the experiment. A typical duration for an experiment at SINQ varies between 2-10 days. On site the local contacts assist the users in all kind of scientific/technical items during their stay at SINQ. They are either with the users at the instrument or 'on call' during 24h. The users may control their experiment either from the dedicated instrument's cabin or remotely from an office. They are free to use the full infrastructure of machine shops/computing/radiation protection available at PSI.
Support offered under this project:
Since 2002 the SINQ users are asked to return a satisfaction questionnaire and to rank various categories like quality of instruments, support, reliability etc between 0 and 5 (best). The overall average score is 4.4 but the highest ranks (both 4.8) are given for 'scientific' and 'technical support'. The scientific support is mainly based on the 'Laboratory for Neutron Scattering', PSI&ETH Zürich (head: Dr Jürg Schefer a.i.) except imaging facilities and the strain scanner instrument, which are operated by the spallation source division, head: Dr Werner Wagner. It is the policy of the institute to involve the staff members actively into the scientific cooperation of the experiments, whenever possible. This enables them to provide a strong scientific competence during both the support of the users and the development of the instruments.
The PSI user office is the central contact address and service installation for all users of the PSI facilities SINQ, S□S, SLS. The central PSI library is open to all users. PSI operates two guesthouses with totally 72 rooms and 83 beds. Three canteens/cafeterias offer their services, two of which are open 24h offering self-service out of working hours. Several hotels and restaurants are located in the neighbouring villages. Bicycles can be rented from the PSI user office. Offices and computers are available for the visiting users. The SINQ computing group together with the main PSI computing department assists the users in all IT related questions. A dedicated sample environment group is on site and is responsible for operating the manifold devices like cryostats, furnaces, magnets, etc. Almost all devices are completely computer controlled such that the parameters can be easily changed in a user-friendly manner. There are several sample preparation labs on site. The most modern one is located in the new guide hall extension and is especially equipped for the preparation, handling and storage of soft condensed matter and biological samples.

Outreach of new users:
SINQ always aimed to attract new users to the method of neutron scattering and imaging: Annually PSI organizes the PSI summer school on condensed matter research dedicated to students and potential new users. This school is organized together with the X-ray (SLS) and muon (S□S) community of PSI and aims strongly for the joint use of the PSI facilities. Since 2009 the school is complemented by a hands-on training course for the students at the PSI facilities. Regularly, a user meeting is organized. Since 2009 this is a joint event together with the PSI synchrotron and the neutron community (JUM@P meeting series). The same year PSI launched an electronic facility newsletter that appears quarterly and is distributed among more than 10.000 addresses from the PSI users' office database: http://www.psi.ch/info/facility-news
PSI lecturers are involved in several teaching activities at universities like ETH Zürich, University of Zürich, EPF Lausanne etc. In addition there is the dedicated SINQ webpage: http://sinq.web.psi.ch, which informs about the access options, contacts and instruments at SINQ. Twice a year the PSI user office announces an electronic call for proposals, which is sent out to almost 2000 dedicated neutron users from the user office database. The number of new users is still very high. As previously the share of new SINQ users supported by the access programmes was in the order of 40% in the first reporting period of the NMI3/FP7 project. The impact of the EU access programmes is also clearly indicated by the fact that the number of international users almost doubled since the first participation of SINQ in 2001 and is stable or increasing ever since.
Review procedure under this project:
The review procedure of the submitted proposals is peer review and entirely based on scientific merit. There is no further access restriction by any national contingency. The proposal selection panel consists of at present 13 international experts from the various scientific fields covered at SINQ. Their term of office is three years. PSI

staff members do only participate for technical consulting purposes. The actual composition of the committee is public and can be found on the SINQ webpages: http://sinq.web.psi.ch/sinq/committee.html. The present chairman of the committee is Prof Dr Andrew Boothroyd, University of Oxford. The selection panel also acts as 'scientific advisory committee' and advises the SINQ and the PSI management in strategic issues regarding the neutron source and the instrumentation.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
5	PSI	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D10.1	Transnational Access Provision	5	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D10.1) Transnational Access Provision: min quantity of acces to be provided 262 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP11	Type of activity [54]	SUPP
Work package title	SμS (PSI)		
Start month	1		
End month	48		
Lead beneficiary number [55]	5		

Objectives

Provision of transnational access

Description of work and role of partners

Paul Scherrer Institute
The ‘Paul Scherrer Institut (PSI)’ is the largest national research institute in Switzerland. PSI uses 70% of its budget to develop, build and operate the National Swiss Large Scale research facilities. The strategic emphasis of PSI is on condensed matter, energy, and biological research based on research at these facilities, with strong emphasis on international co-operation and user-lab function. As a major part in the ETH-domain of the Swiss government it participates in the education at the Ph.D. level. At present approximately 300 graduate students from the ETH Zürich and other universities are working at PSI for their degree. The total number of staff is 1350.
Swiss muon source S□S
The Swiss muon source – powered by the PSI 590 MeV cyclotron with a proton current of 2200 □A – is the world’s most intense continuous beam muon source. A further upgrade of the proton current to 2500 □A is under preparation. The proton beam hits two graphite targets. Attached to those are seven beamlines for muon (or pion) extraction, one of them is equipped with superconducting decay channel. The available muon energies range from 0.5 keV to 60 MeV. The main advantage of continuous muon beams is the detection of individual muons by fast-timing scintillation counters, easily providing nanosecond or better time resolution of the muon response. This allows one to extend □SR studies to much higher muon-spin precession frequencies (in the GHz range, corresponding to magnetic fields of more than 10 Tesla) and shorter muon-spin relaxation times compared to pulsed muon sources, where the time resolution is limited by the muon pulse duration (typically 50 ns). Thus, at the European level, the PSI S□S facility perfectly complements the ISIS pulsed muon source.

S□S as part of a larger ensemble:
A unique feature of PSI is that it is one of the very few places worldwide where the users find the three complementary probes neutrons (SINQ), X-rays (Swiss synchrotron light source SLS) and muons (PSI-SμS facility) together on one site. There is an intense cooperation and know-how transfer between the management, the staff scientists, engineers and users of the three facilities documented e.g. by a growing number of experiments using combined methods. Joint seminars, meetings and the traditional PSI summer schools on condensed matter research further enhance synergy effects and make PSI a highly attractive place to do science.
SμS instrumentation
SμS disposes of 6 state-of-the-art μSR instruments capable of covering a large range of muons kinetic energies. Each of the instruments is equipped with a full suite of modern sample environment making available a large range of experimental parameters as temperature (0.01K - 1200K), pressure (≤ 2.5GPa) or magnetic field (≤ 5T, from 2012 9.5T). Detailed descriptions of the SμS instruments can be found on the SμS web pages: http://lmu.web.psi.ch/. Below just find a summary of the unique, new and outstanding features:
a) Surface muons time differential spectrometers:
GPS is a general-purpose spectrometer for longitudinal- and transverse-field bulk μSR using positive muons with kinetic energy of 4.2MeV. Sample temperatures range from 1.6K up to 1200K. The Low-Temperature Facility LTF is equipped with a top-loading dilution cryostat (T ≥ 0.01K) and superconducting magnet (≤ 3T). The instrument DOLLY has recently been upgraded to allow measurements of samples with strongly reduced lateral

dimensions at very low temperatures (T ≥ 0.24K). Like GPS it is equipped with Helmholtz coils (up to 0.7T). All these instruments are located on beamlines equipped with spin-rotator devices.
A new high-field instrument is currently under construction and its commissioning is foreseen at the beginning of 2012 with users operation from mid-2012. This new instrument will be equipped with a 9.5 Tesla magnet and a dilution cryostat capable of reaching 0.02 K. The necessary technology for the novel high-time resolution detector array (based on avalanche photo-diodes -- APD) was developed in the frame of the previous Joint Research Activities program of the NMI3.
b) High-energy spectrometer:
The instrument GPD is a general-purpose spectrometer for positive or negative decay-channel muons. It has been completely rebuilt in 2006, accommodating state-of-the-art detectors and sample environment. The muon energy can be tuned from 15 to 60MeV. GPD is equipped with pivotable Helmholtz coils (0.5T), to allow both longitudinal- and transverse-field experiments, and with specially designed cryostats to accommodate high-pressure cells (2.5GPa down to 0.24K).
c) Surface muons time-integral spectrometer:
The ALC Avoided-Level Crossing instrument uses integral forward-backward decay asymmetry counting on a high-flux surface-muon beam. It is installed on the piE3 beamline where as much as 5•107 muons can be used per second. ALC is equipped with a longitudinal superconducting solenoid (≤ 5T). Sample environment allow experiments in the range 2K – 800K. In November 2007, ALC has been equipped with new arrays of detectors with Avalanche Photo-Diodes (APDs).
d) Low energy muons instrument:
The low energy muon instrument LEM is a worldwide unique facility that allows to perform depth dependent □SR investigations on a nanometre scale and thus greatly extending the field of application of this technique (e.g. to study of heterostructures, low dimensional systems, near surface effects, nanoparticles). A major upgrade has been completed in 2005/2006 with the construction and commissioning of a dedicated high intensity surface muon beam line, where as much as 7•108 muons per second can be transported to the experimental area. Parallel to this development the LEM apparatus has been completely rebuilt with e.g. a new cryostat for the source of low energy muons allowing reliable long term operation and low Helium consumption. High reliability and long term stability has been achieved to allow the users to concentrate on the experiment and online analysis. The standard sample environment cryostats allow experiments in the range 3K – 320K. External magnetic field can be applied in-plane (0-30 mT) or out of plane of thin films (0-0.3T). The energy of the muons can be tuned from 0.5 to 30 keV. Currently, a special spin-rotator for operation in ultra-high vacuum is under construction. During 2011/2012 it will be installed in the low-energy muon beam line to allow for longitudinal field low-energy □SR measurements. This will considerably extend the application of low-energy □SR to the investigation of spin dynamics and fluctuations in low dimensional systems.

Services currently offered by the infrastructure:
Approximately 60-80 publications appear each year based on S□S experiments. A dedicated website with selected highlights is available: http://num.web.psi.ch/highlights. Below just find a brief selection of recent high ranking publications from various fields based on S□S experiments:
• Spatially homogeneous ferromagnetism of (Ga, Mn)As,
Nature Materials 9, 299 (2010)
• Chiral Induction in Lyotropic Liquid Crystals: Insights into the Role of Dopant Location and Dopant Dynamics,
Angewandte Chemie International Edition 49, 2427 (2010)
• Pressure Induced Static Magnetic Order in Superconducting FeSe1-x,
Physical Review Letters 104, 087003 (2010).
• The electronic phase diagram of the LaO1-xFxFeAs superconductor,
Nature Materials. 8, 305 (2009)
• Direct measurement of the electronic spin diffusion length in a fully functional organic spin valve by low-energy muon spin rotation,
Nature Materials. 8, 109 (2009)

There is a strong and ongoing community interest in the use of the S□S facility, well documented by the number of new proposals. In 2008 approximately 160 proposals were submitted, another 180 in 2009. These numbers are directly reflected in the overbooking factors of the S□S instruments, which are between 2 and 4 for instruments like GPS, LTF, GPD or LEM. Each year S□S delivers approximately 600-700 instrument days and 170-200 experiments are performed. The number of annual user visits is typically between 300 and 350, approximately 60% of those are international visits and 40-50% are eligible for funding within the transnational access programme.

Modality of access under this project:
The users might submit new proposals or continuation requests of previous proposals at two submission deadlines per year (beginning of December and of June). As for the other two PSI user facilities (SINQ and SLS) the submission is completely handled electronically by the central PSI user office and its web interface DUO, https://duo.psi.ch. Furthermore all over the year it is possible to submit urgent beamtime requests, for which between 5-10% of the available beamtime is reserved. The S□S research committee evaluates the submitted proposals entirely based on scientific merit (see below). After the meeting the proposal authors are informed about the result of the evaluation and are then contacted to accommodate and to fix the dates for the experiment(s) taking into account the constraints of the users and the boundary conditions of the facility.
A typical dura¬tion for an experiment at S□S varies between 4-15 days. On site the local contacts assist the users in all kind of scientific/technical items during their stay at S□S, e.g. installation of sample environment, optimization of the instrument setting, introduction into the handling of the instrument, data treatment, etc. The local contacts are either with the users at the instrument or 'on call' during 24h. The users may control their experiment either from the dedicated instrument's cabin or remotely from an office. They are free to use the full infrastructure of machine shops/computing/radiation protection available at PSI.
Support offered under this project:
The scientific support for the S□S users is provided by the 'Laboratory for Muon Spectroscopy, LMU' (head: Prof. Elvezio Morenzoni), which is part of the 'Department for Research with Neutrons and Muons, NUM' of PSI. The laboratory is one of the major competence centres for muon spectroscopy worldwide. The LMU consists of two scientific groups: 'bulk □SR' (Dr Alex Amato) and 'low energy muons' (Dr Thomas Prokscha). In total 13 scientists are involved in the support of the users during their experiments at PSI.
The PSI user office is the central contact address and service installation for all users of the PSI facilities SINQ, S□S, SLS. The central PSI library is open to all users. PSI operates two guesthouses with totally 72 rooms and 83 beds. Three canteens/cafeterias offer their services, two of which are open 24h offering self-service out of working hours. Several hotels and restaurants are located in the neighbouring villages. Bicycles can be rented from the PSI user office. Offices and computers are available for the visiting users. The NUM department runs its own computing group. This one together with the main PSI computing department assists the users in all IT related questions. A dedicated sample environment group is on site that is responsible for operating the manifold devices like cryostats, furnaces, magnets, etc. during the experiments. There are several sample preparation labs on site. The most modern one is co-shared with the SINQ users and is especially equipped for the preparation, handling and storage of soft condensed matter and biological samples.

Outreach of new users:
Annually PSI organizes the PSI summer school on condensed matter research dedicated to students and potential new users. This school is organized together with the X-ray (SLS) and neutron (SINQ) community of PSI and aims strongly for the joint use of the PSI facilities. Since 2009 the school is complemented by a hands-on training course for the students at the PSI facilities. Regularly, a user meeting is organized. Since 2009 this is a joint event together with the PSI synchrotron and the neutron community (JUM@P meeting series). The same year PSI launched an electronic facility newsletter that appears quarterly and is distributed among more than 10.000 addresses from the PSI users' office database: http://www.psi.ch/info/facility-news
PSI lecturers are involved in several teaching activities at universities like like ETH Zürich, University of Zürich, EPF Lausanne etc. Twice a year an electronic call for proposals is announced, which is distributed among several hundred of muon users from the database. The dedicated web page of the facility: http://lmu.web.psi.ch is designed to draw attention to the wide variety of research opportunities offered by □SR spectroscopy. Potential new users will find here a brief introduction to the method and its applications. Furthermore information is provided about the research activities of the facility, descriptions of the instruments and all necessary information to obtain access.
Review procedure under this project:
The review procedure of the submitted proposals is peer review and entirely based on scientific merit. There is no further access restriction by any national contingency. The proposal selection panel consists of presently 10 international experts from the various scientific fields covered at S□S plus a facility representative. The actual composition of the committee is public and can be found on the S□S webpages: http://lmu.web.psi.ch/research/commit.html. The present chairman is Prof. Dr. Christian Bernhard, University of Fribourg/CH. The committee meets once a year (typically January/February) to evaluate the new proposals. The second call is evaluated completely electronically. In addition new users have the option to receive a limited amount of beamtime for a feasibility study based on a letter of intent, which might be upgraded to a full proposal in case of success.

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
5	PSI	1.00
	Total	1.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D11.1	Transnational access provision	5	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D11.1) Transnational access provision: min quantity of access to be provided: 123 [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP12	Type of activity [54]	SUPP
Work package title	BER II (HZB)		
Start month	1		
End month	48		
Lead beneficiary number [55]	6		

Objectives

Provision of transnational access

Description of work and role of partners

The Helmholtz-Zentrum Berlin (HZB) operates the medium-flux research reactor BER II in Berlin-Wannsee, a modern neutron source which was completely renewed during the years 1985-1992 and will have a new generation cold source installed in 2011. In addition, HZB is also operating the Berlin synchrotron radiation infrastructure BESSY II in Berlin-Adlershof. Starting user service in 1993 with the Berlin Neutron Scattering Center (BENSC), BER II has established itself as a major European Neutron Scattering Facility with an exceptionally high demand from European users. BER II offers access to a great variety of new or upgraded neutron scattering instruments with unique features suited for research in many fields of science. Major fields actively pursued at BER II include research on magnetism, soft-matter and biological materials, as well as on nano-sized and engineering materials.
A unique and world-wide recognized strength of BER II is the large range of sample environment equipment available to carry out experiments under extreme sample conditions. Highest magnetic fields (up to 17.5 T), lowest temperatures (down to 30 mK) and pressures up to 8 kBar (clamping)/5 kBar (gas) are routinely offered to users, together with extensive expert support by scientists and technical staff. At present, a great effort is being made at BER II to push the field limit for neutron scattering experiments towards new frontiers: a hybrid magnet for fields initially of 28 T in 2012 and upgradable to 34 T in the future is being constructed at the US National High Field Laboratory in Tallahassee in cooperation with the HZB and will be available at BER II in 2013. In combination with a dedicated diffractometer based on a new time¬-of-flight concept, it will open up unprecedented possibilities in neutron scattering at the highest magnetic fields available world-wide. This “extreme environment diffractometer” (EXED) offers powder and single crystal diffraction as well as SANS and reflectometry with inelastic option and is fully available for users from 2011 on.
The capabilities of the “Dedicated Environment for Combined Gas Adsorption and Scattering Experiments” (DEGAS) are continously enhanced: a 8 kBar gas pressure cell will be commissioned at the end of 2010.
In 2011 the new thermo-gravimetic analysis option (TGA) for in-situ studies under 300 bar gas pressure at temperatures up to 200°C (500 bar at 100°C) will be operational and avaiable for users. TGA, coupled with mass spectroscopy and neutron diffraction, is of high interest in chemistry and catalysis to understand reactions and processes under gas flow in-situ. The hydrogen and gas storage communities would also benefit from data collection strategies that investigate structure and kinetics simultaneously.
Answering the increasing demand for beam time, HZB has doubled the number of heavily oversubscribed instruments during the last years, with each new instrument having a particular specialisation: a new “Very Small Angle Neutron Scattering” (VSANS) machine, a new reflectometer for biological samples (BioRef) and a second polarised-neutron tomography station (PONTO). A large upgrade project, encompassing almost all existing instruments and including a new guide system for the Neutron Guide Hall completes the vast expansion of the experimental possibilities offered at BER II. These efforts will be finished in 2013 by the commissioning of the completely renewed time-of-flight spectrometer NEAT.
In addition to the neutron instrumentation, HZB is offering a variety of complementary laboratory services: a laboratory for soft-matter and biological samples (BioLab), a laboratory for physical properties measurements (LaMMB) with a state-of-the-art PPMS system as well as a highly specialised instrumentation for specific heat measurements and a dedicated laboratory for gas adsorption measurements (DEGAS) activities. These laboratories are available to users even without direct connection to a neutron experiment.

Since January 2009, HZB is offering access to both its neutron facility (BER II) and synchrotron radiation facility (BESSY II) via the on-line general access tool GATE, facilitating the synergetic use of neutron and synchrotron.

Services currently offered by the infrastructure:
14 instruments are routinely offered to external users. These are the major instruments of BER II, covering practically all neutron scattering techniques (except backscattering). Six of these instruments are installed at thermal beam tubes: a flat-cone diffractometer (E2), a residual-stress diffractometer (E3), a single-crystal diffractometer (E4), a 4-circle diffractometer (E5), a single-crystal and medium-resolution powder diffractometer (E6) and a high-resolution powder diffractometer (E9). Ten instruments are installed at neutron guides connected to the cold source of the reactor: a diffractometer (V1), a three-axes spectrometer with resonance spin-echo add-on (FLEX, V2), a time-of flight spectrometer (NEAT, V3), a small angle scattering instrument with polarised-neutron option (SANS, V4), a reflectometer (V6), a tomography station (CONRAD, V7), an ultra small-angle scattering instrument (V12) and -with limited acces until the end of 2010- a very high resolution time-of-flight powder diffractometer optimised for diffraction in extreme conditions (EXED, V15). Three more instruments, the very small-angle scattering instrument dedicated to soft matter research (VSANS, V16), the reflectometer for biological applications (BioRef, V18) and the polarised-neutron tomography station (PONTO, V19) will be available for users in 2011.
Several of the above instruments provide neutron intensities and resolutions competitive with the best instruments world-wide. An outstanding feature of BER II is the high magnetic-field (up to 17.5 T), low temperature (down to mK) and gas pressure (up to 8 kbar) sample environment which is routinely offered to users. In particular, it is the expert support and extensive service by HZB scientists and technicians operating the extreme sample environment which allows even „occasional users"to perform research of the highest quality. The following examples serve to demonstrate the potential of BER II in these fields:

Kofu, M.; Ueda, H.; Nojiri, H.; Oshima, Y.; Zenmoto, T.; Rule, K.C.; Gerischer, S.; Lake, B.; Batista, C.D.; Ueda, Y.; Lee, S.H.
Magnetic-Field Induced Phase Transitions in a Weakly Coupled s=1/2 Quantum Spin Dimer System Ba3Cr2O8
Phys. Rev. Lett. 102 (2009), 177204

Muhlbauer, S.; Pfleiderer, C.; Boni, P.; Laver, M.; Forgan, E.M.; Fort, D.; Keiderling, U.; Behr, G.
Morphology of the Superconducting Vortex Lattice in Ultrapure Niobium
Phys. Rev. Lett. 102 (2009), 136408

Thielemann, B.; Ruegg, C.; Ronnow, H.M.; Lauchli, A.M.; Caux, J.S.; Normand, B.; Biner, D.; Kramer, K.W.; Gudel, H.U.; Stahn, J.; Habicht, K.; Kiefer, K.; Boehm, M.; McMorrow, D.F.; Mesot, J.
Direct Observation of Magnon Fractionalization in the Quantum Spin Ladder
Phys. Rev. Lett. 102 (2009), 107204

Friedrichs, O.; Kim, J. W. ; Remhof, A.; Buchter, F.; Borgschulte, A.; Wallacher, D.; Cho, Y. W. ; Fichtner, M.; Oh, K. H.; Züttel. A.
The effect of Al on the hydrogen sorption mechanism of LiBH4
Phys. Chem. Chem. Phys. 11 (2009), 1515

Modality of access under this project:
70% of the beam time at each of the 14 scheduled instruments is offered to external users, 30% to in-house researchers. A minor part of the beam time for external users (up to 20% of the total beam time of an instrument) can be given to long term collaborating groups from universities and other research institutions, the rest (at least 50% of the total beam time) is allocated to short term projects. The long term collaborations mainly serve two purposes: (i) they allow university groups a reliable planning of thesis works and (ii) they enlarge the pool of scientific expertise available at HZB. The beam time allocation is based on a proposal system with two proposal rounds per year. Proposals for short-term and long-term projects submitted by external users are peer-reviewed by an international Scientific Selection Panel (SSP) which meets at the HZB to discuss and evaluate the proposals. Both neutron and synchrotron radiation beam time applications are reviewed together. Following the decisions of the Scientific Panel, proposers of accepted projects are invited to perform the proposed experiments at BER II free of charge. Experiments performed must be followed by a report which is published in the annual volume of the BER II Experimental Reports. In addition, HZB expects that the results of the experiments are published in refereed journals. Experimental reports and the publications are the main deliverables.

Support offered under this project:

HZB provides extensive technical and scientific support for all external users at the scheduled instruments. The instrument scientists assist in preparing and performing the experiments and in the data evaluation process. Advanced sample environment such as high-field cryomagnets or high-temperature furnaces is operated by experts from the sample environment group. In addition users have access to laboratory services of HZB such as the laboratory for soft-matter and biological samples (BioLab), the laboratory for magnetic measurements (LAMMB) and the laboratory for measurements under controlled gas atmosphere (DEGAS). Working in these highly specialised laboratories under the guidance of in-house experts greatly enhances the scientific output and stimulates the scientific exchange between users and in-house groups. HZB also provides extensive logistic support. It runs a 30 bedroom hostel on site and assists external users by contributing to travel and subsistence expenses. The common accommodation in one guest house on site also helps to stimulate discussions among the different users of BER II.

Outreach of new users:
The information on BER II is disseminated by various channels: (i) a call for proposal with detailed information on established and new scientific opportunities offered at BER II is sent out twice a year by email both to former users of BER II (address list from GATE database) and to the neutron scattering mailing list; the addressees are kindly requested to distribute the information also to all colleagues who could be interested in neutron experiments; (ii) advertisement in each issue of Neutron News;
(iii) regular user meetings held at HZB with talks on new instrumental developments; (iv) all information is compiled on the web pages of BER II (www.helmholtz-berlin.de/user): detailed descriptions of the instruments and the sample environment, access procedures, reactor cycles, the annual volumes of the BENSC Experimental Reports since 2000 etc.
To attract new users from new areas of research HZB demonstrates its scientific opportunities not only at the established conferences of the neutron community (ICNS, ECNS etc.), but also at meetings and Symposia of scientific communities focussed on particular fields. It turned out to be especially fruitful for HZB itself to organize sequences of workshops, as has successfully been done before developing the specialised equipment for adsorption experiments (DEGAS) which now attracts a rapidly growing number of new users from very diverse fields of materials science. The annual neutron school held at HZB is most important for attracting young future users. This is widely announced by sending out flyers and posters.
To increase and broaden the scientific basis in Europe it is absolutely necessary to give young researchers from universities throughout Europe an equal chance to use the infrastructure of the few neutron facilities in Europe. This is only possible through European funding. Thanks to this funding the number of international users is already very high at BER II. To increase it, and to keep it at a high level, continued funding is necessary.

Review procedure under this project:
To strengthen the synergetic use of neutron and synchrotron radiation, HZB has implemented a common HZB Scientific Selection Panel (SSP) dealing with proposals for neutron and synchrotron radiation beamtime at BER II and BESSY II in joint sessions. To this purpose, the SSP is organised in six Scientific Colleges, which are grouped according to research fields in order to facilitate discussions on the scientific merrit of the proposals. All users applying for either neutron or synchrotron radiation beam time are requested to choose the appropriate Scientific College for their proposal upon on-line submission (https://www.helmholtz-berlin.de/user/user-info/colleges/index_en.html). The members of the SSP are independent international experts from a great variety of scientific fields. The SSP meets twice a year at HZB, usually in April and October, and evaluates and rates the scientific merit and innovative character of the proposals. Each proposal is reviewed by several panel members. Based on the ranking list and the beam time recommendations of the SSP the scientific director approves beam time allocation. The selection of users funded by European programs is fully integrated with these normal bi-annual peer-review selection rounds.
All proposals from a round are sent to the panel members 3-4 weeks before the panel meeting. They are then discussed in the respective colleges sessions which normally last one day. At the end of the day the instrument overview lists including the rankings and recommendadtions are shortly discussed with the college speakers in roder to ensure a balanced beam time distribution between the different colleges on each instrument (if needed).
The services provided by HZB are regularly reviewed by international panels. Every five years, with a mid-term review in-between, all services provided by the large scale facilities of the institutes of the Helmholtz Association are rigorously assessed by an independent international committee of high-ranking members. In addition, HZB is reviewed twice a year by the Scientific Council, the external international advisory body of the HZB which reports to the supervisory board.

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
6	HZB	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D12.1	Transnational access provision	6	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D12.1) Transnational access provision: min quantity of access to be provided: 300 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP13	Type of activity [54]	SUPP
Work package title	LLB (CEA)		
Start month	1		
End month	48		
Lead beneficiary number [55]	7		

Objectives

Provision of transnational access

Description of work and role of partners

LLB is a major Research Infrastructure devoted to the study of condensed matter by thermal neutron scattering. The neutron beams used by LLB are produced by the reactor ORPHEE which has a maximum thermal flux of 3.5 1014n/cm2/s. ORPHEE, a recent (1980) medium flux reactor in Europe, is equipped with two cold sources (liquid H2, 20 K) and one hot source (graphite, 1400 K), which allow the production of neutrons with wavelengths ranging from 0.5 to 20Å. Twenty one neutron scattering and imaging instruments, running simultaneously, are offered to the NMI3 users: powder [3T2, G4.1, G6.1] and single-crystal diffractometers [5C1, 5C2, 6T2] for atomic and magnetic structural studies, a diffractometer [7C2] for "short range order" studies, materials science diffractometers [6T1, DIANE] for texture and strain studies, small-angle neutron scattering instruments [PACE, PAXE, PAXY, TPA] for large-scale structure studies, reflectometers [EROS and PRISM] for surface, interface and thin films studies, "3 axis" spectrometers [1T, 2T, 4F1 and 4F2] for the study of nuclear and magnetic excitations in crystals and Spin-Echo [MUSES] instruments for inelastic scattering, and a Neutron Radiography Imaging Facility for non-destructive internal imaging of industrial devices. The LLB instruments are equipped with many facilities such as cryostats and furnaces, high pressures and high magnetic fields. Several of them, for diffraction, inelastic neutron scattering or reflectometry measurements, are able to be used with polarized neutron beams. The characteristics of all the instruments are available on the LLB web-site and on the NMI3-portal. In the frame of the CAP2015 project, the PA20 instrument will replace the PAXE instrument in 2013 and a new quasi-elastic scattering instrument called "Fa#" will be build to replace Mibemol that will be stopped.

Services currently offered by the infrastructure:
LLB and ORPHEE are situated on the CEA site in Saclay, a short distance from the University of Paris XI (Orsay) and the Synchrotron SOLEIL, in the centre of a high level scientific research landscape. The infrastructure runs at least 180 days/year, with 21 spectrometers offered to internal and external users. Over the last few years, about 1/3 of the time (neutron days) has been allocated to international teams, mainly European, and fourteen European countries have benefited from access time within the previous NMI3/FP7 program within its first 18 months. The interest from users in other countries to conduct research at the LLB infrastructure is also attested in the fact that only 1/3 of the eligible European proposals could benefit from the NMI3-FP7 program.

Some of the most interesting scientific achievements made by users are summarized below. They have taken advantage of the characteristics of the existing LLB instruments, either for fundamental or applied research.

Javier CAMPO and Clara RODRIGUEZ BLANCO from Spain have used 5C1 to study the mechanism of spin delocalization in the 3D antiferromagnet Rb2FeCl5:H2O. These single molecular magnets, (SMMs) represent the smallest possible magnetic devices and are a controllable, bottom-up approach to nanoscale magnetism. Potential applications of SMMs include quantum computing, high-density information storage and magnetic refrigeration.
Balgavy PAVOL and Daniela UHRIKOVA, Slovak users, use our SANS machine to study the interaction of 1-Alkanols with lipid bilayers from monosaturated phosphatidycholines. This helps to provide a better understanding of anaesthesia.
Debora BERTI and Piero BAGLIONI from Italy came to study oil droplets embedded in a permanent hydrogel matrix for conservation of Cultural Heritage. The motivation of this work is the application of these complex

fluids to the removal of resins from frescoes and canvases ("reintelage"). This support the Cultural Heritage conservation programs.

Modality of access under this project:
All the LLB users are selected on a scientific basis, with proposals reviewed by scientific experts. Some priority can be given in the case of subjects with high international interest and/or for PhD work. Priority is also given to the successful completion of experiments. NMI3 users are selected in 2 steps: (1) selection on a scientific basis, using the same procedure as for normal users and (2) selection for financial support by NMI3. We recall that for LLB in NMI3/FP7, less than one in three eligible NMI3 proposals could be funded.
Scheduling of an experiment on a LLB spectrometer (the typical duration is 5 days) then results from an agreement between the "external" experimental team and the LLB local contact, taking into account the constraints of both partners: availibility of the users, including sample availability, and of the LLB spectrometer (grouping experiments requiring the same complex sample environment is highly favoured). If a particular experiment requires more beam time, then every effort is also made to provide this while visitors are already on site, or to schedule it within a rather short time.
For every external user, support is offered in terms of scientific, technical and logistic supports, as described below.

Support offered under this project:
Scientific support: All users at the LLB obtain scientific support from their local contact(s), if necessary, before they submit a proposal, while they perform the experiment and/or interpret the data. It is clear that at the LLB they can find not only specialists in neutron scattering, but also high level scientists in various fields of condensed matter physics (including crystallography, magnetism, polymers, materials science). Last but not least, the exceptional scientific environment of LLB, within CEA-Saclay, and within "walking distance" of SOLEIL (the new Synchrotron Facility) and the Paris-Sud University, can lead to fruitful contacts and collaborations far beyond the field of neutron scattering.
Technical support is ensured by the local contact of the experiment and/or the technician on the spectrometer. They set up the experimental environment, introduce any new guest researcher to the handling of the instrument, and operate experimental devices such as furnaces, magnets or pressure cells during the experiment. Both urgent mechanical and electronic assistance can be obtained from LLB specialists during working hours. LLB computing facilities are available for guests, either for preliminary or complete data treatment.
Logistic support: The LLB is located within the CEA Research Centre in Saclay [CEA@Saclay], 25 km from Paris. Both Roissy-CDG and Orly airports are directly connected (RER_B) to Le Guichet station, where buses are available to reach LLB. Local information (including a list of nearby hotels) and assistance are provided by the "Secrétariat Visiteurs" in LLB. Some rooms are also available in the renovated "Maison des Physiciens" within CEA@Saclay, with bicycles at the disposal of our guests. Meals can be taken twice a day, including week-ends, in a CEA canteen, within walking distance from LLB.

Outreach of new users:
Efforts to publicize the LLB neutron facility and widen its user base, both geographically and thematically, is made via:
• "Calls for proposals" in International Scientific Reviews twice a year (Neutron News, Europhysics News, Physics Today)
• LLB web-page
• LLB brochure
• Active participation of LLB scientists in International Conferences, where new scientific contacts can be initiated
• Neutron training courses for new users, both theoretical and practical, via FAN@LLB, HERCULES, SFN schools (SFN is the French Neutron Society).

Review procedure under this proposal:
To perform an experiment, a research team must submit a proposal on a special form (available on www-llb.cea.fr), where the scientific interest of the research is described together with the neutron experiment to be performed. All submitted proposals, including those candidates for NMI3-support, are evaluated by the same User Selection Panel, which is divided into 5 sub-panels, each of them being devoted to a specific scientific field: Chemical physics, biological systems (I), Crystallographic and magnetic structures (II), Magnetism: Single-crystal

systems and thin layers (III), Disordered Disordered Systems, nanostructured materials and materials (IV), Excitations (V). The deadlines for proposal submission are always May 1st and November 1st.

Each of the five User Selection Panels is “European”, i.e. they include two to five physicists and chemists from laboratories in Europe, both inside and outside France. This number strongly depend on the characteristic number of proposals in the sub-panel, and of the scientific area giving rise to proposals, each major scientific area having at least one representative within the Committee. Some of these members are "from other neutron facilities (e.g. ILL, ISIS, FRM-II).

The first selection criterion employed by the Selection Panel is scientific merit. On this basis, all proposals are classified either A [accepted and to be performed], B [could be performed in the case of available neutron beam time] or C [must be rejected]. Among the A classified proposals, the following criteria are then applied to those eligible for NMI3 funding: (1) new users, (2) experiments involving PhDs or Post-Doctors, (3) countries with no neutron facilities, (4) selection of a maximum of two projects per team.

Each applicant (group leader) is informed, by official mail, of the classification of his proposal and, consequently, of the allocated beam time. In case of classification C, the reasons for rejection of the proposal are explained to the applicant. For “NMI3” supported projects, a specific letter is also sent to group leaders to inform them about which individual users will be eligible, according to the rules of the NMI3-access programme. The document "Information for Users", as proposed by the NMI3-management, is sent together with the official letter of LLB-management.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
7	CEA	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D13.1	Transnational access provision	7	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D13.1) Transnational access provision: min quantity of access to be provided: 271 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3: Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP14	Type of activity [54]	SUPP
Work package title	BRR (BNC-AEKI)		
Start month	1		
End month	48		
Lead beneficiary number [55]	9		

Objectives

Provision of transnational access

Description of work and role of partners

The Budapest Research Reactor (BRR) is a tank-type reactor, moderated and cooled by light water. BRR was first put into operation in 1959. A full scale reactor reconstruction started in 1986 and the upgraded 10 MW reactor has been operating since 1993 on an average ~3500 hours per year. The reactor operation can be foreseen until 2023; the core conversion will be completed in 2011. The fresh LEU fuel stock on hand ensures the stable reactor operation until 2016.
A Cold Neutron Source (CNS) at a tangential beam port feeds 3 neutron guides upgraded in 2007. A thermal guide was installed in 2004 for a TOF diffractometer. High profile instruments operated around the research reactor are listed below (description can be found on www.bnc.hu webpage):
Prompt Gamma Activation Analysis, PGAA facility is one of the two working facilities in Europe and a leading PGAA laboratory of the world. It is dedicated to perform non-destructive multi-elemental or isotopic analysis on various samples, including archaeological object up to tens of centimetres in diameter, geological rocks, catalysts, samples of inactive tracing, fissionable materials etc. The 1.2x108 n/cm2s neutron flux in the target chamber and the superb background conditions enable the users to study the average composition of materials from a few 100 milligrams to several grams in a short period of time.
Neutron Induced Prompt-gamma Spectroscopy, NIPS facility is amongst the few working neutron-capture facilities of the world that is designed for studying cold neutron capture. Its good background conditions and 3x107 n/cm2s neutron flux is ideal for performing γ - γ coincidence on various samples with our multi-parameter data acquisition system. Samples of 10 milligrams to several grams can be put in the beam and studied with several closely placed detectors to determine the nuclear structure of the target nuclei or to measure decay-properties of fissionable materials. Recently it has been also equipped with Compton-suppression enabling it to serve as a second PGAA facility.
The SANS facility is a classical pin-hole device. It covers a Q-range from 0.002 Å-1 to 0.5 Å-1 allowing density, composition and magnetization fluctuations in materials to be measured on a length scale from 5 Å to 1400 Å. The wavelength resolution can be varied on the selector between 12% and 30%. The beam is formed by a 5 m long collimator with variable parameters. Scattered neutrons are detected by a 64 x 64 pixel detector filled with BF3 gas.
The ATHOS facility is a cold triple axis spectrometer for excitation and methodological developments.
PREF reflectometer with a double PG monochromator is operated mostly for neutron optical developments and quality assurance.
The GINA reflectometer is designed to study structural and magnetic properties of surfaces, interfaces, thin films, membranes and multilayers. GINA is supplied with cold neutrons of wavelength 0.31 to 0.52nm (Be-filtered) with a lambda resolution of 1.2% of the PG focusing monochromator. The 200x200mm2 2D detector allows for studying specular and off-specular scattering to study depth profiles and in-plane structures, respectively. GINA has a polarization option and a SM polarization analyser for specular scattering.
TOF is a high resolution time-of-flight powder diffractometer, and it has been installed on a thermal neutron beam in a separate guide-hall. The TOF monochromator consists of a 4 choppers system with optimised supermirror neutron guides. In high resolution mode the very short - 10μs - neutron pulse and the 25m total flight path allows us to obtain a diffractogram with 10-3Å precision in a single measurement, while in low resolution mode liquid diffraction can be done with good neutron intensity up to 15 Å-1 scattering vector.

The PSD, two-axis neutrondiffractometer offers a wide range of atomic structure studies, including both crystalline and disordered materials. The instrument is unique in Central Europe for the short-and medium range structure investigations of amorphous solids and molecular liquids due to the high counting efficiency based on the modern detector system and to the special knowledge of the reverse Monte Carlo modelling of the 3-dimensional atomic configuration for data treatment.
The MTEST facility is a high resolution diffractometer, is suitable for determining internal stresses, stress distribution in bulk(y) samples and for texture measurements.
The TAST triple–axis spectrometer provides flexible operation for high intensity/resolution measurements. TAST is used in a multi purpose regime, e.g. for high-resolution diffractometry, strain analysis, quasielastic and inelastic scattering as well as for thermal beam irradiation and transmission tests.
The radiography station, RAD offers an extraordinary variability of the probes, besides neutron- and gamma radiography, portable X-ray generator and vibration diagnostics allows for auxiliary measurements.
The horizontal irradiation channel is also unique with its various dose ranges, spectrum and the neutron/gamma dose ratio. This variability is achieved through remote controlled filters.
The fast rabbit system is a pneumatic irradiation facility, situated in the reactor core, provides convenient utilisation of short lived isotopes. Neutron activation analysis with fast rabbit system can be applied for environmental chemistry, geochemistry, biological and medical research.
BAGIRA site is a gas-cooled irradiation rig in a dry channel inside the core. The rig serves irradiation of nuclear reactor vessel and fusion equipment materials to investigate irradiation ageing.
Progress with new developments: In the past couple of years a considerable effort was devoted to sample environment developments. Cryostat down to 10 K, furnaces to 1100 C, a 2T magnet and various set-ups for kinetic/stroboscopic measurements were realised, these devices can be shared between several instruments.
Services currently offered by the infrastructure:
Budapest Neutron Centre (consortium of 4 research institutes) has an important regional position because there are only a few large scale infrastructures in Central Europe. BNC role is to provide opportunity for neutron research in this region where around 500 potential neutron users are working (ENSA survey). High demands for neutrons are demonstrated by the number of EU eligible users (25-35 users/yearly) and number of the international users, which are around 70. We highlight here some research work carried out by international teams:
New steels for industry. To produce and characterize new materials for clean energy technologies is an important research field in science. Considerable efforts are now devoted to the investigation of steels to be used in extrem conditions e.g. in new type of power generators. SANS was applied to so called nano-structured duplex steels (containing two different phases) of industrial interest subjected to various ageing processes. Supposing that the scattering objects in steels have cuboid or rombohedral form, the scattering law obeys known formulae (in the case of monodisperse size distribution) and the cahracteristic size of these particles can be determined. The form factor and the contrast factor of the objects relative to the basic material give information also on the angle of orientation of the diagonal of the rhombes relatively to the main axes of investigation. We have observed the growth of cuboids with size changes from $a \approx 17$ nm to $a \approx 20.5 \pm 6.6$ nm due to thermal treatment. Further thermal treatment causes a developing of polydispersity of scattering particles. Therefore in this case only an average size was estimated. It was shown that this system becomes very polydisperse and the scattering data can be approximated by average parameter of particles as $a \approx 17$ nm.
The principle of atomic resolution neutron holography was first published, then experimentally realised by a BNC team lead by L. Cser. Since the first successful experiment on a single crystal sample of a Pb-Cd, several new measurements were made; a successful neutron holographic measurement on ammonium-chloride (NH_4Cl) was performed on the thermal three-axes spectrometer. In this measurement the protons act as internal detector and internal source of neutrons also. The simultaneously appearing inside detector and inside source hologram cause false peaks, but increase the signal-to-noise ratio. The TAST instrument, in fact, was used as a dedicated holographic device to measure the hologram at 45° scattering angle, and rotate the sample around two axes using an Eulerian cradle. The plane of the cradle was parallel to the scattered beam. For the better signal-to-noise ratio we have put the detector close to the sample. Its total viewing angle was near 5°. The angular steps were also 5° in both directions. The reconstructed holographic peaks of the first nitrogen and first hydrogen neighbours of the hydrogen atoms are in good agreement with the model calculations. The atomic resolution neutron holography is a suitable and unique method for direct measurement of local lattice distortions with sub-picometer accuracy.
Multi-component alkali borosilicate glasses are known as most promising host materials for immobilizing of high-level radioactive wastes, like U-, Pu-, Th-oxides. We have successfully prepared amorphous $55SiO_2 \cdot 10B_2O_3 \cdot 25Na_2O \cdot 5BaO \cdot 5ZrO_2$ loaded with 30wt% UO_3 and investigated by neutron diffraction and reverse Monte Carlo modelling. It was established that the basic network structure consists of tetrahedral SiO_4

units and of mixed tetrahedral BO4 and trigonal BO3 units. For the U-O correlations two distinct peaks were resolved at 1.84 Å and 2.24 Å, characteristic for uranil ions known for crystalline compounds. It was revealed that uranium ions take part in the network forming, which may be the reason of the observed good glassy stability and hydrolytic properties.

Modality of access under this project:
The user programme is advertised on the BNC webpage. Researcher whishing to use BNC's instruments should prepare a proposal and submit to the user office. All proposals go through on the same evaluation procedure. First the local contact makes a feasibility review of the proposals: i.) technical feasibility and ii.) time schedule. The pre-selected proposals are distributed to the panel members via internet. They evaluate the proposals; taking into account the selection criteria (see below), and rank the proposals from A to C. C means that the proposal is rejected. The proposals, ranked on A are approved. The B ranked proposals, also accepted, but the requested beam days might be reduced according to availability. The coordinator gives feedback to the applicants. Special attention is given to the rejected proposal; detailed written explanation is provided to the applicant. Local contact of the experimental stations schedules the projects and supervises the experiment. The result of the project is jointly published by the user team and the local scientific staff.
Support offered under this project:
Running the user programme fluently requires effective coordination provided by the user office. Whose task is to allocate the beam time to diverse activities. The access to specific equipment involves administration support (concerning the users: date of arrival, departure, room reservation, etc.), supervision and assistance by the local contact (set up sample environment), and consultation (elaborate-evaluate experimental result, prepare joint publication etc.). Visitors also benefit from the scientific environment of the KFKI campus where the BNC is located. The campus hosted 5 research institutes including scientists of nuclear techniques, computers, solid state physics, optics, mathematics and particle physics. KFKI campus is also place of scientific discussions; seminars, conferences, workshops are frequently organized here.
Outreach of new users:
The most effective way to approach the targeted researchers is the internet. Budapest Neutron Centre invites applications twice a year (mid May and mid October) via internet using of BNC's website. Call for proposals is also available on the European Neutron Portal. The access opportunity to the BNC facilities is regularly advertised in the Neutron News. BNC also places advertisement in the Progress Report of the Budapest Research Reactor. The Report is distributed to the European user community. International conferences and meetings are also utilized to establish new contact. A practiced way of attracting new users is the regular training school of BNC. The series of the "Central European Training School on Neutron Scattering" (CETS) is organized every second year. The scope of this course is to provide insight into neutron scattering techniques and their applications. This training opportunity is offered to the European community with special emphasis on the Central European region. The CETS 2010 was organised in May and it is considered as a very successful event. The full involvement of the participants could be followed throughout the program.
Review procedure under this project:
The members of the User Selection Panel are invited from the main European neutron centres. The competence of 11 member panel including 2 Hungarians covers the whole research activity to review. Its membership is quite stable, one or two membership is changed each year. Two deadlines (May 15, October 15) for submission of applications were established to ensure high level scientific evaluation and schedule the available beam time. Next to the regular selection process, a fast track application evaluation is also possible in especially important cases.
The user office collects the applications following each deadline and circulates to the panel members via internet. The decision is made via internet at the spring cycle and made by the annual panel meeting in the autumn period.
The principals of the selection process:
1. All distributed proposals shall meet BNC's format and content requirements.
2. The same evaluation procedure is applied to all proposals to ensure consistency.
3. All experimental proposals is reviewed and evaluated by the panel members responsible for the specific scientific field.
4. No interested party is involved in the selection process.
The selection criteria applied by the panel members was prepared and approved by the International Scientific Advisory Board. These are the scientific merit, Ph.D or diploma work involvement, new research field, new users, and users who are working in countries where no such infrastructures exist.

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
9	BNC-AEKI	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D14.1	Transnational access provision	9	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D14.1) Transnational access provision: min quantity of access to be provided: 150 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP15	Type of activity [54]	SUPP
Work package title	RID (TUD)		
Start month	1		
End month	48		
Lead beneficiary number [55]	12		

Objectives

Provison of transnational access

Description of work and role of partners

Description of the infrastructure:
The Reactor Institute Delft is part of the Applied Sciences faculty of the University of Technology Delft. The 2 MW "Hoger Onderwijs Reactor" is its central facility. The institute is a partner in the NMI3 network. Various experimental facilities have been offered to the European community in the FP6 program and the first NMI3 program within FP7.
The reactor is in operation 200 days a year, 5 days a week. For selected instruments, 6 % of the capacity is offered to European researchers through the transnational access mechanism. The facilities offered are the POSH Positron beam (as well as the other instruments in the positron center), the spin-echo small-angle neutron scattering instrument (SESANS), the poly-axis neutron depolarization instrument (PANDA), the reflectometer (ROG) and the Instrumental Neutron Activation Analysis (INAA) systems. A classical SANS instrument is under construction and will be offered as well as soon as it becomes operational (probably in the fall of 2011).
Services currently offered by the infrastructure:
RID IN GENERAL
The RID infrastructure offers as number of facilities as described further down. Over the past 6 years, these facilities have used by 20 scientists from 10 countries through the transnational access mechanism. Our websites gives more information: www.rid.tudelft.nl.
INAA
The infrastructure for INAA of the Reactor Institute Delft consists of irradiation facilities of the nuclear research reactor "Hoger Onderwijs Reactor", Radiological laboratories, automated gamma-ray spectrometers and associated software, and a quality management system accredited for compliance with ISO/IEC 17025:2005. The INAA infrastructure is unique in its kind by the ample availability of reactor time for irradiations, the automated gamma-ray spectrometers that allow for parallel processing of analysis requests and the fully integrated quality assurance and management. The laboratory's activities are based on more than 40 years experience in gamma-ray spectrometry, neutron activation analysis, automation, quality management and multi-disciplinary approaches.
The Laboratory for INAA has been making its facilities available to users from outside the institute since the midst of the 1970's. Many scientific collaborations have resulted in PhD dissertations at geological, archaeological, medical, chemistry and physics faculties of the Dutch universities. In addition, scientific collaborations have taken place with renowned foreign institutions and universities such as the National Institute of Standards and Technology and the Johns Hopkins Medical Institutions in USA; University of Surrey, UK; University of Sao Paulo, Brazil.
POSITRONS
At present high intensity positron beams can only be generated using nuclear reactors or dedicated accelerators. At the RID the high intensity positron beam POSH is generated using one beam port of the 2MW research reactor HOR. The facilities of the Positron Center Delft are placed in a specially constructed beam guide hall adjacent to the HOR containment. It encompasses the intense low-energy positron beam POSH coupled to the 2D-ACAR facility, the Variable Energy Positron facility and positron lifetime set-ups, all equipped with computer controlled annihilation gamma detection set-ups and data storage system. Typically, PADB, 2D-ACAR and PALS experiments take between 1 and 2 weeks of measurement time depending on the scientific problem.

These other positron set-ups use the 22Na isotope as positron source. Depending on the application, source strengths vary between 2 GBq and 1 MBq.
Access to the above equipment is provided on a collaboration basis, as well as through the NMI3 network. Current topics include specific studies of semiconductor thin films, nanocrystalline opto-electronic materials, hydrogen storage materials, constructive metals, as well as ceramic and polymer coatings. Examples of recent collaboration research are mono-disperse PbSe quantum dots, low-k dielectric thin films for micro-electronics applications, and embedded nanocrystals, vacancy-impurity complexes and electrical deactivation in semiconductors.
SESANS
The spin-echo small-angle neutron scattering (SESANS) instrument is the one of the two dedicated instrument of its kind in the world - the other is OFFSPEC at ISIS. It uses the Larmor precession of polarized neutrons in magnetic fields to label the scattering angle resulting from single or multiple scattering in a sample. As a result one obtains structural information on the sample material, in real space as opposed to Fourier space, on length scales of ~ 30 nm up to ~ 10 □m. Applications of this technique have been up till now on colloids, protein clusters, micro emulsions (as in food material), granular materials, polymer fibres, lithographic gratings and voids and precipitates in metals.
At several other places in the world (Indiana USA, Dubna Russia, PSI Swiss, Grenoble France, ISIS UK) plans exist to build similar instruments, or construction has commenced. Some other spin-echo instruments in the world (Berlin and Munich Germany) could be reconfigured to be used in the same manner, but they are not dedicated for this type of measurement and therefore less convenient. Furthermore, these instruments can only measure up to ~ 1 µm.
PANDA
The instrument PANDA was designed to perform 3-dimensional neutron depolarisation (3DND) measurements. This technique was developed in Delft in the 1970s [1] and since then applied to study a wide variety of magnetic materials [2]. In 3DND measurements the interaction of a monochromatic polarised neutron beam with a spatially inhomogeneous ferromagnetic material is probed. Larmor precession of the neutron polarisation within the magnetic domains in the sample can cause both a rotation and a reduction of the polarisation during transmission. The polarisation rotation probes the magnetic volume fraction and the magnetisation of the ferromagnetic phase. The reduction in polarisation (depolarisation) probes the average magnetic domain size in the range from 10 nm up to 30 □m within the sample. The instrument has been used extemsively also i nthe development fo spin flipper foils for polarized neutron applications.
PREVIOUS TRANSNATIONAL ACCESS PROJECTS
The following topics have been addressed with this infrastructure through the transnational access mechanism:
• Epidemiology of cardiovascular disease in Jerusalem as related to trace element status.
• Epidemiology of Se in the Gdansk working population.
• Se status in the population of Wales as related to local conditions.
• Air pollution in Portugal.
• Surfactant templated silica compsites.
• New manipulation techniques for polarised neutrons.
• Near-surface damage in magnesium alloys after friction under varying pressures.
• Barium fluormica and barium fluormica-fluorapatite glass ceramic materials for use in restorative surgery for the hard tissues of the human body.
• Large sample INAA technique development for the characterisation of ancient pottery.
• The barrier properties of nano-composites consisting of a polymeric matrix and inorganic nano-particles as reinforcement.
• Particulate matter behaviour in the Irish atmosphere.
Description of work
Modality of access under this project:
Potential users will be required to submit a proposal to the Facilities & Services department of the Reactor Institute Delft. Selection of proposals on the basis of scientific merit will be performed involving independent peer review when necessary. The established procedures of the NMI3 network will be followed closely in this respect. All facilities are located in one secure building, at walking distance from the center of Delft. The Delft University has established contacts with local hotels. Public transportation takes the user to less than 100 m from the front door of the institute.
All experiments, including those performed in the course of normal research activity of the University of Technology Delft, are scheduled through the Facilities & Services department, so that the beamtime for the visitor can be guaranteed.

Typical visit duration for an in-beam experiment would be a week, sometimes two weeks. Neutron activation analysis, depending on the type of samples and the interest of the user, could be performed entirely by Delft staff.

Support offered under this project:
The institute offers health-physics courses for those visitors who are not yet entitled to do radiological work, at the appropriate level. Assistance during the experiments is offered, as well as scientific expertise in designing the experiments and interpreting the results. The users are assisted in booking their hotels, and finding their way to the institute.

Outreach of new users:
The newly provided opportunity for transnational access to the RID facilities was already publicized through the NMI3 portal website, where the specifications of the facilities offered were also added to the “neutron pathfinder”. We also point out the access possibilities on our own website (www.rid.tudelft.nl).
Apart from that, an article was published in the journal “Notiziario Neutroni e Luce di Syncrotrone” on the access possibilities. We also promote the accessibility of our facilities at international meetings and conferences.
Finally, we are contacted quite often with requests for beam time or neutron activation analysis. Whenever we feel the subject matter is of sufficient quality and scientific relevance, we point out the existence of transnational access mechanism and suggest submission of a proposal.
Our experience in the FP6 and first FP7 period of time demonstrates that there will be sufficient demand for access to our facilities – we are offering as many units of access in this proposal as we have been offering over the past two years.
Review procedure under this project:
The subject matter of the proposals that reach RID varies from neutron manipulation techniques to cardiovascular health in Jerusalem. It is therefore not feasible for RID to have a single selection panel that judges all proposals and meets periodically to rank the proposals. Instead, we seek expert advice from a single expert for each proposal received. If the advice is positive, that is, if the scientific content of the proposal is deemed of sufficiently high quality, the proposal is approved of. This has the extra advantage of speedy processing of proposals, and a short time lag from proposal submission to actual experiment.
The Users selection panel consists of scientists generally considered to be eminent in the field. Whenever a proposal comes in on subject matter that is not yet “covered” by a member of the selection panel, the advice of a new panel member is sought.
Currently, the panel consists of
Dr. H. Schut (for proposals having to do with positrons),
Dr. W. Bouwman ((for proposals having to do with SESANS),
Dr. M. Th. Rekveldt (polarised neutron manipulation techniques),
Dr. E. Guallar (epidemiological studies)(of Spanish nationality, but affiliated in the USA),
Dr. M. Rossbach (INAA proposals)

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
12	TUD	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D15.1	Transnational access provision	12	1.00	O	PU	48
		Total	1.00			

Description of deliverables

AM

D15.1) Transnational access provision: min quantity of access to be provided: 90 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP16	Type of activity [54]	SUPP
Work package title	NPI		
Start month	1		
End month	48		
Lead beneficiary number [55]	13		

Objectives

Provision f transnational access

Description of work and role of partners

Description of the infrastructure:
Neutron Physics Laboratory (NPL) is a part of the Nuclear Physics Institute (NPI) of the Czech Academy of Sciences. It was founded with the aim to perform neutron physics experiments according to NPI research programme as well as to provide experimental facilities and research experience to external users. The research activities of the NPL neutron physicists are located at the medium flux research reactor LVR-15 (10 MW mean power, thermal neutron flux in the core about 9×1013 ncm-2s-1) which belongs to the neighbouring Nuclear Research Institute, plc. (NRI, plc.). NRI, plc., operates the reactor LVR-15 on a commercial basis. The reactor serves predominantly as a radiation source for material testing, irradiation experiments and production of radiofarmaceuticals.
In general, NPL cannot compete at once with all the sophisticated instrumentation of large centres for neutron physics. Nevertheless, offering particular instruments and techniques complementary with the ones existing at large centres have an impact on the European research with neutrons. NPL operates 7 instruments installed at 5 radial horizontal beam tubes (for experiments in nuclear physics, solid state physics and materials research) and 2 vertical irradiation channels (for neutron activation analysis) hired from NRI, plc.. These seven instruments, particularly

- High-Resolution Stress/Strain Diffractometer (TKSN-400),
- Double-Crystal SANS Diffractometer (DN-2),
- Multipurpose Double Axis Diffractometer (SPN-100),
- Medium Resolution Powder Diffractometer (MEREDIT),
- Neutron Activation Analysis (NAA),
- Thermal Neutron Depth Profiling (T-NDP),
- Thermal Neutron Capture Facility (NG) - suitable also for Prompt Gamma Activation,

are offered also for external users. The first group (TKSN-400, DN-2, SPN-100, MEREDIT) are neutron-scattering techniques while the other (NAA, T-NDP, NG) represent analytical methods based on nuclear reactions involving neutrons. Such facilities are either rare or have particular optimization and/or ancillary equipment which makes them unique or comparatively advantageous.
Most of the neutron research carried out at NPL can be characterised as materials and interdisciplinary science. Only a negligible portion of the work is aimed directly to the industry. The majority of experiments are a part of research on materials with possible technological applications (shape memory alloys, two-phase stainless steels, high strength steels, superalloys, superplastic ceramics, thermal barrier coatings etc.), of surface studies (e.g. diffusion, sputtering corrosion) of technologically interesting materials used in electronics and optronics technology and of biological/biomedical studies (plant, animal and human tissue analyses), trace elements detection in an environmental samples as well as in biological, geological and metallurgical materials.
The NPL neutron techniques which are offered to EU users for a rapid access are - in majority - either overloaded (strain diffractometers TKSN-400, SPN-100) or are rarely provided (high resolution SANS, T-NDP, NAA, NG) in other neutron laboratories. These facilities are complemented by the powder diffractometer MEREDIT, which can be either used for texture determination of samples intended to be measured at high-resolution diffractometer or for ex-situ or in-situ diffraction experiments under warious external conditions.

An important aspect of neutron physics facilities are in situ measurements at natural conditions of the tested materials. This requires sophisticated sample environment, the development of which is given a permanent attention at NPL. In the past, several devices were developed, e.g. for thermo-mechanical tests in combination with high-resolution diffraction, for residual strain measurements on irradiated samples, for morphology determination at high temperatures etc. Presently available are deformation rig including current heating up to 1000°C, transmission furnace with radiation heating (T<1500°C), chamber for irradiated samples, positioning devices, hot air heating (<300°C), cryostat; a furnace (T<1000°C) for powder diffraction will be available in 2011.

Services currently offered by the infrastructure:
The infrastructure was widely opened to the international users in connection with the Access action of NMI3 projects (2004-2008, FP6; 2009-2010, FP7). Within the NMI3 projects, 32 experiments (roughly 200 beamdays) carried out by 23 different groups all over the Europe and associated countries (particularly Belgium, France, Germany, Greece, Italy, United Kingdom, Hungary, Latvia, Poland, Slovakia, Switzerland, Portugal, Israel) were succesfully finished. The non-conventional facilities offered for NPL Access were beneficial for Europe's scientific community.
Among the most interesting achievements in the last years within the experiments using nuclear analytical methods belongs the result of investigation on the effects of diet and environment on the health of children in different localities of Tanzania. Measurements were made of 20 elements in hair samples that are essential to good health or are toxic [see N.K. Mohammed, J. Mizera, N. M. Spyrou: Elemental contents in Hair of children from Zanzibar in Tanzania as bio-indicator of their nutritional status. Journal of Radioanalytical and Nuclear Chemistry 276, 2008, 125-128].
In the group of the neutron scattering experiments, interesting results were obtained in the field of materials science, particularly in the investigation of nanoporous metallic materials [see P. Strunz, D. Mukherji, O. Näth, R. Gilles, J. Rösler: Characterization of nanoporous superalloy by SANS, Physica B 385-386, 2006, 626–629]. Unique results were also obtained during measurement of residual stresses in the vicinity of welds formed by means of weld metals with various chemical composition. It has been found that the use of a weld metal with a low martensite temperature may considerably reduce the thermal stress in the low temperature region after welding, and consequently may decrease the residual stress in the weld metal and weld toe [C. Schiga, L. Mráz, P. Bernasovský, K. Hiraoka, P. Mikula and M. Vrána, Residual stress distribution of steel welded joints with weld metal of low martensite transformation temperature, Welding in the World 51, No 11/12 (2007), 11-19].

Description of work
Modality of access under this project:
For the accepted proposals, the particular period for the experiment is scheduled after negotiation between the instrument responsible and the user. The particular facility is then fully reserved for the user experiment. The user is supposed to be present at NPL during the whole duration of the experiment which lasts in average 8 days. If a tedious experiment is to be carried out or if a complex sample environment is to be used, two users can take part at the measurement and benefit from financial support (which is standardly reserved for one user only). In special cases, e.g. long scans or extremely long exposure time which can be performed - after initialization - nearly without an interaction of the scientist with the facility, the user can leave even before the end of the measurement. This option is, however, only possible when there is really no decision to be made by the user in the remaining beamtime.
Support offered under this project:
At NPL, a considerable emphasis is placed on the provision of entire support, including permanent assistance of the responsible researcher, quality software for data analysis and preliminary data evaluation. This is an approach ensuring the cost-effective use of the instruments.
Each experiment is performed under a supervision of an instrument responsible who organises the user programme at that facility, trains and supports users during the experiment period, eventually helps with the pre-analysis of the received data. The facilities also have a responsible technician who deals with the maintanance of the instrument and sample environment.
If it appears during carrying out the particular experiment that the experiment requires slightly more beam time than originally scheduled, the beamtime for the experiment can be expanded because of the inherent flexibility of the beam distribution in the NPL system.
NPL pays permanently attention to the development of software for the data analysis. As the instruments are not of the kind usually offered at other centers, it is supposed that the pre-analysis of the data is done basically at NPL in collaboration with the instrument responsible.
Construction of simple mechanical elements necessary for the successfull performance of the experiment is possible in the workshop. PC's, computer network as well as software for basic data treatment are available as well. Access to other sites and to a wide range of journals is available through the internet. The local library

offers access to common research journals. The NPL user programme administrator helps users with regard to their travel and accommodation requirements and provides other necessary assistance.

Outreach of new users:
NPL has a strong interest in promoting the use of neutron physics techniques and to encourage new users to enter the neutron physics field. Training periods are offered on an individual basis, in particular to students. NPL Access possibilities are disseminated using the following methods:
• The facilities opened for external users are listed in database at "The Neutron Pathfinder", http://pathfinder.neutron-eu.net/idb, a facility-selection tool for European neutron instruments.
• The local web page http://neutron.ujf.cas.cz/CFANR/access.html is frequently updated in order to inform the scientific community on the facilities available, on the research areas investigated using these facilities as well as on the organizational issues connected with the experiments.
• The potential users are informed on proposal submission deadlines via European neutron portal web pages, http://pathfinder.neutron-eu.net/idb/access.
• Advertising by NPL staff attending appropriate scientific conferences and other events. This is often the most effective method of attracting new users to neutron scattering.
• Acknowledgement of NPL Access in scientific papers based on the results obtained at NPL.

Review procedure under this project:
The proposals of experiments are peer reviewed by the NPL International Selection Panel. The main criterion for acceptance is scientific excellence of the project followed by the intention to fund young scientists and new neutron users.
Before passing the proposals to the members of the Selection Panel, their technical feasibility is considered by the instrument responsible of the particular facility. It can result in a request to modify the proposal according to the available equipment.
Proposals are assessed on the basis of scientific merit by the NPL International Selection Panel (currently having eight members). The individual members have a wide range of expertise appropriate to the instrumentation at NPL. All panel members except one (the head of NPL) are independent of NPL and even affiliated at institutions abroad (i.e. outside Czech Republic). The members of the User Selection Panel were selected on the basis of (i) their experience with neutron physics, (ii) their specialization in one or more fields covered by the facilities included in the Access programme. Every set of proposals is sent to all the members of the Selection Panel. One of the members of the Panel, who is a top expert in the related field, is asked to provide a written report on the given proposal. The other members of the panel can comment on the proposal as well and suggest accepting it or not. In order to ensure the rapid assessment, e-mail is preferably used for communication of the administrator and the Selection Panel members as well as of the administrator and the proposers. On the basis of the recommendations of the Selection Panel members, the successful proposals are accepted and scheduled.
Each accepted proposal is assessed on its eligibility for financial support by the Access administrator according to the firm rules. In case the financial sources were limited, preference is given to new users and to young scientists.
The main proposer is informed about the general acceptance/rejection of the proposal and about the success of their application for funding. The author of the rejected proposal is notified, the reason for rejection is clearly stated and further actions to be taken are suggested (e.g. discussion with the instrument responsible on the feasibility, referee's suggestions to improve proposal).

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
13	NPI	1.00
	Total	1.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D16.1	Transnational access provision	13	1.00	O	PU	48
		Total	1.00			

Description of deliverables

D16.1) Transnational access provision: min quantity of access to be provided: 92 beam days [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP17	Type of activity [54]	RTD
Work package title	Muons		
Start month	1		
End month	48		
Lead beneficiary number [55]	2		

Objectives

Task 17.1: JRA management activities
Work to manage and coordinate the JRA activities, including the stimulation of twelve monthly partner meetings, preparation of reports and maintenance of the website.
Task 17.2: Software Development for Muon Data Analysis
Work developing state of the art data reduction methods applicable to new applications of the muon technique; including routines specific to novel experiments and methods to combine these with simulation; improved data formats and metadata to underpin these techniques.
Task 17.3: Concept Studies for Future Muon Sources
Work will take a forward look at the next generation muon sources, instrumentation and user requirements; simulation will be used to develop preliminary design studies.
Task 17.4: Detector Technologies for Pulsed Muon Sources
Work developing novel detector technologies for pulsed muon beams, including collaborative work between facilities to develop and characterise a prototype detector bank based on Geiger-mode Avalanche Photo Diodes for the ISIS High Field Instrument.

Description of work and role of partners

The Muon JRA will consist of four tasks, one of which will be focussed on managing the JRA. Details are set out below.

Task 17.1: JRA management Activities
STFC, as co-ordinator, also seeks to undertake management and co-ordination activities. This will include stimulation of twelve monthly JRA partner meetings, preparation of all required reports, maintenance of a Muon JRA website including reports, meeting notes, technical documents, etc, publicising the muon JRA within the wider NMI3 consortium, and budget management. In addition to the formal JRA meetings, there will be regular informal contact between partners to discuss JRA work.

Task 17.2: Software Development for Muon Data Analysis
Co-ordinator: STFC; Partners: PSI;
Summary: This task area aims to develop state of the art data reduction methods applicable to new applications of the muon technique in subject areas such as soft matter, semiconducting materials and radical chemistry. The recent development of complex experimental methods (such as high field, laser, RF and gas phase studies) has highlighted the important role that simulation now plays in data analysis, and tools to combine instrument simulation (developed during previous JRAs) with analysis will be developed. Improved data formats, particularly including advanced metadata, will be devised to underpin the new analysis techniques.

Specific Aims:
1. Development of routines for efficient analysis of high field experiments. This is likely to include code to improve the analysis of time domain Avoided Level Crossing measurements – the aim will be to incorporate routines within a supported analysis framework.
2. Developing routines to link simulation code developed as part of the muon JRA activities during FP6 and FP7 with existing analysis programs. This is likely to include code to simulate the muon stopping profile in gas and pressure cells and evaluate coincidence with applied stimuli.

Abg

3. A document considering how the existing NeXus Instrument Definition File may be augmented to better support novel analysis techniques through the introduction of additional metadata. Specific examples may be implemented during the JRA.

Task 17.3: Concept Studies for Future Muon Sources
Co-ordinator: PSI; Partners: STFC;
Observers: Parma, Huddersfield, ESS, RIKEN-RAL;

Summary: This task area will take a forward look at the next generation muon sources, instrumentation and user requirements (such as specialised sample environment), using simulation to develop preliminary design studies as to how these might be realised. Work is likely to be focussed in two areas: firstly, to evaluate how novel muon-beam facilities might be realised and their impact on the scientific community, and secondly, to consider how high intensity muon sources might be implemented and consider the associated scientific benefits.

Specific Aims:
1. Concept study for advanced muon beams (e.g. micro-beam). The application and impact of such beams will be assessed, and the need for specialised sample environment equipment (as using anvil cells for very high pressures on micro-beams) considered.
2. Concept study for future high intensity muon sources; examining how, for instance, improved production target technologies, beam optics and future facilities, such as the ESS, might be used to provide new high intensity muon channels. The potential applications of high intensity muon beams will be assessed.

Task 17.4: Detector Technologies for Pulsed Muon Sources
Co-ordinator: STFC; Partners: PSI;

Summary: This task area will involve collaborative work to characterise a prototype detector bank based on Geiger-mode Avalanche Photo Diodes (APD) for the ISIS High Field Instrument. APD technology was developed by PSI during previous JRAs for continuous muon beams, and the aim of this task is both technology transfer and innovation to enable its application to the pulsed beams at ISIS. The prototype bank will be designed to function as both a longitudinal and transverse array, and in the latter configuration RF experiments will be performed to evaluate its timing resolution.

Specific Aims:
1. Design document for a prototype APD detector for the ISIS High Field Instrument (HiFi). In particular, this will involve an extended visit by ISIS staff to PSI to identify key technical challenges and specify appropriate components.
2. Prototype APD detector for the HiFi instrument, designed to operate both as an additional transverse bank (specifically for pulsed RF experiments and requiring good timing resolution) and a longitudinal array.
3. Document discussing the performance of the APD detector array, and considering whether APD technology is currently viable for replacing traditional Photomultiplier tube technology at pulsed muon sources.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	STFC	36.00
5	PSI	36.00
	Total	72.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D17.1	Document outlining specification of software routines	2	3.00	R	PU	8

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D17.2	Software routines implemented and released within the Mantid framework	2	3.00	R	PU	36
D17.3	Document considering integration of simulation codes	2	3.00	R	PU	18
D17.4	Report of an application of linked analysis and simulation	2	3.00	R	PU	48
D17.5	Report of concept study	2	6.00	R	PU	48
D17.6	Document discussing target technologies	2	3.00	R	PU	24
D17.7	Document considering options for a muon facility at the ESS	2	3.00	R	PU	36
D17.8	Design document for an APD detector array	2	3.00	R	PU	12
D17.9	Prototype APD detector array for an ISIS spectrometer	2	3.00	R	PU	30
D17.10	Results on beam array evaluation	2	6.00	R	PU	48
		Total	36.00			

Description of deliverables

D17.1) Document outlining specification of software routines: Software Development for Muon Data Analysis [month 8]

D17.2) Software routines implemented and released within the Mantid framework: Software Development for Muon Data Analysis [month 36]

D17.3) Document considering integration of simulation codes: Software Development for Muon Data Analysis [month 18]

D17.4) Report of an application of linked analysis and simulation: Software Development for Muon Data Analysis [month 48]

D17.5) Report of concept study: Concept study for advanced muon beams [month 48]

D17.6) Document discussing target technologies: Concept study for advanced muon beams [month 24]

D17.7) Document considering options for a muon facility at the ESS: Concept study for advanced muon beams [month 36]

D17.8) Design document for an APD detector array: Detector Technologies for Pulsed Muon Sources [month 12]

D17.9) Prototype APD detector array for an ISIS spectrometer: Detector Technologies for Pulsed Muon Sources [month 30]

D17.10) Results on beam array evaluation: Document summarising results of on-beam array evaluation and performance of APD technologies at a pulsed muon source [month 48]

WT3:
Work package description

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

AW

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP18	Type of activity [54]	RTD
Work package title	Imaging		
Start month	1		
End month	48		
Lead beneficiary number [55]	6		

Objectives

Neutron imaging is a direct method for non-destructive investigations of objects in science and technology. Up-to-date high resolution detector systems already allow for investigations of microsystems with the spatial resolutions down to 20 µm. The step towards micro- and nano-resolution can be made with the help of imaging methods like grating interferometry and Bragg-edge mapping in transmission geometry, which connect the real with the reciprocal space. The development of these innovative methods will help to address scientific problems related to investigations of porous (e.g. fuel cell research) and cellular (e.g. polymer foams) materials as well as residual stress and texture mapping of industrial stainless steel parts. The extension of the imaging methods in the direction of the Time-of-Flight (ToF) imaging can lead to an established perspective for an optimized imaging instrument at the upcoming ESS in Lund.
Neutron imaging of magnetic systems is a field which has continuously progressed during the past decades to answer the questions arising as new magnetic systems were synthesized. Existing magnetic imaging techniques (Magnetic Force Microscopy, X-ray PEEM, electron holography) have shortcomings. MFM only probe stray fields, PEEM is only sensitive to the outermost surface magnetism, holography only measures the induction integral. We propose the extension of neutron scattering techniques to perform vectorial magnetic imaging in the volume of nano and micro-structures. We will explore 3 complementary routes, which aim at 3 different types of systems: (i) SANS 3D: vectorial magnetic imaging of nano-particles to determine the magnetization distribution M(r) in nano-particles with a spatial resolution of the order of 1 nm to 100 nm; (ii) Precessionnal spectroscopy to determine the magnetization distribution M(r) in planar systems with a spatial resolution of the order of 10 nm to 1 µm; (iii) Magnetic tomography to image bulk samples with a resolution of 10 µm. This would open new scientific opportunities in the field of nano and micro-magnetism. Though SANS operates in the reciprocal space, precessionnal spectroscopy operates in the precession space and tomography operates in the direct space, they will nevertheless basically provide the same information –the vectorial distribution of the magnetization M(r). The difference is that these 3 approaches will answer the needs of different magnetism communities: the nano-particles community, the thin films community, and the magnetic materials scientists. Note that these techniques would be unique. The project will benefit from the instrumentation which has been developed during the past decade and focus on developments of new methods and modelling tools to exploit all the potential of the existing instrumental facilities. A key concern of the network will be to work in close collaboration with people from the nano-magnetism community to meet their actual needs. We will mostly aim at performing demonstration experiments and will involve university magnetism laboratories from the very begin of the project in order to define the requirements to these new techniques. This will ensure that these techniques will be actually useful for a large part of magnetism community.

Description of work and role of partners

Neutron imaging for structural investigations
Task 18.1. Nano- and micro structures resolved dark-field imaging with grating interferometers.
Neutron beam with a high spatial and temporal coherence produces the interference pattern at a certain distance behind a phase grating. The structure of the pattern which is beyond the spatial resolution of imaging detectors can be resolved by transverse scanning of an analyzer grating through the beam. The presence of a sample distorts the interference pattern locally. The spatially resolved detection and analysis of the pattern (phase, amplitude and offset) reveal information about phase effects, small angle scattering and attenuation introduced by the sample. These three contributions can be extracted and analyzed independently and provide a unique suite of complementary position sensitive information about the sample material. The grating interferometer can

be used for investigation of micro- and nano-heterogeneity of structures in the scale range of 0.1 µm to 10 µm. The goal of the project will be the visualization of micro-structural changes in industrial stainless steel samples under tensile or torsion stresses. For this purpose a motorized loading frame for controllable load application will be used. In this way the correlation between stress distributions and micro-structural changes will be studied.
Task 18.2. Direct high resolution neutron imaging.
We will improve the spatial resolution in neutron imaging experiments below 10 µm. This goal will be achieved by implementation of dedicated optical lens systems (macro lenses) and very thin (thickness: 10 µm) neutron scintillating screens based on Gd substances (e.g. Gd2O2S). Dedicated neutron optics will provide high quality cone beams and the required flux densities for high resolution imaging. The aim in this case will be to focus the neutron beam in a small point in order to approach point source geometry. This will be achieved by developing of innovative elliptic neutron guides focusing the beam in a spot of 50 µm size. Application areas are investigation of innovative micro cellular materials like metal and polyester foam structures, porous materials like water distribution in Gas Diffusion Layer (GDL) in Proton Exchange Membrane (PEM) fuel cells, borated steel shielding materials and wood research samples.
Task 18.3. Energy-selective neutron imaging.
The neutron attenuation coefficient for polycrystalline materials decreases suddenly for well-defined neutron wavelengths where the conditions for Bragg scattering are no more fulfilled. The position of the Bragg-cut-off can be related to the corresponding dhkl spacing. The shift of the Bragg-edge can be used for the detection of stress and strain in metallurgical samples. The method can be used for material phase separation in heterogeneous materials as well. Combination of Prompt Gamma Activation Analysis (PGAA) for bulk elemental analysis and PGAI (I for imaging) technique with neutron tomography for mapping of materials heterogeneity will be developed as complimentary tool. The experience which will be collected at continuous neutron sources by using convention monochromatisation methods (crystals, choppers, velocity selectors) will be a step towards ToF imaging at spallation (pulsed) neutron sources like ESS. Areas of applications are residual stress accumulation and annealing, analysis of fatigue tests, optimization of welding techniques (e.g. Friction Steer Welding) and various industrial inspection procedures.
Magnetic imaging
Task 18.4. SANS 3D: vectorial magnetic imaging of nano-particles with a resolution of 1nm to 100nm.
During the last few years polarized SANS with polarization analysis (PASANS) has been made available thanks to the developments of 3He polarizing cells that are presently available at a few facilities. We will develop the technique of PASANS to study the magnetization distribution in magnetic particles of complex geometrical shapes. The numerical tools will be developed in common between several labs to ensure a harmonization of the tools from the beginning of the development of the PASANS technique and prevent fragmentation as has been observed for other techniques. We will design a processing chain as integrated as possible, going from the micro-magnetic modelling tools to the simulation of the expected experimental results. To extend the technique to micron-scale magnetic structures (as found in magnetic domain formations), the possibility of implementing polarization and polarization analysis in Multiple SANS (very small Q) will be demonstrated. This would bridge the length-scale gap between classical SANS (□<200nm) and tomography (□>10µm). The use of spherical polarimetry (CRYOPAD) will be evaluated for SANS experiments on small magnetic crystals in which long range magnetic modulations exist. Another possibility to bridge the gap between nm scale and µm scale structures will be to explore the possibilities offered by Magnetic SESANS. The direct measurement of magnetic correlation functions will be demonstrated.
Task 18.5. Precession techniques for imaging magnetic structures in thin film systems.
Besides magnetic nanoparticles, there is an interest in probing the magnetic structure of planar systems (films) in which the magnetization is not homogeneous. Neutron reflectivity is a technique which has proved to be rather efficient in probing such systems. In this task, we propose to develop a new technique based on neutron polarization vector precession which could be complementary to polarized neutron reflectivity and allow probing buried non collinear structures with typical length-scales in the range 100 nm - 1 µm. This technique, which can principally be can be implemented on any polarized neutron reflectometer, would provide the following advantages: (i) operation in transmission and hence a large flux, (ii) sensitivity only to magnetic structures so that the chemical details or the flatness of the sample are not issues, (iii) possibility of probing deeply buried systems. We will explore the potential of this technique both in monochromatic and ToF modes and develop the tools to model the neutron precession data to reconstruct magnetic structures. If successful, it might be considered for the implementation at ESS.
Task 18.6. Tomographic imaging of magnetic structures at the µm scale.
The aim of this task is to push the limits of direct magnetic imaging in order to be able to resolve magnetic structures at the µm scale (in the direct space). This can be done by implementing advanced neutron optics as developed within the WP17 of the NMI3 consortium. Optimisation of the detector components can help to

improve the resolution down to 10 µm. Two different techniques will be explored for the direct visualization of magnetic structures: (i) Imaging with polarised neutrons. A polarizer-analyser setup will be used to convert the precession angle of the neutron spin at its transmission through magnetic field to imaging contrast. The method will be limited to small magnetic fields (few mT) and spatial resolution of 100 µm; (ii) Grating interferometry. The Talbot-Lau interferometer will be used to visualize domain walls in magnetic systems with a high resolution (10 µm). The method will be limited to high magnetic fields (few T).

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	STFC	2.00
3	TUM	35.00
4	Jülich	28.00
5	PSI	34.00
6	HZB	38.00
7	CEA	41.00
11	II HAS	11.00
12	TUD	10.00
13	NPI	6.00
	Total	205.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D18.1	Implementation of grating interferometry for visualization of residual stresses	6	10.00	O	PU	36
D18.2	Publication and Interim report	6	6.00	R	PU	36
D18.3	Grating interferometry experiments performed with university partners	3	3.00	O	PU	48
D18.4	Optimization of high-resolution detector system	6	6.00	O	PU	18
D18.5	Adapting of high-resolution detector system	5	6.00	O	PU	36
D18.6	High-resolution experiments performed with university partners	3	10.00	O	PU	48
D18.7	Optimization of monochromator parameters for high wavelength resolution	6	6.00	O	PU	18
D18.8	Bragg-edge mapping and energy-selective experiments	5	6.00	R	PU	36

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D18.9	Extending the technique towards ToF-imaging	5	8.00	O	PU	48
D18.10	Evaluation of the PASANS	7	6.00	R	PU	18
D18.11	User friendly sample environment	4	6.00	R	PU	36
D18.12	User friendly platform for PASANS	2	5.00	O	PU	48
D18.13	Evaluation of the Precessionnal spectroscopy techniques possibilities	7	6.00	R	PU	18
D18.14	Precession spectroscopy measurements	7	6.00	R	PU	36
D18.15	User friendly platform for the exploitation of precession data	2	5.00	O	PU	48
D18.16	Imaging of magnetic structures in bulk samples with high resolution	6	5.00	R	PU	18
D18.17	Direct magnetic imaging experiments	5	5.00	R	PU	36
D18.18	Data processing platform	3	5.00	R	PU	48
D18.19	Wiki pages on NMI3 portal	7	12.00	R	PU	48
		Total	122.00			

Description of deliverables

D18.1) Implementation of grating interferometry for visualization of residual stresses: [month 36]

D18.2) Publication and Interim report: [month 36]

D18.3) Grating interferometry experiments performed with university partners: [month 48]

D18.4) Optimization of high-resolution detector system: Optimization of high-resolution detector system by innovative lens systems and new scintillating screens [month 18]

D18.5) Adapting of high-resolution detector system: Adapting of high-resolution detector system to Bragg edge mapping, magnetic imaging and phase grating interferometry [month 36]

D18.6) High-resolution experiments performed with university partners: [month 48]

D18.7) Optimization of monochromator parameters for high wavelength resolution: Optimization of monochromator parameters for high wavelength resolution. Optimization of the detector setup for energy-selective purposes [month 18]

D18.8) Bragg-edge mapping and energy-selective experiments: Bragg-edge mapping and energy-selective experiments performed with university users [month 36]

D18.9) Extending the technique towards ToF-imaging: [month 48]

D18.10) Evaluation of the PASANS: Evaluation of the PASANS possibilities by numerical modeling (vectorial SANS, MSANS, polarimetry, magnetic SESANS) [month 18]

D18.11) User friendly sample environment: User friendly sample environment to perform PASANS and magnetic SESANS experiments with university users [month 36]

D18.12) User friendly platform for PASANS: User friendly platform for the exploitation of PASANS. Publication of user's results [month 48]

D18.13) Evaluation of the Precessionnal spectroscopy techniques possibilities: Evaluation of the Precessionnal spectroscopy techniques possibilities (fixed wavelength & ToF) [month 18]
D18.14) Precession spectroscopy measurements: Precession spectroscopy measurements Experiments performed with university users [month 36]
D18.15) User friendly platform for the exploitation of precession data: [month 48]
D18.16) Imaging of magnetic structures in bulk samples with high resolution: Imaging of magnetic structures in bulk samples with high resolution [month 18]
D18.17) Direct magnetic imaging experiments: Direct magnetic imaging experiments performed with university users [month 36]
D18.18) Data processing platform: [month 48]
D18.19) Wiki pages on NMI3 portal: Common entry portal for the nano-magnetism community [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP19	Type of activity [54]	RTD
Work package title	Advanced methods and techniques		
Start month	1		
End month	48		
Lead beneficiary number [55]	18		

Objectives

Exploration of novel techniques to introduce conceptually new instrumental set-ups. Prototype development to pave the road for implementation on user instruments with a particular emphasis on the characteristics of the future ESS.

Description of work and role of partners

Task 19.1: Sub-mm3 samples for extreme environments
Task co-ordinator: Ken Andersen (ESS)
Partners: ESS (30MM), ILL (30MM), ICMA Zaragoza (30MM)
The impact of neutron scattering science is severely limited by the inherently low brightness of the available neutron sources. Even with the order-of-magnitude increase in brightness from the ESS, the source brightness will remain the limiting factor in many circumstances. The problem is exacerbated when the sample under study needs to be studied under extreme conditions of pressure, magnetic field, or temperature. Common to these sample-environment parameters is that the extreme condition can only be applied over a very small volume.
In addition, the available solid angle for detectors is also severely reduced, resulting in often unfeasibly long counting times or the signal falling below the threshold set by background noise.
We propose to address this in two ways: (1) by developing focusing optics that are compatible with extreme sample environments and that are capable of capturing more of the source brightness and of converting it into a flux increase at the sample and (2) by designing the instrument such as to take full advantage of the small solid angle allowed by the extreme sample environment.
Task 19.2: Multiple-beam SANS
Task co-ordinator: Albrecht Wiedenmann (ILL)
Partners: ILL (12MM), ESS (12MM)
We propose to design and build a prototype of an innovative SANS instrument using multiple beams focussed on the sample. In the final version the instrument should allow investigations of nanoscale fluctuations and sub-millisecond dynamics in new materials available only in extremely small quantities. The prototype will consist of a multichannel guide combined with monochromating mirrors, which produces 6 individual beams with different wavelengths focussed on the sample of 2 mm in size. As demonstrated by simulations the multichannel guide can compress the intensity at the end of a conventional (cold neutron) guide by more than a factor 5-10 leading to a spot size of only a few mm. At the end of this device neutrons are extracted in 6 individual beams with angles of $\alpha = \pm 11°$, $\pm 8°$ and $\pm 5°$ with cross sections 5 mm (in the prototype the other direction can be increased for intensity reasons leading to slit smearing). It is expected that the wavelength distribution in these two beams will be very different when a white spectrum is offered to the device. Mean wavelengths (between 4 and 20 Å), bandwidths (and also neutron polarisation) can be chosen individually for each beam by proper multi-layer coating. E.g. neutron beams of 11 Å, 8 Å and 5 Å are obtained with a d-spacing of 30 Å with Ni-Ti multi-layers reflecting at 11°, 8° and 5°, respectively, with >60% reflectivity. All beams are then focussed on the sample with a cross-section of 2×2 mm2. Scattering cross sections are measured simultaneously for each individual beam in separate detectors with pixel sizes of mm resolution covering the entire Q-range as defined by the incoming beams. The standard SANS collimator is replaced by movable apertures which allow a flexible choice of the collimation.
Task 19.3: Spin Echo with Oscillating Intensity for the ESS
Task co-ordinator: Wolfgang Häußler (TUM)
Partners: TUM (40MM), TU Delft (13MM), STFC (20MM)

AGY

The Neutron Spin Echo (NSE) technique in its different variants is a high-resolution method for measuring dynamical phenomena in soft matter and spin excitations in magnetic systems. It relies on Larmor precession of the neutron spin in magnetic fields before and after the sample position. In one variant of the spin echo technique - the MIEZE (Modulation of IntEnsity by Zero Effort) technique -, all spin manipulations are performed before the sample position. In contrast to NSE, this technique leads to a spin echo signal with oscillating intensity, and needs time-resolved neutron detection. This makes it a technique being ideally suited for instruments with time-resolving detectors being used as a standard at pulsed neutron sources. At elastic scattering instruments, for example performing small angle neutron scattering (SANS), the time-of-flight information is so far used for wavelength determination only. The proposed task aims in developing a MIEZE setup, which will acquire the spatial information and the high-resolution quasi-elastic information at the same time in an experiment at a pulsed source. In the light of plans to build the ESS and the upgrade of several neutron sources in Europe, this technique should be brought to the high level needed for integrating this technique in future instruments, as it allows for extending the field of NSE applications. In particular, it makes possible both experiments in strong magnetic fields applied at the sample, and with spin-depolarizing samples.
The development tasks for a MIEZE setup, on which the proposed JRA task will focus on, are:
• In order to achieve correct magnetic field strengths and directions for the MIEZE spin manipulations, the magnetic field coils have to be connected to electromagnetic resonance circuits supplied by high frequency (RF) power amplifiers. The first part of this tasks comprises: Building up a test resonance circuit (at the NRSE instrument RESEDA, FRM II), including remote control of the frequency synthesizers generating the RF signal in the frequency range needed for the resonance flip coils; the amplitude of the resonant magnetic field has to be adapted to the neutron wavelength, according to different time slots after the spallation pulse. Test of the circuit by using it at different fixed wavelength ranges, and analyzing the spin flip efficiency.
:

• Defining a requirement profile for fast position sensitive detectors needed for MIEZE, taking into account the scattered intensities expected at the ESS. The detectors have to be synchronized both to the resonant frequency of the magnetic coils, leading to time slots on the 1-10 MHz scale, and to the spallation source frequency. They are thus different from ordinary time resolving detectors at pulsed sources.
• For transferring the MIEZE concept from the currently reactor based instruments to a pulsed source it will be necessary defining new measurement strategies together with new data analysis concepts for an instrument at the ESS.
• Performing a set of measurements at an instrument at a spallation source (TS2, ISIS) for proof of principle. Using the existing OffSpec RF electronics by applying the modifications developed with respect to the resonance circuit design. Test of the setup in the whole wavelength range available at ISIS.
Task 19.4: Choppers for the ESS instrumentation
Task co-ordinator: Michael Monkenbusch (Jülich)
Partners: Jülich (36MM)
The ESS is planned as intense long pulse neutron source with an effective neutron pulse length of the order of 2ms at a repetition frequency of 10..20Hz. With these parameters it is obvious that at least for all instruments that do not correspond to reactor instruments with velocity selectors (i.e. SANS, NSE, reflectometry) additional pulse shaping is required to achieve a reasonable resolution. This pulse shaping has to be performed by some kind of choppers. One task certainly is to modify existing chopper families (Fermi choppers, disk choppers with and without magnetic bearings) such that they meet the harsher radiation requirements of the ESS environment. However, to fully exploit new ideas, e.g. employing repetition rate multiplication, focusing in time, energy and/or even space, choppers with extended capabilities are needed to realize the solutions with optimum neutron usage. Here we propose to investigate the capabilities, properties and feasibility of new chopper concepts that may allow for high frequency (KHz), large area and adaptability to focusing strategies. At the same time the kinetic energy shall be limited such that safety issues do not prevent their practical use. The idea is to compose a Fermi chopper type by an array of slim rotators that are operated synchronously and eventually with adjustable phase shifts. To cover a larger area, a staggered array of these rotors with diameters less than e.g. 1cm is needed.
Provided the drive synchronization issues can be solved, these choppers on the one hand will have the flexibility of support focusing strategies, e.g. by opening all parts of a converging beam at the same time…or in a given sequence… On the other hand the kinetic energy will be not more than a few 10J even for the largest frequencies. [r=5mm, f=1KHz, h=100mm, w=100mm → ~7J/rotor x 10 = 70J].
Task 19.5: Polarising all neutrons in a beam
Task co-ordinator: Katia Pappas (TU-Delft)
Partners: TU-Delft (4MM), ESS (6MM)

Current polarisers select one of the two spin-states of the neutron beam and discard the other. For cold neutron beams it should be possible to take advantage of the long target-instrument distances, which result from the low repetition rate of the ESS, and polarise the totality of the beam by combining polarizing supermirrors in reflection and transmission. In this way it will possible to produce two beams with opposite polarisations, flip the polarization of one of the beams (e.g. with a broad band radiofrequency flipper) and recombine them. To satisfy Liouville's theorem, phase space volume necessarily increases, either in divergence, wavelength or time. On the other hand, the resulting very high intensity polarized neutron beams will be unique and will mark a qualitative lap in neutron scattering by enabling the full exploitation of the unique capabilities of the neutron spin.
At a first stage Monte Carlo simulations will be used to calculate and check the whole concept. The optimization procedure should identify the best trade-off between polarization efficiency, transmission, beam profile homogeneity, beam divergence, etc. In addition the simulations will look into the possibility of combining such a device with focussing-geometry guides and/or of switching between "one beam" high-resolution/low-intensity and "combined beams" low-resolution/high-intensity configurations on the same instrument. The extensive simulation and optimization work shall explore the potential of this concept and should lead to generic setups, which at a later stage will be realized and tested as low-scale prototypes.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	42.00
2	STFC	20.00
3	TUM	40.00
4	Jülich	36.00
12	TUD	17.00
17	UNIZAR-ICMA	30.00
18	ESS	48.00
	Total	233.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D19.1	Report on performance of prototype guide	1	20.00	R	PU	48
D19.2	Report on performance of prototype KB mirrors	18	18.00	R	PU	48
D19.3	Report on design of long-pulse diffractometer for extreme environments	18	18.00	R	PU	48
D19.4	Report on design of long-pulse crystal-analyser instrument for extreme environments	18	18.00	R	PU	48
D19.5	Report on performance of prototype Multiple-beam SANS experiments	1	22.00	R	PU	48
D19.6	Design report	3	10.00	R	PU	24

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D19.7	Performance report	3	10.00	R	PU	36
D19.8	Report on the requirements	3	10.00	R	PU	24
D19.9	Report on the measurement strategies and the design of data analysis system	3	10.00	R	PU	36
D19.10	Report on the proof of principle measurements	2	20.00	R	PU	48
D19.11	Report on mechanical layout and FE-calculation	4	12.00	R	PU	36
D19.12	Report on Neutronic layout of single rotor	4	12.00	R	PU	36
D19.13	Report on conceptual design	4	12.00	R	PU	42
D19.14	Delivery of the prototype, following design and procurement	12	10.00	R	PU	30
D19.15	Report and publication of the test results	12	7.00	R	PU	38
		Total	209.00			

Description of deliverables

D19.1) Report on performance of prototype guide: Sub-mm3 samples for extreme environments [month 48]

D19.2) Report on performance of prototype KB mirrors: Sub-mm3 samples for extreme environments [month 48]

D19.3) Report on design of long-pulse diffractometer for extreme environments: Sub-mm3 samples for extreme environments [month 48]

D19.4) Report on design of long-pulse crystal-analyser instrument for extreme environments: Sub-mm3 samples for extreme environments [month 48]

D19.5) Report on performance of prototype Multiple-beam SANS experiments: [month 48]

D19.6) Design report: Spin Echo with oscillating intensity for the ESS Report on the design of the circuit including remote control and wavelength adapted amplitude control [month 24]

D19.7) Performance report: Report on performance of the resonance circuits [month 36]

D19.8) Report on the requirements: [month 24]

D19.9) Report on the measurement strategies and the design of data analysis system: [month 36]

D19.10) Report on the proof of principle measurements: [month 48]

D19.11) Report on mechanical layout and FE-calculation: [month 36]

D19.12) Report on Neutronic layout of single rotor: [month 36]

D19.13) Report on conceptual design: [month 42]

D19.14) Delivery of the prototype, following design and procurement: [month 30]

D19.15) Report and publication of the test results: [month 38]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP20	Type of activity [54]	RTD
Work package title	Advanced Neutron Tools for Soft and Bio Materials		
Start month	1		
End month	48		
Lead beneficiary number [55]	7		

Objectives

Neutrons have a leading role in the study of a large variety of Soft Materials (physical chemistry or bio-inspired systems). This is first and foremost due to the possibility of labelling by deuteration (absent in light or X-rays), which allows highlighting the parts of interest in the multi-component systems common in soft matter. Both the structure and dynamics of soft materials are ideally elucidated by Small Angle (SANS), Reflectivity (NR) and Quasi-elastic Neutron Scattering (QENS) due to the characteristics time and length scales probed by these techniques (from picoseconds to few hundred nanoseconds and from fraction of nanometers up to several hundreds nanometers). In addition, neutrons are non-destructive and their large penetration depth makes them easily penetrate matter (contrary to electrons and x-rays) which allows developing complex sample environments without parasitic scattering or significant loss of scattering signal from the sample.
Most soft materials are very sensitive to external stimuli (i.e. deformation, electric or magnetic fields, UV or visible irradiations, pH, concentration, humidity, temperature and pressure variations). More kinetics and dynamics studies using advanced in-situ devices need to be developed to use efficiently the existing high flux sources and in perspective of the European Spallation Source. Present environments require large sample volumes that limit technical performances of high pressure, T-jump or shear devices. Furthermore, many experiments are today inaccessible due to the limited quantity of sample available (labelled or biological molecules). Great advancement in our understanding of soft materials properties can be achieved by pushing forward the limits of preparing samples, applying external stimuli and recording in-situ/in-operation experimental data.
A clear tendency of research in the last ten years has focused on bio-inspired materials. Neutron techniques, especially neutron reflectivity, have recently offered high performance tools for the study of biological membranes. A great challenge for the future in the field is to succeed in standard production of model membranes, of recipes for specific deuteration and in the development of novel modelling methodology, including molecular scale information from MD simulations for the interpretation of neutron data.
We propose to join efforts from different facilities and users laboratories on 2 points:
- (i) A platform for model biological membranes
- (ii) Soft materials specific sample environments and in-situ devices

Our objective is to provide a wider range of experimental tools enabling to make the best use of using neutron scattering for Soft and Bio-Materials, which have many possible applications in the areas of environment, energy and health.

Description of work and role of partners

(i) A platform for model biological membranes
Task 1. A platform for model biological membranes for structural and dynamical characterizations
ILL (task leader)- STFC, CEA (partners) – HZB, TUM, JÜLICH (observers)

Natural biological membranes are highly complex systems, composed of different lipids, proteins, sterols, etc. As a result of this complexity, native membranes are difficult to study and simpler models need to be devised for structural characterization in the fraction of nanometer scale. ILL has pioneered the floating bilayer system, which provides biologists with bio-inspired model membranes (MM) to use for the study of interactions with a plethora of bio-molecules. This and other models developed in various neutron facilities, suffer from a number of drawbacks and are not always suitable to mimic the complexity of real membranes. A very topical issue in this field is also the development of reliable protocols for reconstitution of membrane proteins into model membranes. With these aims, different approaches will be studied to produce reproducible and realistic model membranes for biophysical and biological studies. In addition, there is a need for improved data analysis methods to extract as much information as possible from reflectivity data. The second aspect of the work will be in the development of novel modelling methodology, including molecular scale information from molecular dynamics simulations in the interpretation of NR data. Additionally, the deuteration of lipid compounds is essential for such studies but their chemical synthesis is challenging (due to the presence of double bonds in most of lipids): We thus propose to extract natural lipids from the biomass produced from protein deuteration at the D-Lab facility in Grenoble, so that deuterated lipids not available in the commerce can be provided to the neutron scattering users of European facilities.

(ii) Soft materials specific sample environments and in-situ devices
Task 2. Kinetic/dynamic measurements in periodic external fields
JÜLICH (task leader)- ILL, CEA (partners)- STFC, HZB, TUM, Tübingen Univ. (Germany) (observers).

Soft materials are very sensitive to various stimuli (mechanical deformation, electric or magnetic fields, UV or visible irradiation, pH, concentration or temperature variations)... Many of these external fields have been applied mostly statically, and we need now to study responses of the sample to periodic time dependent fields. Besides, since neutron spectroscopy experiments allow for largely unrestricted access to a wide range of the solid angle which is not used by detectors, we could exploit this advantageous situation by establishing in-situ combined light or UV/Vis/IR spectroscopies and neutron experiments. The aim of the following contributions is the extension of the accessible fields, of kinetics and in situ measurements in neutron scattering.
Stopped Flow (SF) devices are used on the SANS spectrometers to record real time measurements and very short acquisition times on a sample after application of an external stimulus (dilution, mixture, pH or T-jump…). Such equipment has been successfully used to follow the growth in the very early stages (100ms) of vesicles, the transition from a lamellar phase to a micro-emulsion, or the exchange rate in mixed surfactant aggregates... A crucial step to improve both performances and spread kinetics studies with SF equipment could be overcome by improving the filling and emptying of the sample cell and adapting the cell volume and geometry to the amount of “available” samples (design of micro-cells or on the contrary, larger and thicker cell to reduce the number of repetitions). Another important development of these devices concerns a more precise control of temperature and, specifically, a separated control of the temperature of the reservoirs and observation head has to be improved in order to follow phase transitions after T-jumps.
Investigation of the wide scale range intermediate states of structures displayed by soft materials is another major challenge for all future technical developments. Modern light scattering set-ups (optical fibres and CCD detection) now allow miniaturized devices. A combined static LS / SANS setup would complement the standard SANS Q-range to smaller Q range (2x10-4 Å-1 ≤ Q ≤ 3x10-3 Å-1) and would allow accurate monitoring of aggregation phenomena, approach to a phase separation etc. Until now, a combination of SANS and dynamic light scattering (DLS) has been only achieved for a fixed light scattering angle, and static light scattering has never been used before in combination with SANS: the proposed set-up is thus a real step forward in soft matter sample environment. We will also implement DLS for several scattering angles with the flow-through cell of the stopped flow in order to measure S(Q,t) in the micro- to millisecond range.
External stimuli like UV irradiation can induce a chemical reaction and/or conformational changes in soft materials. Oscillating electric field applied to many charged colloids, polyelectrolytes or other biomolecules (producing reversible gels for examples) is of interest as well. Such devices are scarcely developed. While the realization of sample cells for in situ UV or electric field applications should be easy, temperature stability has to be ensured by using a temperature control. Optimization of the field homogeneity depending on the sample cell geometry (flat or annular) is also necessary. The design and drawings of EF cells will be extended for TOF measurements, provided different geometries and larger sample cell are taken into account.
So far, only few high resolution neutron scattering experiments addressed the dynamics of soft matter involving pressure. Some experiments investigated microemulsions under pressure up to 500 bar, but in the pressure region of several kbar interesting questions can be addressed: proteins, for example, undergo a transition from the folded to the unfolded state not only by an increase of temperature but also at high pressure (about 7 kbar) as shown by SANS measurements. NSE spectroscopy has a great potential in the study of internal dynamics of unfolded proteins, but its large beam cross section and its requirements of non-magnetic materials are challenging for high pressure devices. Besides, since the same pressure cell can also be used for static measurements with neutron polarization and polarization analysis, the construction of a pressure cell for NSE will open new fields in the determination of nanoscale magnetic organizations. It will also allow for separating the incoherent background from a coherent scattering signal, which is highly important for the studies of biological molecules in diluted solution. We propose to develop a non-magnetic pressure cell accepting a large incoming beam cross section and large exit angles.

Agy

Task 3. Humidity chamber
HZB (task leader)- ILL, JÜLICH (partners)- STFC, TUM, CEA, McMaster Univ. (Canada) (observers)
In-situ control of the hydration level of soft materials samples plays a crucial role in the investigations of a number of systems like for example the proton motion in Nafion membrane, the dynamics of phospholipid membranes, the structure and dynamics of clays, as well as in the study of the function/structure relationship of proteins. In the last years, ILL and HZB have been developing humidity chambers for neutron scattering using different techniques to control both relative humidity and temperature. But further developments are needed to obtain a faster and better controlled response in wider temperature and humidity ranges. Different geometries of humidity chambers with different specifications will be produced to adapt to SANS, reflectometry, and spin-echo measurements. Multi-position sample holder for SANS with controlled temperature stability across the sample holder will be also designed.

Task 4. Cryogen-free cryostat with sample changer for fast automatic data collection.
ILL (task leader) - STFC, TUM (partners) – HZB, JÜLICH, CEA, ANSTO (Australia), ORNL (USA), JAEA (Japan) (observers).
In order to decrease dead times related to temperature and sample changes during neutron scattering experiments in cryostats (many soft materials studies are carried out in cryostats), it is necessary to design and build a cryostat that features a carousel of samples either placed at room temperature or thermalized at low temperature (for example at 80K by using a cold gas stream), equipped with an automatic sample changer, and capable to extend the available temperature range (down to 3 K or lower and up well above room temperature). A more compact design with less cold mass would allow rapid cool-down and sample changes by means of a robot.
We propose to design and draw a new cryostat with a sample changer fulfilling these specifications. The body of the cryostat will be modular so as to allow the mounting of a tail optimised for SANS, Reflectometry, and other neutron instruments from different facilities. Tail windows will be designed in order to apply in-situ light/UV or other external radiation.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	91.00
2	STFC	19.60
3	TUM	22.40
4	Jülich	18.00
6	HZB	25.20
7	CEA	28.00
	Total	204.20

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D20.1	Optimization of model bilayer systems including natural membrane lipids	1	1.00	R	PU	36
D20.2	Set up a lipid extraction facility to extract and fractionate membranes from real cells	1	1.00	R	PU	18

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D20.3	Protocols for reliable reconstitution of membrane proteins	2	1.00	R	PU	48
D20.4	Characterization of biomembranes	1	1.00	R	PU	48
D20.5	Designs of new stop flow observation heads for SANS	1	1.00	R	PU	18
D20.6	Conception and design of MA-LS setup	4	1.00	R	PU	18
D20.7	Design an electric field cell for SANS	7	1.00	R	PU	18
D20.8	Conception and design of a pressure cell for NSE	4	1.00	R	PU	36
D20.9	Tests of MA-LS prototype setup	4	1.00	R	PU	24
D20.10	Tests of new stop flow observation heads for SANS.	1	1.00	R	PU	30
D20.11	Prototype of pressure cell for NSE. Tests	4	1.00	R	PU	48
D20.12	Prototype of EF for SANS. Tests. Design of EF for TOF.	7	1.00	R	PU	48
D20.13	Specifications	6	1.00	R	PU	36
D20.14	Assembly of the humidity chamber. Tests	6	1.00	R	PU	48
D20.15	Design and performance estimations	1	1.00	R	PU	36
D20.16	Drawings of the cryostat	1	1.00	R	PU	48
		Total	16.00			

Description of deliverables

D20.1) Optimization of model bilayer systems including natural membrane lipids: [month 36]

D20.2) Set up a lipid extraction facility to extract and fractionate membranes from real cells: [month 18]

D20.3) Protocols for reliable reconstitution of membrane proteins: [month 48]

D20.4) Characterization of biomembranes: D lipids extraction. Characterization of biomembranes with scattering and complementary techniques. [month 48]

D20.5) Designs of new stop flow observation heads for SANS: [month 18]

D20.6) Conception and design of MA-LS setup: [month 18]

D20.7) Design an electric field cell for SANS: [month 18]

D20.8) Conception and design of a pressure cell for NSE: [month 36]

D20.9) Tests of MA-LS prototype setup: [month 24]

D20.10) Tests of new stop flow observation heads for SANS.: [month 30]

D20.11) Prototype of pressure cell for NSE. Tests: [month 48]

D20.12) Prototype of EF for SANS. Tests. Design of EF for TOF.: [month 48] D20.13) Specifications: Specifications of the next-generation humidity chambers. Drawings and procurement of components for humidity chambers [month 36] D20.14) Assembly of the humidity chamber. Tests: [month 48] D20.15) Design and performance estimations: Design and performance estimations of cryostats with sample changer [month 36] D20.16) Drawings of the cryostat: [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments

WT3:
Work package description

Project Number [1]	283883	Project Acronym [2]	NMI3-II

One form per Work Package

Work package number [53]	WP21	Type of activity [54]	RTD
Work package title	Detectors		
Start month	1		
End month	48		
Lead beneficiary number [55]	2		

Objectives

Development of detector technologies to replace 3He detector technology in neutron scattering applications. This work will concentrate on two tasks; the development of wavelength shifting fibre scintillator detectors and the development of solid10B gas detectors.

Description of work and role of partners

Neutron scattering facilities have, for many years, depended on the availability of 3He for a large fraction of their detector requirements. Within the last 2 – 3 years demand for 3He, driven largely by the US homeland security requirements, has lead to an unprecedented rise in the cost of 3He and its unavailability for all but the smallest of systems. For neutron scattering facilities to function effectively it is crucial that alternative, cost effective detector technologies are developed. This work package concentrates on the development of two promising detector technologies which could alleviate the dire situation now facing the facilities as a result of the high cost and near unavailability of 3He.

Task 21.1 Development of scintillation detectors based on WLS fibre STFC JÜLICH and CNR

Wavelength-shifting fibre scintillation detectors shall be developed as an alternative to 3He-detectors. In these detectors light from ZnS/6LiF scintillator will be captured in wavelength shifting fibres and converted to electronic signals by photomultiplier tubes, PMTs. The output signals from these tubes will then be electronically processed to determine where on the detector an event took place and whether or not the event was a neutron. Within this task special emphasis will be given to reduce the gamma-sensitivity and intrinsic background of such detectors. It is these characteristics in particular which will determine how successful these detectors can be in replacing 3He detector technology for neutron scattering applications. Scalability will be a prime consideration facilitating construction of large area detector arrays based on this technology. STFC and FJZ will concentrate on the development of systems using vacuum PMTs. In parallel CNR will explore options for reading out large area scintillation detectors using SiPMTS. These are relatively new devices, still in the development phase and have some performance issues in neutron detector applications. Nevertheless, these devices are very compact, run at low voltages and high magnetic fields and are easily integrated into signal processing electronics. In the future the possibility of low cost production and improved signal to noise could enable these devices to make a significant impact on the cost and performance of large area scintillation detectors for neutron scattering applications. This work will benefit from the SiPMT work done in the muon JRA in the FP7 1 NMI3 programme.

T21.1.1 Detector development

Two types of detector system will be developed. STFC and JÜLICH will each develop a demonstrator system with a sensitive area of ~30 x 30 cm2. The design of these demonstration detectors will allow easy adaptation to different configuration so that different components and geometries can easily be explored. STFC will concentrate on a system using highly-coded wavelength shifting fibre arrays and PMTs with single or small numbers of anodes. In this case the number of PMT channels and associated electronics is relatively low, but count rate may be more limited and optical cross talk and ghosting is more problematic. Work will concentrate on optimisation of the fibre code to minimise these problems. JÜLICH will develop a detector system with a lower degree of fibre coding and flat-panel multi-anode PMTs which have large numbers of anodes. In this case the number of PMT channels is high, but the corresponding count rate will be higher and the optical cross is expected to be low.

T21.1.2 Electronics hardware development

The PMTs envisaged for use in the STFC detector have relatively high gain and STFC will adapt an existing electronics system for the development of its detector. The gain of the flat panel PMTs is relatively low and more

sophisticated and higher density electronics hardware is required to process the PMT output signals. Therefore JÜLICH will develop a specific FPGA based data acquisition system for processing the output signals from the flat panel PMTs. This system will be connected to a PC via a fibre optic link.
T21.1.3 Signal processing
In both detector systems signal processing will be carried out in firmware in the FPGAs. In addition the JÜLICH system will have the ability to carry out further pulse processing on the PC. The development of algorithms in the signal processing will be critical in achieving the required detector performance Development of suitable algorithms will be carried out jointly by STFC and JÜLICH.
T21.1.4 SiPMT evaluation
SiPMTs will be evaluated to assess the potential of these devices for the readout of larger area scintillation detectors based on ZnS scintillator. Even if the cost of SiPMTs drops dramatically in the future, at this stage it is not realistic to consider covering the entire active area of a large detector with SiPMTs. The question then becomes, "By what factor could the active SiPMT area be reduced, compared with the active area of the detector?" Such a reduction could be achieved using wavelength shifting or clear fibre or using passive or active optical elements. CNR will explore these possibilities and determine consequences of such reduction techniques on detector performance.
T21.1.5 Detector evaluation and final report
STFC, JÜLICH and CNR will agree assessment criteria for detector performance, evaluate their respective detectors and document the results.
Task 21.2 Development of gas detectors based on solid 10B converter HZB, TUM, BNC and CEA
One of the major challenges in developing such detectors is the need to deposit uniform 10B layers of ~1 µm thickness over large areas. Because of the rather low efficiency of a single layer, up to 30 layers are necessary to achieve 50% absorption efficiency for thermal neutrons. Once a suitable deposition method has been determined two detector design concepts will be pursued. One will be based on extruded tubes equipped with micro-structured profiles as the neutron converter. The other will be based on a stacked micromegas structure equipped with multiple conversion layers and corresponding amplification areas. The micromegas detector will benefit from the large amount of work already done at IRFU
The development of large-area thermal neutron detectors using 10B as an alternative to 3He is also being proposed in the ESFRI INFRA-Cluster project, 2010 call, by the ILL and ESS. The emphasis in the NMI3 detector JRA will be to develop 10B detectors using Electron beam evaporation whereas the INFRA-Cluster project will concentrate on sputtering techniques. Other non-sputtering techniques may be explored in both projects. The detector constructions in the two projects are also fundamentally different. The ESFRI 10B detector task leader, Bruno Guerard from the ILL and the ESS Detector Group Leader, Richard Hal-Wilton will participate as observers in the NMI3 detector JRA. This will ensure that work in the two tasks is not duplicated and an effective synergy between the two is achieved.
T21.2.1 Optimization of substrate and production parameters
At present the potential techniques for the production of solid 10B converter layers are based on PVD methods (RF/DC magnetron sputtering, Electron beam evaporation). With a proper facility now available at HZB, these types of layers can be produced and serve as a reference. Preference will be given to the investigation and optimization of the production parameters using Electron beam evaporation. Type and topology of the substrate are regarded as important and their influence on detection efficiency will be studied. It is planned to prepare substrates as micro-structured profiles, shaped by rolling or etching. The results shall be compared with the work based on magnetron sputtering techniques carried out by ILL and ESS in the framework of the ESFRI programme. BNC-RISP will provide additional facilities for the production of 10B converter layers using Electron beam evaporation. BNC-RISP will contribute to the characterization of 10B films, including, thickness absorption efficiency and uniformity.
T21.2.2 Exploration of alternative production techniques
Electron beam evaporation and magnetron sputtering techniques are both time consuming and costly processes in view of the size and large number of layers required in large area detectors. The feasibility of alternative vacuum and non-vacuum deposition techniques will be explored by all task partners and their potential use in gaseous detectors evaluated.
T21.2.3 Measurements with test detector
Efficiency, homogeneity and proper performance in gas detectors are the most important parameters of the layers in view of a potential use in future detectors. For the most promising coatings these properties will be studied in small size prototype detectors capable of handling single or multiple converter layers. A common test detector will be provided by TUM, while TUM HZB, BNC-RISP and CEA all provide test beam facilities and adequate equipment which will be used to analyse detector performances. This allows an efficient distribution of tasks and the comparison of results.

T21.2.4 Concept study for a large area detector
Although the results obtained in Tasks T2.1 – T2.3 are as valuable for the production of small and medium size detectors, preference is given to the design of large area position sensitive detectors with resolutions of about 20 mm in either direction. Potential concepts for a large area demonstration detector will be explored, focusing on affordable production techniques. The concept study, carried out by all participants will cover MC simulation, design and production processes. It is intended to study two detector types. One will be based on extruded tubes equipped with micro-structured profiles as the neutron converter. The other will be based on a stacked micromegas structure equipped with multiple conversion layers and corresponding amplification areas.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	ILL	0.00
2	STFC	30.00
3	TUM	31.00
4	Jülich	29.00
6	HZB	36.00
7	CEA	12.00
10	BNC-RISP	18.00
14	CNR	24.00
18	ESS	0.00
	Total	180.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D21.1	ISIS detector hardware produced	2	10.00	P	PU	24
D21.2	Jülich detector hardware produced	4	10.00	P	PU	24
D21.3	Report on STFC and JÜLICH detector hardware	2	15.00	R	PU	24
D21.4	ISIS electronics system completed	2	10.00	P	PU	24
D21.5	Jülich electronics system completed	4	12.00	P	PU	36
D21.6	Report on STFC and JÜLICH detector electronics hardware	4	10.00	R	PU	36
D21.7	Report on signal processing development	4	10.00	R	PU	36
D21.8	Interim report on Si PMT Detector performance	14	12.00	R	PU	24
D21.9	Report on scintillation detector performance	2	10.00	R	PU	48

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D21.10	Report on production parameter and substrate optimization	6	12.00	R	PU	36
D21.11	Report on exploration of alternative production techniques	3	10.00	R	PU	36
D21.12	Small size test detector produced	3	10.00	P	PU	12
D21.13	Experimental Report on converter investigation	3	10.00	R	PU	36
D21.14	Concept study for large area detector based on extruded tubes	6	12.00	R	PU	48
D21.15	Concept study for large area detector based on micromegas	7	12.00	R	PU	48
		Total	165.00			

Description of deliverables

D21.1) ISIS detector hardware produced: [month 24]

D21.2) Jülich detector hardware produced: [month 24]

D21.3) Report on STFC and JÜLICH detector hardware: [month 24]

D21.4) ISIS electronics system completed: [month 24]

D21.5) Jülich electronics system completed: [month 36]

D21.6) Report on STFC and JÜLICH detector electronics hardware: [month 36]

D21.7) Report on signal processing development: [month 36]

D21.8) Interim report on Si PMT Detector performance: [month 24]

D21.9) Report on scintillation detector performance: [month 48]

D21.10) Report on production parameter and substrate optimization: [month 36]

D21.11) Report on exploration of alternative production techniques: [month 36]

D21.12) Small size test detector produced: [month 12]

D21.13) Experimental Report on converter investigation: [month 36]

D21.14) Concept study for large area detector based on extruded tubes: [month 48]

D21.15) Concept study for large area detector based on micromegas: [month 48]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments

WT4:
List of Milestones

Project Number [1]	283883	Project Acronym [2]	NMI3-II

List and Schedule of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments

WT5:
Tentative schedule of Project Reviews

Project Number [1]	283883	Project Acronym [2]	NMI3-II

Tentative schedule of Project Reviews

Review number [65]	Tentative timing	Planned venue of review	Comments, if any
RV 1	24	ILL - Grenoble	Mid term review foreseen by Clause 5

WT6:
Project Effort by Beneficiary and Work Package

Project Number [1]	283883	Project Acronym [2]	NMI3-II

Indicative efforts (man-months) per Beneficiary per Work Package

Beneficiary number and short-name	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	WP 10	WP 11	WP 12	WP 13	WP 14	WP 15	WP 16	WP 17	WP 18	WP 19
1 - ILL	36.00	0.00	16.00	6.00	4.00	28.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.00
2 - STFC	0.00	6.00	0.00	2.00	4.00	4.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00	2.00	20.00
3 - TUM	0.00	51.00	32.00	0.00	48.00	4.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	40.00
4 - Jülich	0.00	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	36.00
5 - PSI	0.00	6.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	36.00	34.00	0.00
6 - HZB	0.00	0.00	0.00	0.00	8.00	4.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	38.00	0.00
7 - CEA	0.00	0.00	0.00	0.00	8.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	41.00	0.00
8 - HZG	0.00	0.00	0.00	0.00	8.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9 - BNC-AEKI	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
10 - BNC-RISP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11 - II HAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00
12 - TUD	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	10.00	17.00
13 - NPI	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	6.00	0.00
14 - CNR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 - UCPH	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16 - DTU	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17 - UNIZAR-ICMA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
18 - ESS	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.00
Total	36.00	63.00	81.00	8.00	96.00	60.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	72.00	205.00	233.00

WT6:
Project Effort by Beneficiary and Work Package

Beneficiary number and short-name	WP 20	WP 21	Total per Beneficiary
1 - ILL	91.00	0.00	223.00
2 - STFC	19.60	30.00	125.60
3 - TUM	22.40	31.00	264.40
4 - Jülich	18.00	29.00	119.00
5 - PSI	0.00	0.00	86.00
6 - HZB	25.20	36.00	112.20
7 - CEA	28.00	12.00	94.00
8 - HZG	0.00	0.00	12.00
9 - BNC-AEKI	0.00	0.00	5.00
10 - BNC-RISP	0.00	18.00	18.00
11 - II HAS	0.00	0.00	11.00
12 - TUD	0.00	0.00	30.00
13 - NPI	0.00	0.00	9.00
14 - CNR	0.00	24.00	24.00
15 - UCPH	0.00	0.00	30.00
16 - DTU	0.00	0.00	3.00
17 - UNIZAR-ICMA	0.00	0.00	30.00
18 - ESS	0.00	0.00	52.00
Total	204.20	180.00	1,248.20

WT7:
Project Effort by Activity type per Beneficiary

Project Number [1]	283883	Project Acronym [2]	NMI3-II

Indicative efforts per Activity Type per Beneficiary

Activity type	Part. 1 ILL	Part. 2 STFC	Part. 3 TUM	Part. 4 Jülich	Part. 5 PSI	Part. 6 HZB	Part. 7 CEA	Part. 8 HZG	Part. 9 BNC-AEK	Part. 10 BNC-RIS	Part. 11 II HAS	Part. 12 TUD	Part. 13 NPI	Part. 14 CNR
1. RTD/Innovation activities														
WP 17	0.00	36.00	0.00	0.00	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 18	0.00	2.00	35.00	28.00	34.00	38.00	41.00	0.00	0.00	0.00	11.00	10.00	6.00	0.00
WP 19	42.00	20.00	40.00	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	0.00	0.00
WP 20	91.00	19.60	22.40	18.00	0.00	25.20	28.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 21	0.00	30.00	31.00	29.00	0.00	36.00	12.00	0.00	0.00	18.00	0.00	0.00	0.00	24.00
Total Research	133.00	107.60	128.40	111.00	70.00	99.20	81.00	0.00	0.00	18.00	11.00	27.00	6.00	24.00
2. Demonstration activities														
Total Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities														
WP 1	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Management	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Work Packages for Coordination activities														
WP 2	0.00	6.00	51.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 3	16.00	0.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 4	6.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 5	4.00	4.00	48.00	4.00	4.00	8.00	8.00	8.00	4.00	0.00	0.00	2.00	2.00	0.00
WP 6	28.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Coordination	54.00	16.00	135.00	8.00	14.00	12.00	12.00	12.00	4.00	0.00	0.00	2.00	2.00	0.00

WT7:
Project Effort by Activity type per Beneficiary

4. Other activities														
Total other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Work Packages for Support activities														
WP 7	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 8	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 9	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 10	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 11	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 12	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 13	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
WP 15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
WP 16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Total Support	0.00	2.00	1.00	0.00	2.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00

Total	223.00	125.60	264.40	119.00	86.00	112.20	94.00	12.00	5.00	18.00	11.00	30.00	9.00	24.00

WT7:
Project Effort by Activity type per Beneficiary

Activity type	Part. 15 UCPH	Part. 16 DTU	Part. 17 UNIZAR-	Part. 18 ESS	Total
1. RTD/Innovation activities					
WP 17	0.00	0.00	0.00	0.00	72.00
WP 18	0.00	0.00	0.00	0.00	205.00
WP 19	0.00	0.00	30.00	48.00	233.00
WP 20	0.00	0.00	0.00	0.00	204.20
WP 21	0.00	0.00	0.00	0.00	180.00
Total Research	0.00	0.00	30.00	48.00	894.20
2. Demonstration activities					
Total Demo	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities					
WP 1	0.00	0.00	0.00	0.00	36.00
Total Management	0.00	0.00	0.00	0.00	36.00
Work Packages for Coordination activities					
WP 2	0.00	0.00	0.00	0.00	63.00
WP 3	30.00	3.00	0.00	0.00	81.00
WP 4	0.00	0.00	0.00	0.00	8.00
WP 5	0.00	0.00	0.00	0.00	96.00
WP 6	0.00	0.00	0.00	4.00	60.00
Total Coordination	30.00	3.00	0.00	4.00	308.00
4. Other activities					
Total other	0.00	0.00	0.00	0.00	0.00

WT7:

Project Effort by Activity type per Beneficiary

Work Packages for Support activities					
WP 7	0.00	0.00	0.00	0.00	1.00
WP 8	0.00	0.00	0.00	0.00	1.00
WP 9	0.00	0.00	0.00	0.00	1.00
WP 10	0.00	0.00	0.00	0.00	1.00
WP 11	0.00	0.00	0.00	0.00	1.00
WP 12	0.00	0.00	0.00	0.00	1.00
WP 13	0.00	0.00	0.00	0.00	1.00
WP 14	0.00	0.00	0.00	0.00	1.00
WP 15	0.00	0.00	0.00	0.00	1.00
WP 16	0.00	0.00	0.00	0.00	1.00
Total Support	0.00	0.00	0.00	0.00	10.00

Total	30.00	3.00	30.00	52.00	1,248.20

WT8:
Project Effort and costs

Project Number [1]	283883	Project Acronym [2]	NMI3-II

Project efforts and costs

Benefi-ciary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)							Total receipts (€)	Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Access costs (€)	Total costs		
1	ILL	223.00	897,900.00	21,000.00	694,000.00	955,140.00	0.00	2,568,040.00	0.00	2,019,661.00
2	STFC	125.60	349,175.00	0.00	268,655.00	366,634.00	1,300,991.50	2,285,455.50	0.00	2,074,728.25
3	TUM	264.40	1,018,100.00	0.00	197,395.76	729,297.46	1,524,600.00	3,469,393.22	0.00	2,892,208.46
4	Jülich	119.00	397,886.00	0.00	72,800.00	390,188.00	0.00	860,874.00	0.00	647,155.50
5	PSI	86.00	391,000.00	0.00	149,846.14	108,169.23	1,115,556.56	1,764,571.93	0.00	1,625,071.93
6	HZB	112.20	332,000.00	0.00	224,197.00	249,000.00	748,062.00	1,553,259.00	0.00	1,383,446.50
7	CEA	94.00	275,000.00	0.00	151,072.00	165,000.00	908,646.74	1,499,718.74	0.00	1,375,843.74
8	HZG	12.00	12,640.00	0.00	6,000.00	9,693.00	0.00	28,333.00	0.00	19,944.80
9	BNC-AEKI	5.00	0.00	0.00	32,064.58	6,412.92	239,893.50	278,371.00	0.00	274,202.60
10	BNC-RISP	18.00	32,625.00	0.00	23,000.00	33,375.00	0.00	89,000.00	0.00	66,750.00
11	II HAS	11.00	11,000.00	0.00	5,500.00	9,900.00	0.00	26,400.00	0.00	19,800.00
12	TUD	30.00	66,040.00	0.00	35,211.00	70,663.00	181,176.30	353,090.30	0.00	316,414.30
13	NPI	9.00	13,500.00	0.00	22,749.00	11,750.00	110,736.72	158,735.72	0.00	149,523.22
14	CNR	24.00	33,000.00	0.00	8,095.00	25,740.00	0.00	66,835.00	0.00	50,126.00
15	UCPH	30.00	173,000.00	0.00	8,000.00	108,600.00	0.00	289,600.00	0.00	193,670.00
16	DTU	3.00	14,500.00	0.00	3,900.00	19,320.00	0.00	37,720.00	0.00	19,688.00
17	UNIZAR-ICM	30.00	67,200.00	0.00	5,000.00	43,320.00	0.00	115,520.00	0.00	86,640.00
18	ESS	52.00	103,600.00	0.00	9,000.00	67,560.00	0.00	180,160.00	0.00	135,120.00
	Total	1,248.20	4,188,166.00	21,000.00	1,916,485.48	3,369,762.61	6,129,663.32	15,625,077.41	0.00	13,349,994.30

WT9:
Summary of transnational access / service provision per installation

Project Number [1]	283883	Project Acronym [2]	NMI3-II

Summary of transnational access / service provision per installation

Part. num.	Org. short name	Short name of infrastructure	Installation									
			Num.	Name	Operator country code	Unit of access	Total Estimated costs	Estimated unit cost	Min. quantity of access to be provided	Access costs charged to the GA	Est. num. of users	Est. num. of proj.
2	STFC	ISIS Neutrons	1	ISIS Neut	United Kingdom	day	174,586,716.00	15,865.75	68.00	1,078,871.00	125	64
			2	ISIS Muon	United Kingdom	day	174,586,716.00	15,865.75	14.00	222,120.50	26	13
3	TUM	FRM II	1	FRM II	Germany	day	144,975,760.00	3,300.00	462.00	1,524,600.00	215	120
5	PSI	SINQ & SmuS	1	SINQ	Switzerland	days	37,247,172.00	2,897.00	262.00	759,014.00	110	80
			2	SmuS	Switzerland	days	12,383,769.00	2,898.72	123.00	356,542.56	65	50
6	HZB	BER II	1	BER II	Germany	dyas	87,076,020.00	2,493.54	300.00	748,062.00	150	75
7	CEA	LLB	1	LLB	France	days	79,320,939.00	3,352.94	271.00	908,646.74	92	54
9	BNC-AEKI	BRR	1	BRR	Hungary	days	5,234,043.00	1,599.29	150.00	239,893.50	45	32
12	TUD	RID	1	RID	Netherlands	days	14,476,021.00	2,013.07	90.00	181,176.30	20	10
13	NPI	NPI	1	NPI	Czech Republic	days	3,394,314.99	1,203.66	92.00	110,736.72	17	10
						Grand Total	733,281,470.99			6,129,663.32		

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1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It cannot be changed unless agreed so during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

53. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

54. Type of activity

For all FP7 projects each work package must relate to one (and only one) of the following possible types of activity (only if applicable for the chosen funding scheme – must correspond to the GPF Form Ax.v):

• **RTD/INNO =** Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence

• **DEM** = Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups

• **MGT** = Management of the consortium - applicable for all funding schemes

• **OTHER =** Other specific activities, applicable for all funding schemes

• **COORD** = Coordination activities – applicable only for CAs

• **SUPP =** Support activities – applicable only for SAs

55. Lead beneficiary number

Number of the beneficiary leading the work in this work package.

56. Person-months per work package

The total number of person-months allocated to each work package.

57. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

58. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

59. Milestone number

Milestone number:MS1, MS2, …, MSn

60. Delivery date for Milestone

Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

61. Deliverable number

Deliverable numbers in order of delivery dates: D1 – Dn

62. Nature

Please indicate the nature of the deliverable using one of the following codes

R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

63. Dissemination level

Please indicate the dissemination level using one of the following codes:

• **PU** = Public

• **PP =** Restricted to other programme participants (including the Commission Services)

• **RE =** Restricted to a group specified by the consortium (including the Commission Services)

• **CO =** Confidential, only for members of the consortium (including the Commission Services)

A&M

• **Restreint UE** = Classified with the classification level "Restreint UE" according to Commission Decision 2001/844 and amendments

• **Confidentiel UE** = Classified with the mention of the classification level "Confidentiel UE" according to Commission Decision 2001/844 and amendments

• **Secret UE** = Classified with the mention of the classification level "Secret UE" according to Commission Decision 2001/844 and amendments

64. Delivery date for Deliverable

Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

65. Review number

Review number: RV1, RV2, ..., RVn

66. Tentative timing of reviews

Month after which the review will take place. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

67. Person-months per Deliverable

The total number of person-month allocated to each deliverable.

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Part B – Narrative Form

B1 Concept and objectives, progress beyond state of the art, S/T methodology and work plan

1.1 Concept and objectives

Advanced solutions to the technology challenges that confront our technology based society – from energy and environment to health – are crucially dependent on a detailed knowledge of material properties down to the atomic scale. The European Commission addresses this in its Innovation Union flagship initiative. Modern science offers a large variety of analytical tools that allow us to acquire such indispensible information. Neutron scattering and muon spectroscopy are among the best adapted methods of investigation on the micro- and nanoscopic length scale, due to their unique properties. They deliver detailed information not only on the structure of a material but also on its dynamics. The high quality of these experimental probes is attested to by the ever-broadening demand for neutron scattering and muon spectroscopy and its outstanding scientific impact.

Europe has a world leading role in neutron scattering and muon spectroscopy, both with respect to capacity and quality. This lead has been maintained despite > $1B investment into new neutron and muon sources in the rest of the world (e.g. SNS in the USA or JSNS in Japan). This leading position relies on the fact that all actors within the eco-system of neutron scattering and muon spectroscopy perform at an exceptionally high level. The importance and excellence of the research conducted make neutron scattering and muon spectroscopy an indispensible building block of the European research area. Within the eco-system the large-scale facilities are primarily responsible for the optimized provision of neutrons and muons for scientific applications. There is a strong mutual dependence between these facilities and the academic and industrial users. It is the users who carry the burning scientific questions to the large-scale facilities. These questions arise directly from the grand scientific and social challenges and are prioritized by national and European funding agencies. The large-scale facilities then adapt the analytical tools they offer to the changing demands of the user community. This continuous adaptation process is the main performance driver of the neutron and muon eco-system. It assures that the facilities contribute effectively to the scientific innovation process.

Neutron scattering and muon spectroscopy are a truly European endeavour. The production of high-brilliance neutron and muon beams at large scale facilities requires a high level of investment. Powerful national sources, for example ISIS in the United Kingdom and FRM II in Germany, coexist with multi-national flagships like the ILL in France and the projected new European spallation source ESS in Sweden. A suite of smaller sources complements these key facilities. All sources occupy specific and complementary roles within the NMI3 network. Optimizing the overall use of such significant investments is certainly a stringent requirement in order to preserve the leading role of Europe and to accelerate the worldwide advancement of science in the area of neutron and muon research. This optimization process cannot solely rely on competition, even if it is certainly essential to maintaining a high level of excellence. Competition is anyway assured in the international context.

Optimum use of European scientific resources requires a conscious effort in coordination of both the use and the development of facilities. This coordination should be inclusive i.e. it should involve all key facilities. The central objective of the "Neutron and Muon Integrated Infrastructure Initiative" NMI3 is therefore to provide the central platform for this inclusive integration effort. All major neutron and muon facilities will be partners of NMI3. Via NMI3 the EU will play an important catalysing and leveraging role for neutron and muon infrastructures, which will continue to be mainly funded by the Member States.

The integration effort within NMI3 has three main objectives. The first concerns transnational access. To optimize knowledge creation it is essential that all European researchers have open access to the best-adapted infrastructures. In view of the high demand for access to the sources, a selection procedure is indispensible. This selection is primarily based on criteria of scientific excellence. By providing such open Access NMI3 will foster the mobility of researchers within Europe. Harmonisation of access procedures will help researchers to make the most appropriate choice between the proposed experimental possibilities. It is the clear objective of NMI3 to work towards a situation where users will increasingly perceive the network of European neutron and muon providers as a single distributed facility. Particular attention will be given to improving the harmonization process. In this context access is considered in a holistic way, from the writing of the proposals to the analysis of the results and their publication. NMI3 will coordinate actions in all relevant areas along the scientific production line.

The shifting scientific challenges require a continuous development of the methods and techniques employed in neutron scattering and muon spectroscopy. In addition, facilities have to provide more and more auxiliary services necessary for complex sample preparation and sample conditioning. Collaboration between the different neutron and muon providers helps to share the financial burden of such developments, which in turn leads to a better service for all the users. The joint research activities within NMI3 address such collaborations in areas that are strategically important, innovative and have a large potential for synergy. By fostering a general climate of exchange and coordinated action among the partners, NMI3 will also have a strong catalysing effect even beyond the European boundaries. Internationally coordinated efforts have been, and will be, germinated by NMI3 JRAs. They thus bear direct testimony to the global influence of NMI3 actions.

Optimisation of the performance of a multi-facility infrastructure requires establishment of a real network. A central objective of NMI3 is the structuring and renewal of the user base. This type of training will occupy a central role within NMI3. Thanks to NMI3 the European neutron and muon community has access to an excellent suite of training schools. Under this project these activities will be regrouped by NMI3 within the European Neutron and Muon School. This approach will allow development of a more harmonized pedagogical offer and improved publicity. In the same vein NMI3 will make use of new technologies developing a comprehensive offer for e-learning. Within the whole training and dissemination effort the internationally recognized European Neutron portal occupies a central place.

The NMI3 governing bodies will offer a unique forum for coordinating development strategies among the partners and with the user organization ENSA. This is particularly important in the context of the future European Spallation Source ("ESS"), which will have a decisive influence on the structuring of neutron science in Europe. The present project is set up to help prepare the European user community for the new experimental possibilities offered by the future ESS. All JRAs feature methodological or technological questions that will be of direct benefit for the ESS. The ESS and its scientific capacities will be fully featured in the training activities. Access to the current sources will also help to further develop the user community, making it ready for the start-up of the ESS.

1.2 Progress beyond the state-of-the-art

NMI3 is an integrating initiative that started under FP6. Carried by this success, NMI3 has over the years acquired the status of an internationally recognized trademark. It is considered a model to follow within the international neutron and muon community. NMI3 has allowed for open transnational access to all major neutron and muon facilities, thus enhancing and structuring the user base. NMI3 networking activities have helped to train new generations of users and to prepare, via workshops and foresight studies, the strategic decisions of the consortium partners. The European Neutron Portal has become the central information and communication hub for neutron and muon scattering in Europe. Our international partners continuously reference it. Joint research activities have led to technological breakthroughs that immediately improved the quality of the services provided to the users.

NMI3 was reformed under the call INFRA-2008-1.1.1 within FP7. The successful proposal led to a project (in the following labelled NMI3-FP7-I) running from February 2009 to January 2013. However, capping of the funding at 10 M€ made it impossible to pursue the

NMI3 mission at the original level. The transnational access program had to be reduced considerably in scope. Mindful of the need to keep access at a reasonable level it was decided to use these funds over a limited period of two years. Networking and Joint Research activities were similarly downsized.
The present project (NMI3-FP7-up) is intended to re-establish NMI3 at its previous strength. It will cover the period from 2012 to 2016 and thus will overlap with NMI3-FP7-I for one year. Details about how this overlap will be dealt with administratively will be given below.
NMI3-FP7-up has three main ambitions:

i) To build open transnational access capacities for the European neutron and muon users in a new form of quality.

ii) To further develop the culture of co-operation between NMI3 partners, in particular in the areas of training and outreach.

iii) To respond to new challenges in instrumentation and methods via focussed joint research collaborations.

All NMI3 actions will be directed at enhancing the performance of the neutron and muon infrastructures and in particular at enhancing the scientific capabilities at the future ESS. Special attention will be given to a close exchange of information with other existing or upcoming EU-projects that may add further value to the integration effort of NMI3.

1.2.1 Networking Activities

NMI3 brings together all major facilities in the area of muon and neutron scattering. It aims to optimise the scientific performance of these facilities by harmonizing their strategies. In particular, NMI3 will foster synergies in the development and the services provided by the facilities. NMI3 thus will help to make the European Research Area more efficient. To achieve this goal NMI3 will employ a whole suite of networking tools.
With a work package dedicated to the technical aspects of ACCESS provision NMI3 will make an important step forward in the direction of "common look and feel". The vision is that in the near future all European Users will be able to submit their proposals through a single entry point. This would be connected with an unique European User identification. As this is an area where other initiatives like PANDATA are currently preparing the terrain NMI3 will be very attentive to the outcome of these projects, incorporating them if possible and useful into its own strategy, in order to achieve the highest form of integration within the European scientific community. On the technical level efforts will be deployed to develop a generic digital user office (DUO). The outcome of this activity is particularly valuable to the smaller partners of the consortium that do not have the resources to develop DUOs on their own. In summary, this networking initiative will be an essential building block towards a more harmonized transnational access for neutrons and muons.
NMI3 will similarly reinforce its coordination efforts in the domain of data analysis. This is becoming an increasingly important processing step along the scientific production line. Duplication of effort and the absence of common standards lead to a loss in efficiency and hamper the mobility of researchers. NMI3 will address these shortcomings in a dedicated workpackage by first conducting a review of existing software and software creation and implementation routes. Based on the outcome of this review a concept for synergetic data analysis software development will be elaborated. This concept will be put into action by producing a concrete prototype. Once again, NMI3 will leverage other existing activities.

NMI3 has an excellent track record of dissemination and outreach to the wider public. The European neutron portal has become the most important single-entry information hub for neutrons and muons worldwide. Its reputation is such that the international user community would like to use it as the nucleus of a global neutron portal. The neutron portal features a pathfinder that allows any potential user to quickly access information on the characteristics of most neutron and muon spectrometers in the world. The neutron portal is equally the main tool for internal exchange of information and organisation. It features a fully functional registration, evaluation and reporting system. NMI3 is very active in publicizing Access and the results of its JRA and networking activities via articles and advertisements in the most suitable journals. This activity will be pursued and intensified under the current project. The architecture of the website will be modernized and navigation will be made simpler. Brochures will be edited for the broader public to further increase the visibility of NMI3. As in the past, an information manager who will act under the guidance of the NMI3 networking co-ordinator will assume these tasks.

Under the current project NMI3 will place a very strong emphasis on the training of future generations of users. To harmonize this focussed educational initiative, and to spread good practice, the high-level European training schools will be grouped together by NMI3 into one distributed educational activity - the European Neutron and Muon School ("ENMS"). The NMI3 scientific advisory committee will closely monitor the quality of the ENMS and the attribution of NMI3 support to individual schools will be subject to a positive evaluation. In parallel to the ENMS, NMI3 will put into place a complementary e-learning school that allows for remote training and tutoring. The e-learning networking initiative will incorporate a fully developed teaching corner on the neutron portal, including graduate level teaching material illustrated by state of the art virtual experiments. These European efforts in training new generations of users will be coordinated with related international initiatives, in particular from the US.

Structuring of the user base implies not only training but also outreach to scientific communities that do not yet fully profit from the capabilities that neutron scattering and muon spectroscopy offer for enhancing their research. NMI3 can look back at a successful series of events that have raised its visibility in such diverse fields as energy, environment, earth sciences and food sciences, just to name a few. These events have been accompanied by the publication of books in these fields. Under the present project NMI3 will continue to support outreach through dedicated actions, preferentially at international congresses and via dedicated workshops. Particular attention will be given to widening the user base for muon spectroscopy.

NMI3 places a high value on the governance of the consortium. The general assemblies and board meetings of NMI3 constitute a platform for exchange of good practice and preparation of common development strategies. They equally serve as a forum to discuss the ways in which NMI3 actions can be carried forward sustainably into the future. The presence of the EU project officers at the General Assemblies is particularly important in this respect. NMI3 keeps close contact with national funding agencies and assures a presence in the advisory committees of its partners. The involvement of representatives from international facilities and from user organizations in the governing bodies of NMI3 ensures that NMI3 is solidly embedded in the international research environment related to neutron scattering and muon spectroscopy.

1.2.2 Transnational Access Activities

Under the current project NMI3 will provide access to all the major national neutron and muon providers in Europe. This inclusive network offers experimental possibilities both in terms of capacity, quality and breadth that are unequalled in the world. Continuous investment has maintained the performance of European neutron and muon facilities at an outstanding level. We can mention the recently commissioned second target station at ISIS in the United Kingdom, which introduces a wholly new portfolio of world-class spectrometers with unique characteristics and the new instrument suite at the FRM II in Germany. All the Access providers have specificities that make their offer either unique or particularly tailored to a certain thematic or geographic clientele. The smaller sources in particular provide valuable services to specific parts of the user community, and in addition have a particularly strong training potential. The division of funding proposed for transnational access under this project is motivated by the desire to optimize the overall impact of the program, taking into account both scientific output and equally training and structuring of the user community. This has been agreed by consensus among the partners.

The services provided under NMI3 transnational access are holistic, ranging from help with writing the proposals to training, performance of the experiment and assistance with analysing and interpreting the data.

In terms of scientific impact the European neutron scattering community is unsurpassed in the world. Transnational access provided through NMI3 contributes substantially to this success. Access through NMI3 will be open and exclusively based on scientific excellence. Where proposals from smaller countries and those without their own facilities are found to be not competitive, facilities will actively work with the proposers to improve quality. International expert committees will carry out the selection. The stringent selection standards will ensure high scientific quality. The open nature of access, coupled with the high selectivity, will guarantee that the research performed under NMI3 access is oriented towards the grand challenges as prioritized by the European and national scientific funding bodies. Only researchers capable of competing for such national or international funding will be able to build up research programs of a sufficient quality that allows them to pass the hurdle of the strict proposal evaluation of the NMI3 access providers. In addition, the broadening and structuring of the user community via NMI3 transnational access will be an essential preparation for the future European spallation source. The ESS will only be as good as the science brought to it by the user community that NMI3 Access will play a key role in developing.

The networking and dissemination activities will ensure that the NMI3 access program is widely publicized. In addition, the individual access providers will launch publicity campaigns of their own.

Access under the current project will be further harmonized with respect to previous NMI3 programs. In this spirit the three partners providing access at the neutron source FRM II will pool their offer within a single proposal system. The access work package, which has already been mentioned under networking, will work towards a single entry authentication system for access provision. Harmonized proposal forms and evaluation procedures will make it easier for the user to navigate within the network of NMI3 access providers.

1.2.3 Joint Research Activities

The portfolio of tasks proposed within the five joint research activities in this project aims at technical and methodological innovations that have a high potential for improving the quality and capacity of the services that will be offered to users. In particular they address a large number of problems whose solution will be essential for optimisation of the instrumentation at the future ESS. In this context the detector JRA is a particularly illustrative example. The selection of JRA topics has been based on a competitive process based on expressions of interest. The selection criteria included both the strategic relevance and the innovation potential of the proposed tasks. All the results developed by the JRAs will be published and thus made available to the entire community.

NMI3 alone can certainly not deal with the full breadth of the subjects touched by the JRAs. Past experience has, however, demonstrated that the spirit of collaboration developed within the JRAs nucleates further collaborative activities that are funded by the facilities themselves. In addition the JRAs, via their close collaboration, help to set standards in technology and methodology, thus making future collaborations more efficient and supporting knowledge exchange.

The JRA dedicated to the improvement of muon infrastructures addresses the full spectrum of questions from preliminary design studies for next generation muon sources, through detector technologies to specific methods such as imaging.

In the case of the neutron related JRAs the tasks are either oriented towards pressing technological questions or towards innovations in areas where there is a strong potential for growth and that are closely related to societal grand challenges. The latter is definitely the case for the JRA on structural and magnetic imaging at the micro and nano scale. Imaging techniques are becoming increasingly important in neutron science for studying materials, with applications ranging from cultural heritage to energy technology. This great success is dependent on continuous improvement in resolution and sensitivity. This is the first JRA on imaging within NMI3. It is the firm intention to give this method of investigation a further boost by extending both its performance and areas of applicability.

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Progress in neutron instrumentation is often associated with increasing the brilliance of the beam on the sample or with conditioning the beam for time-of-flight and polarization applications. The Advanced Technologies JRA includes a selected set of innovative ideas in this area. All the tasks will explore avenues of instrument development that are useful to any neutron provider including the future ESS. Two of the tasks are, however, particularly tailored to the needs of the ESS.

Neutron instruments are only as good as their detectors. Over the past years enormous gains in instrument performance have been achieved by increasing the area, efficiency and sensitivity of detectors. Many of these were based on the use of 3He. This gas has become increasingly expensive and unavailable. It is presently not realistic to base any new instrument development on 3He technology. An international effort, driven on the European side by a core group emerging from the current detector JRA, has been deployed to find solutions to this so-called 3He crisis. The success of the future ESS will hinge on such solutions. It is thus imperative that NMI3 continues to contribute to the detector effort. The current work package has exactly this goal. The work proposed is carefully chosen such that it is complementary to existing efforts both in Europe and worldwide. The community places a lot of hope on the success of this work package.

Soft condensed mater research is one of the areas currently experiencing the strongest growth in demand at neutron facilities. The large number of instruments dedicated to soft-matter that are coming on-line continuously testifies to this trend. Soft-condensed matter is equally at the heart of many important technological questions. It thus has a very close connection with the grand challenges. With biomaterials being part of it, soft condensed matter is in addition at the frontier to biology. Soft condensed matter is particularly demanding when it comes to preparation of the samples. There are in addition a large number of control parameters and external stimuli that require dedicated sample environments. The best use of neutron instrumentation in this area requires collaboration and synergy in the development of such environments as well as in sample preparation methods. The JRA proposed here has the objective of stimulating such collaborations in a number of key areas.

1.3 S/T methodology and associated work plan

1.3.1 Overall strategy of the workplan

The overall strategy of the work plan governing this project is based on a holistic approach to the chain of scientific knowledge creation. High scientific output relies on bringing the best science to the highest performance and best-adapted infrastructures. The balance proposed for transnational access, joint research and networking activities aims to optimize the leveraging power of NMI3 within European neutron and muon science within the imposed funding ceiling and is strongly guided by past experience.

More than 50 % of the resources are foreseen for transnational access. All access providers run open access programs for national and European users. NMI3 transnational access funding helps to build access capacity e.g. by allowing hiring of additional staff. As we have stressed previously, staffing is a major factor in experiment turn-round, not just purely instrument performance (indeed, higher performance requires higher staffing to be effective). NMI3 thus fosters the European research area. Without NMI3 access the cross-border mobility of neutron and muon users would strongly diminish. While access is still provided by individual partners, the present project will further harmonise the services offered. Meetings between the access managers and the digital user office work package are platforms for exchange of good practice and will lead to a more efficient use of the resources. The division of access funding initially proposed will be periodically scrutinized and can be adapted by the board e.g. to deal with unforeseen events that would reduce the capacity of an access partner.

The joint research activities deal with technical and methodological areas that have both a high potential for innovation and are high on the priority list of users. They are broken down into single tasks that are self-contained, as much as this is technically possible while maintaining an overall coherence of the JRA. This subdivision into tasks helps to manage the JRAs, since single tasks can be performed in parallel and spread over the whole project, and minimizes risk related to inter-dependence. The scope of each task is carefully chosen to ensure that it can be achieved with the allocated resources. The spirit of NMI3 is to foster collaboration and exchange while maintaining a high level of efficiency. The number of partners within a JRA reflects this balance. Whenever synergies can be expected, without threatening efficiency, additional partners are included. Particular care is taken to avoid resources allocated to individual partners or tasks becoming sub-critical.

The training activities bundled within the JRA on E-learning and the European Muon and Neutron School will help to expand, renew and structure the user base. They are thus directly needed to keep transnational access sustainable in the future. The budget allocated to the schools is chosen such as to make the NMI3 contribution substantial helping to leverage the main contributions from other funding channels.

The overall cohesion of the project is assured by the management and dissemination activities. Despite their rather small budget they have an enormous impact in the overall integration effort. The central pillar of dissemination and internal communication is the neutron and muon portal. After a successful implementation under NMI3/FP6 it is timely to review its architecture in order to facilitate navigation. In addition, the software has to be updated to modern standards. This is absolutely essential for the long-term maintainability of the European Neutron portal. Apart from the web portal, NMI3 will also invest in printed material for dissemination. The dissemination and communication activities are closely interlinked with other parts of the project. On one hand, transnational access and JRAs will provide the scientific/technical material to be disseminated internally and externally. On the other hand the neutron portal will assist with the overall management of the project by providing the electronic tools necessary for internal and external communication, registration and evaluation.

1.3.2 Timing of the different work packages and their components (Gantt charts)

WP1 Management

WP2-6 (Networking)

WP 7-16 (Transnational Access) (no Gantt charts)

WP 17-21 (Joint Research Activities)

Task 0 is a common task for all work packages, implying sending their respective report input to the coordinator prior to the reporting periods (M18, M36 and M48).

The task in detail:

Task 0.1 First periodic report input (M18)

Task 0.2 Second periodic report input (M36)

Task 0.3 Final report input (M48)

Task 0.4 Meeting minutes of JRA meetings
(continuous task all over the project M0-48)

Task 0.5 Regular update of the JRA website on the NMI3 Portal
(continuous task all over the project M0-48)

WP1 Management & WP2 Dissemination / Outreach

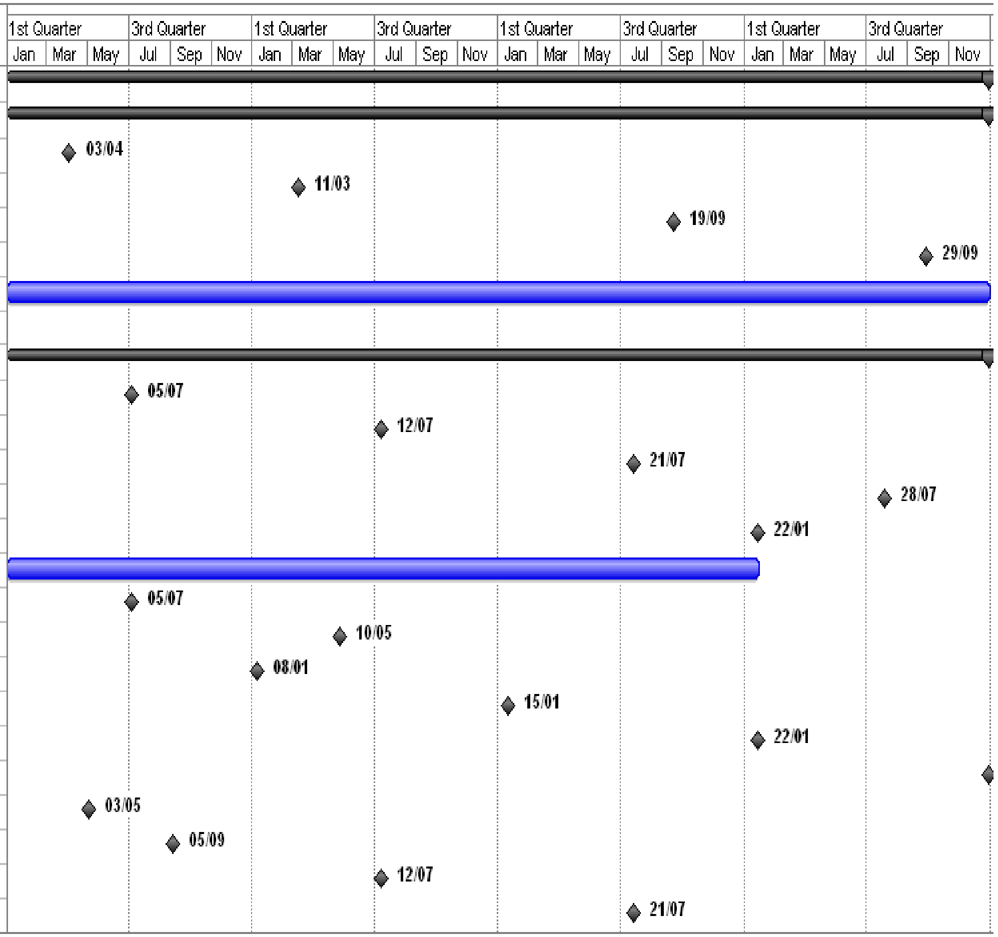
ID	Task	Deliverable/Task Name Milestone		Date
1	WP1		Management	
2		Task 1.1	General management (coordination, administration and logistics)	
3		D1.1	Agenda General Assembly & Minutes of the Board meeting	03/04
4		D1.2	Agenda General Assembly & Minutes of the Board meeting	11/03
5		D1.3	Agenda General Assembly & Minutes of the Board meeting	19/09
6		D1.4	Agenda General Assembly & Minutes of the Board meeting	29/09
7		D1.5	Report on Innovation workshop	
8				
9	WP2		Dissemination & Outreach	
10		D2.1	Newsletter summarizing the work in progress	05/07
11		D2.2	Newsletter summarizing the work in progress	12/07
12		D2.3	Newsletter summarizing the work in progress	21/07
13		D2.4	Newsletter summarizing the work in progress	28/07
14		D2.5	New NMI3 Internet Portal finished	22/01
15		D2.6	Advertising material for conferences and journal advertising (continuous task)	

[redacted]

Timeline: 1st Quarter, 3rd Quarter (Jan, Mar, May, Jul, Sep, Nov) repeated over four years.

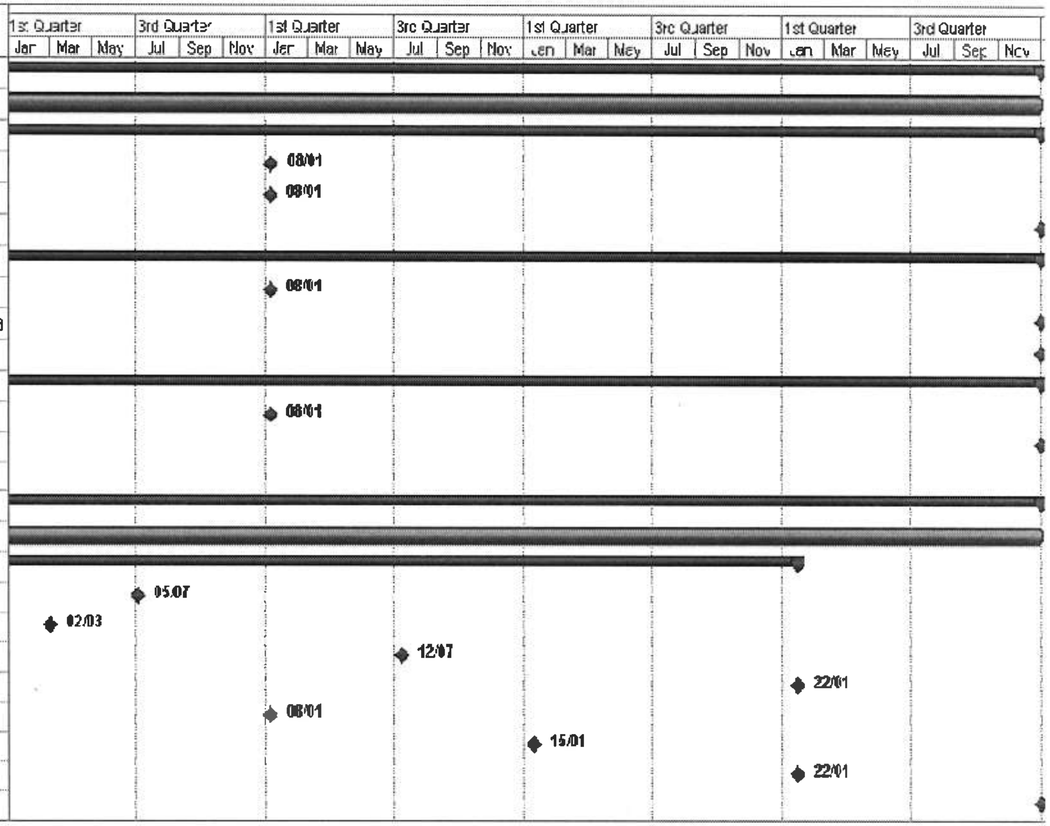
WP1 Management & WP2 Dissemination / Outreach

ID	task	Deliverable/ Milestone	Task Name
1	**WP1**		**Management**
2		**Task 1.1**	**General management (coordination, administration and logistics)**
3		D1.1	Agenda General Assembly & Minutes of the Board meeting
4		D1.2	Agenda General Assembly & Minutes of the Board meeting
5		D1.3	Agenda General Assembly & Minutes of the Board meeting
6		D1.4	Agenda General Assembly & Minutes of the Board meeting
7		D1.5	Report on Innovation workshop
8			
9	**WP2**		**Dissemination & Outreach**
10		D2.1	Newsletter summarizing the work in progress
11		D2.2	Newsletter summarizing the work in progress
12		D2.3	Newsletter summarizing the work in progress
13		D2.4	Newsletter summarizing the work in progress
14		D2.5	New NMI3 Internet Portal finished
15		D2.6	Advertising material for conferences and journal advertising (continuous task)
16		D2.7	Evaluation of possible presentations on conferences, workshops
17		D2.8	Brochure for target group 1
18		D2.9	Report on outreach activities
19		D2.10	Report on outreach activities
20		D2.11	Report on outreach activities
21		D2.12	Report on outreach activities
22		D2.13	Establish a website describing high field developments at PSI and ISIS
23		D2.14	Publicity material describing potential applications of high field μSR
24		D2.15	Workshop on aspects of Functional Materials
25		D2.16	Workshop on aspects of Soft Matter



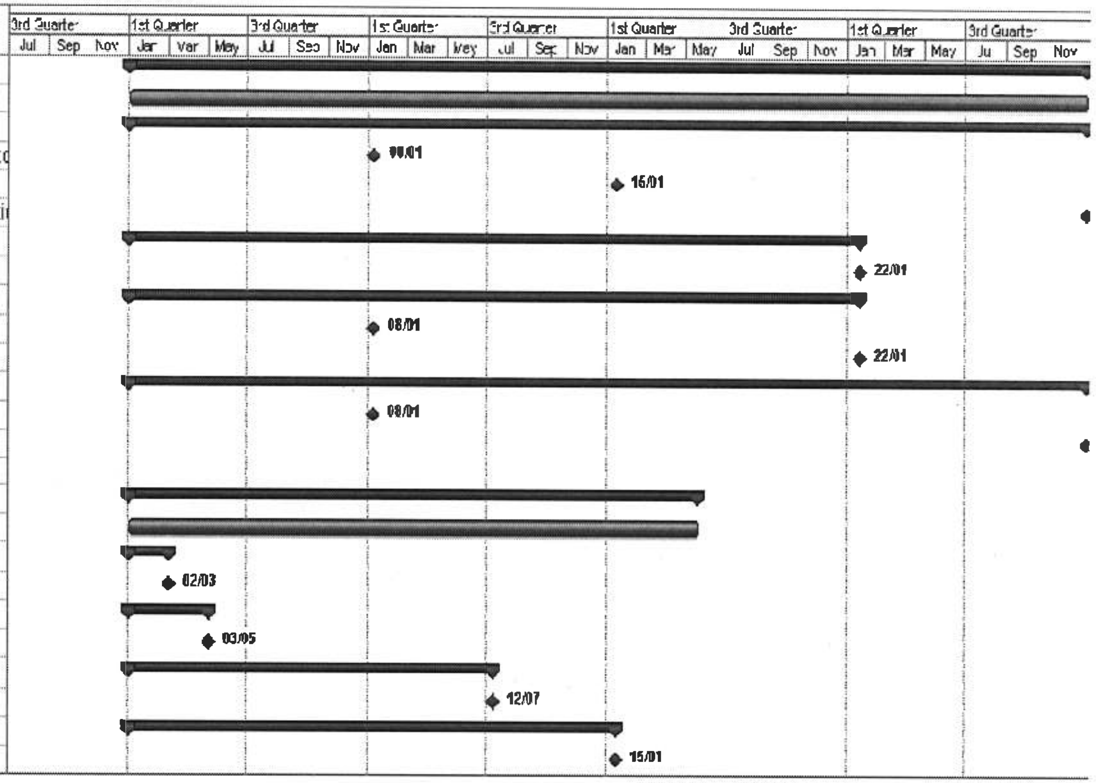
WP3 E-learning WP4 European Neutron & Muon Schools

ID	Deliverable/ Milestone	Task Name
1		**E-learning**
2	Task 3.0	Reporting to coordinator
3	Task 3.1	**e-learning platform**
4	D3.1	Concept and content of the learning modules
5	D3.2	Requirements of an e-learning platform (software base and functionality)
6	D3.3	Provision of e-learning neutron scattering platform
7	Task 3.2	**Lecture material**
8	D3.4	Content analysis of neutron course
9	D3.5	Didactical course material for neutron scattering covering basic theory to specialized a
10	D3.6	Lecture material to support the neutron courses
11	Task 3.3	**Virtual Instruments**
12	D3.7	Definition of instruments to be simulated
13	D3.8	Virtual neutron scattering instruments, report on the setup and documentation
14		
15		**European Neutron & Muon Schools (ENMS)**
16	Task 4.0	Reporting to coordinator
17	Task 4.1	**Coordination of the ENMS**
18	D4.1	Brochure of the different schools and their technical specificities and dates
19	D4.2	Brochure of the different schools on the NMI3 web portal
20	D4.3	Minutes of "Directors of Schools" meeting I
21	D4.4	Minutes of "Directors of Schools" meeting II
22	D4.5	Report on schools held in this period
23	D4.6	Report on schools held in this period
24	D4.7	Report on schools held in this period
25	D4.8	Report on schools held in this period



WP5 Integrated User Access & WP6 Standards for Data Analysis Software

ID	task	Deliverable/Task Name Milestone
1	WP5	**Integrated User Access**
2	Task 5.0	Coordination & Reporting to Project Manager
3	Task 5.1	**Evaluation of a generalized integrated user registration**
4	D5.1	Survey on existing comparable systems and report on requirements and framework for co
5	D5.2	Software package prototype to handle integrated user registration
6	D5.3	Software package prototype to handle proposal submission and reviewing between faciliti
7	Task 5.2	**Harmonized proposal forms and templates**
8	D5.4	Report and suggestions for harmonized proposal forms
9	Task 5.3	**Web based proposal peer review process**
10	D5.5	Report on requirements for web based review process
11	D5.6	Prototype of web based review process
12	Task 5.4	**Platforms for cross source independent beam time access**
13	D5.7	Report on requirements for cross facility beam time access
14	D5.8	Feasibility study on software prototype for cross facility beam time access
15		
16	WP6	**Standards for Data Analysis Software**
17	Task 6.0	Coordination & Reporting to Project Manager
18	Task 6.1	**Review existing data analysis software and practices of software developers**
19	D6.1	Report on current software and practices
20	Task 6.2	**Review existing solutions for a common data analysis infrastructure**
21	D6.2	Report on solutions for developing a common software infrastructure
22	Task 6.3	**Develop prototype software in chosen solution for representative applications**
23	D6.3	Prototype software in chosen solution
24	Task 6.4	**Evaluate prototype software**
25	D6.4	Report on evaluation of prototype software



WP17 Muons

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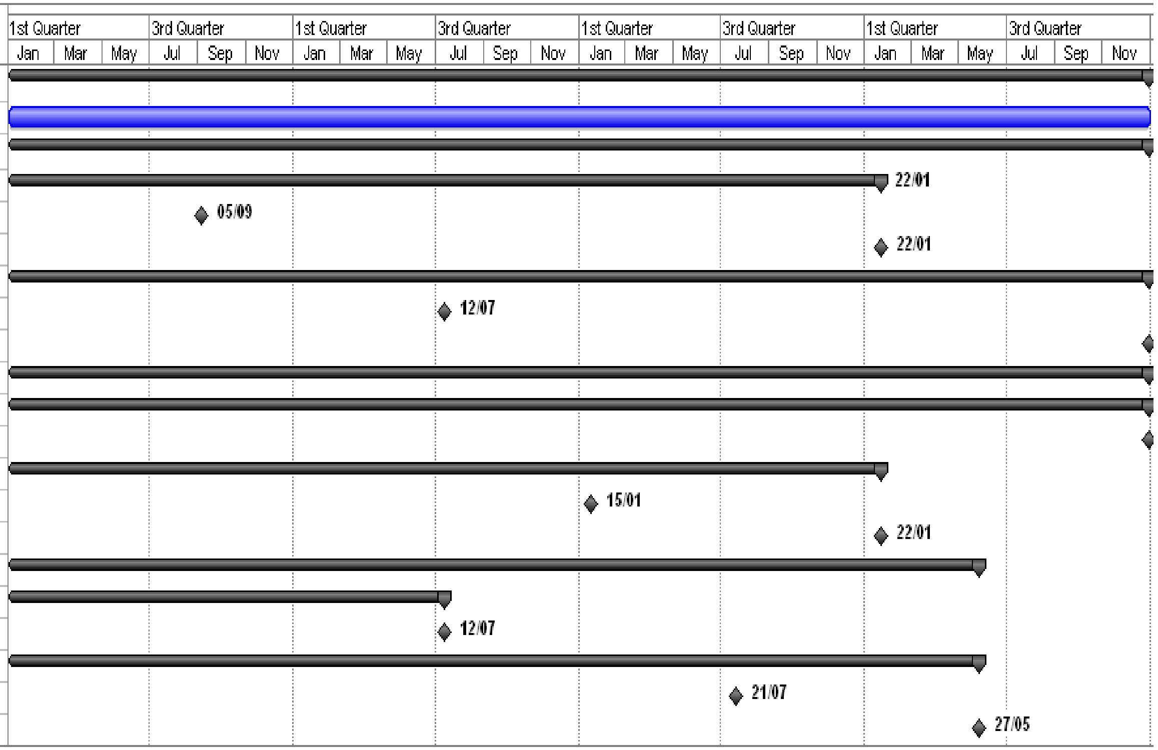
WP17 Muons

ID	task	Deliverable/ Milestone	Task Name
1	WP17		MUONS
2	Task 17.0		Coordination & reporting
3	Task 17.1		Software Development for Muon Data Analysis
4	Sub task 17.1.1		Routines for efficient analysis of high field experiments
5		D17.1	Document outlining specification of software routines
6		D17.2	Software routines released within the Mantid framework
7	Sub task 17.1.2		Routines to link simulation with analysis codes
8		D17.3	Document considering integration of simulation codes
9		D17.4	Report of application of linked analysis and simulation
10	Task 17.2		Concept Studies for Future Muon Sources
11	Sub task 17.2.1		Concept study for advanced muon beams
12		D17.5	Report of concept study
13	Sub task 17.2.2		Concept study for high intensity muon sources
14		D17.6	Document discussing target technologies
15		D17.7	Document considering option for a muon facility at the ESS
16	Task 17.3		Detector Technologies for Pulsed Muon Sources
17	Sub task 17.3.1		Design document for APD detector
18		D17.8	Design Document for a prototype Geiger-mode APD detector for ISIS
19	Sub task 17.3.2		Prototype APD array
20		D17.9	Prototype APD array
21		D17.10	Document summarising results of array evaluation

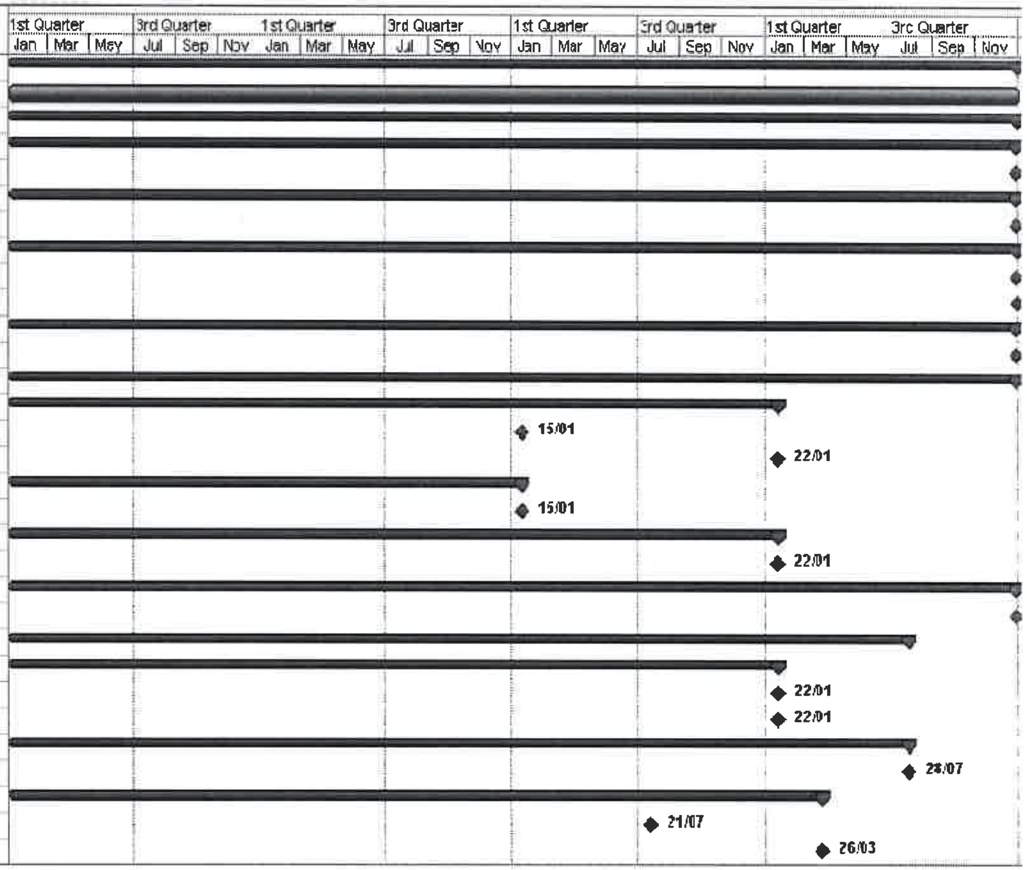


WP18 Structural and Magnetic Imaging at the micro and nano scale

ID	task	Deliverable/ Milestone	Task Name	
1	**WP18**		**Structural and Magnetic Imaging**	
2	**Task 18.0**		**Coordination & Reporting**	
3	**Task 18.1**		**Nano- and micro structures resolved dark-field neutron Imaging with grating interferometers**	
4		D18.1	User friendly environment to perform grating interferometric experiments	22/01
5		D18.2	Publication and interim report	22/01
6		D18.3	Grating interferometry experiments performed with university users	
7	**Task 18.2**		**Direct high resolution neutron imaging**	
8		D18.4	Innovative high-resolution neutron imaging detector	12/07
9		D18.5	High-resolution detector solutions for innovative techniques	23/01
10		D18.6	High-resolution experiments performed with University partners.	
11	**Task 18.3**		**Energy-selective neutron imaging**	
12		D18.7	Optimization of monochromator parameters for high wavelength resolution	12/07
13		D18.8	Bragg-edge mapping and energy-selective experiments performed with University users	22/01
14		D18.9	ToF-imaging feasibility experiments	
15	**Task 18.4**		**SANS 3D: vectorial magnetic imaging of nano-objects**	
16		D18.10	Evaluation of the PASANS possibilities by numerical modeling (vectorial SANS, MSANS, polarimetry, magnetic SESANS)	15/07
17		D18.11	User friendly sample environment to perform PASANS	22/01
18		D18.12	User friendly platform for PASANS	
19	**Task 18.5**		**Precession techniques for imaging magnetic structures in thin film systems**	
20		D 18.13	Evaluation of the Precessionnal spectroscopy techniques possibilities (fixed wavelength & TuF)	12/07
21		D 18.14	Precession spectroscopy measurements	22/01
22		D 18.15	User friendly platform for the exploitation of precession data	
23	**Task 18.6**		**Tomographic imaging of magnetic structures at the µm scale**	
24		D 18.16	Imaging of magnetic structures in bulk samples with high resolution	12/07
25		D 18.17	Direct magnetic imaging experiments performed with University users	22/01
26		D 18.18	Data processing platform	
27	**Task 18.7**		**Common entry portal for the nano-magnetism community**	
28		D18.19	**Wiki pages on the NMI3 web portal**	

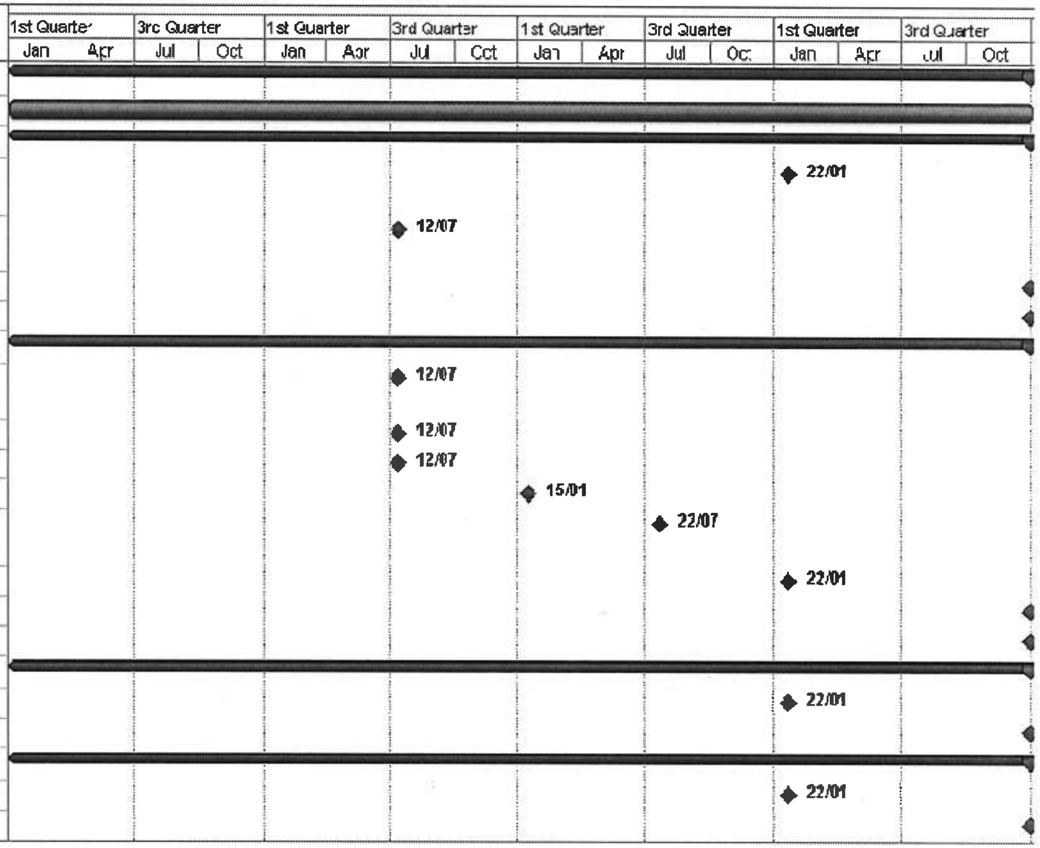
WP 19 Advanced Methods and Techniques

ID	task	Deliverable/ Milestone	Task Name
1	WP 19		**Advanced Methods & Techniques**
2	Task 19.0		**JRA management activities**
3	Task 19.1		**Sub-mm3 samples for extreme environments**
4	Subtask	19.1.1	**Development of focusing multichannel guide**
5		D 19.1	Report on performance of prototype guide
6	Subtask	19.1.2	**Development of nested Kirkpatrick-Baez mirrors**
7		D 19.2	Report on performance of prototype KB mirrors
8	Subtask	19.1.3	**Design of long-pulse instruments optimised for high-field magnets and pressure cells**
9		D 19.3	Report on design of long-pulse diffractometer for extreme environments
10		D 19.4	Report on design of long-pulse crystal-analyser instrument for extreme environments
11	Task 19.2		**Multiple-beam SANS**
12		D 19.5	Report on performance of prototype Multiple-beam SANS experiments
13	Task 19.3		**Spin Echo with oscillating intensity for the ESS**
14	Subtask	19.3.1	**Development of electromagnetic resonance circuits**
15		D 19.6	Report on the design of the circuits
16		D 19.7	Report on performance of the resonance circuits
17	Subtask	19.3.2	**Defining the requirements for the time and position sensitive detector**
18		D 19.8	Report on the requirements
19	Subtask	19.3.3	**Development of measurement strategies and data analysis**
20		D 19.9	Report on the measurement strategies and the design of data analysis system
21	Subtask	19.3.4	**Proof of principle at ISIS**
22		D19.10	Report on the proof of principle measurements following measurements at OFFSPEC
23	Task 19.4		**Choppers for the ESS instrumentation**
24	Subtask	19.4.1	**Single rotor layout**
25		D19.11	Report on mechanical layout and FE-calculation
26		D19.12	Report on Neutronic layout of single rotor
27	Subtask	19.4.2	**Conceptual design of drive and and synchronisation**
28		D19.13	Report on conceptual design of drive and sync. and system integration
29	Task 19.5		**Polarising all neutrons in a beam**
30		D19.14	Delivery of the prototype, following design and procurement
31		D19.15	Report and publication of the results



WP20 Advanced Neutron Tools for Soft- and Bio-Materials

ID	task	Deliverable/ Milestone	Task Name
1	WP20		**Advanced Neutron Tools for Soft- and Bio-Materials**
2	Task 20.0		**JRA management activity**
3	Task 20.1		**A platform for model biological membranes**
4		D20.1	Optimization of model bilayer systems including natural membrane lipids
5		D20.2	Set up a lipid extraction facility to extract and fractionate membranes from real cells
6		D20.3	Protocols for reliable reconstitution of membrane proteins
7		D20.4	Characterization of biomembranes
8	Task 20.2		**Kinetic/dynamic measurements in periodic external fields**
9		D20.5	Designs of new stop flow observation heads for SANS and reflectometry
10		D20.6	Conception and design of MA-LS setup
11		D20.7	Design an electric field cell for SANS
12		D20.9	Tests of MA-LS setup
13		D20.10	Tests of new stop flow observation heads for SANS. Drawings of SF cell for reflectometry.
14		D20.8	Conception and design of a pressure cell for NSE
15		D20.11	Prototype of pressure cell for NSE. Tests
16		D20.12	Prototype of EF for SANS. Tests
17	Task 20.3		**Humidity chamber**
18		D20.13	Specifications of the next-generation humidity chambers
19		D20.14	Assembly of the humidity chamber. Tests
20	Task 20.4		**Cryogen-free cryostat with sample changer**
21		D20.15	Design and simulations of cryostat with sample changer
22		D20.16	Drawings of cryostat



WP21 Detectors

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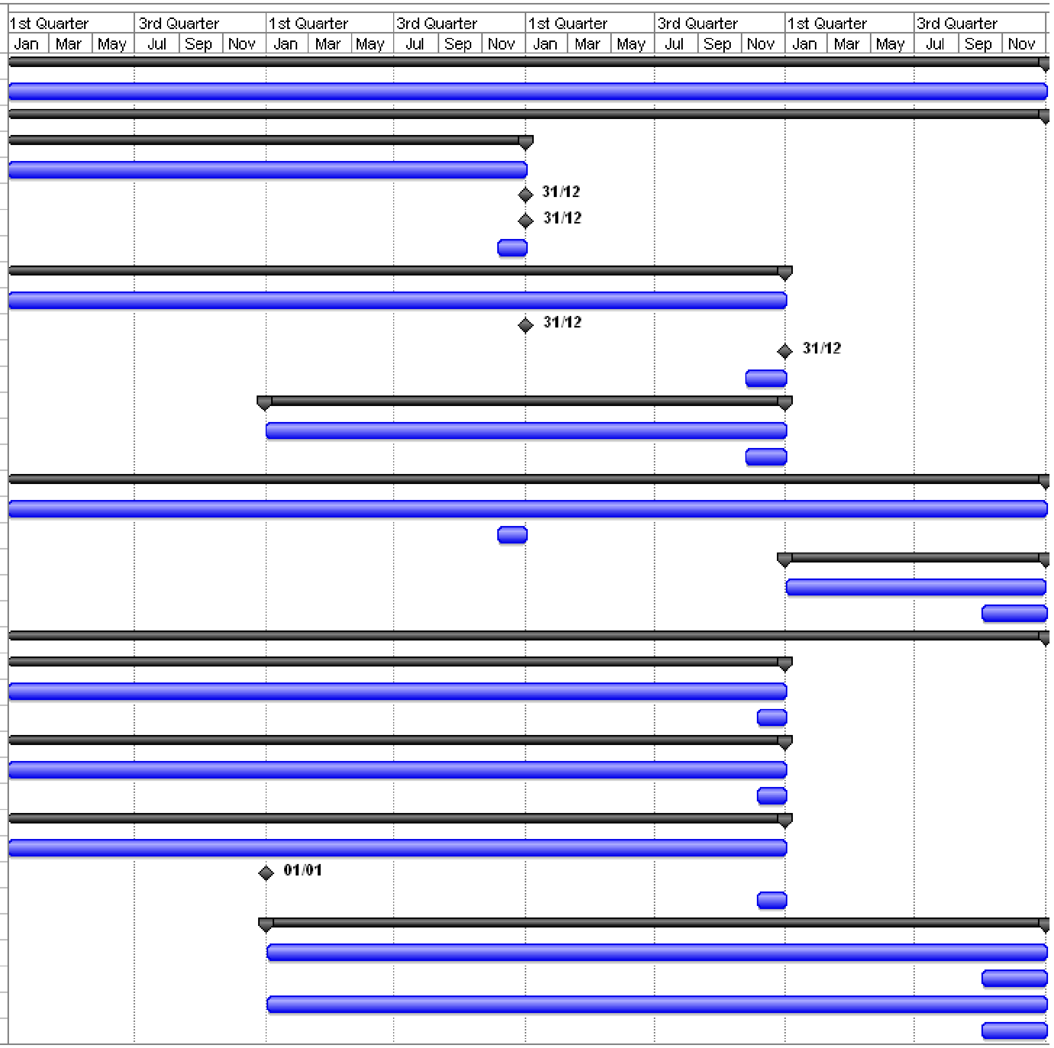
WP21 Detectors

ID	task	Deliverable/ Milestone	Task Name
1	**WP21**		**Detectors**
2	**T21.0**		**JRA management activity**
3	**T21.1**		**Development of scintillation detectors based on WLS fibre**
4	**T21.1.1**		**Development of detector hardware**
5			Development of detector hardware
6		D21.1	ISIS detector hardware produced
7		D21.2	FZJ detector hardware produced
8		D21.3	Report on STFC and FZJ detector hardware
9	**T21.1.2**		**Development of detector electronics hardware**
10			Development of detector electroncics hardware
11		D21.4	STFC electronics system completed
12		D21.5	FZJ electronics system completed
13		D21.6	Report on STFC and FZJ detector hardware
14	**T21.1.3**		**Signal Processing development**
15			Signal Processing development
16		D21.7	Report on signal processing development
17	**T21.1.4**		**Si PMT evaluation**
18			Si PMT evaluation
19		D21.8	Interim report on Si PMT Detector performance
20	**T21.1.5**		**Detector evaluation**
21			Detector evaluation
22		D21.9	Report on scintillation detector performance
23	**T21.2**		**Development of gas detectors based on solid 10B converter**
24	**T21.2.1**		**Optimization of substrate and production parameters**
25			Optimization of substrate and production parameters
26		D21.10	Report on production parameter and substrate optimization
27	**T21.2.2**		**Exploration of alternative production techniques**
28			Exploration of alternative production techniques
29		D21.11	Report on exploration of alternative production techniques
30	**T21.2.3**		**Measurements with test detector**
31			Measurements with test detector
32		D21.12	Small size test detector produced
33		D21.13	Experimental Report on converter investigation
34	**T21.2.4**		**Concept study for a large area detector**
35			Concept study for large area detector on extruded tubes
36		D21.14	Report for large area detector on extruded tubes
37			Concept study for large area detetctor based on micromegas
38		D21.15	Report for large area detetctor based on micromegas



2. Implementation

2.1 Management structure and procedures

The NMI3 consortium had submitted a successful proposal to the call INFRA-2008-1.1.1. Due to the imposed ceiling of the funding at 10 M€ the project that has emerged from this proposal had to be considerably downsized in scope with respect to its predecessor under FP6. NMI3/FP7-I started in February 2009 and will run up to the end of January 2013. In particular transnational access under the NMI3/FP7-I is limited to the period from February 2009 to January 2011. The downscaling, however, affected all aspects of the project including management, training and dissemination as well as JRAs. The present project aims at complementing, extending and enhancing the running NMI3 over the period from 2012 to 2016. As NMI3 has become a real trademark within the international scientific community we want to keep the acronym equally for the present project (NMI3/FP7-II). The current project NMI3/FP7-I has an overlap with NMI3/FP7-II of roughly one year. It is evident that we share the management in order to gain efficiency. In particular the project manager and the information manager are charged to this project only for 36 months.

The NMI3 structure has proven highly efficient in managing the project. It is shown in Figure 2.1.1. With respect to the previous structure the main difference relies in the fact that the information manager is attached to the networking activities coordinator. The specific roles of the NMI3 General Assembly (NMI3-GA), the NMI3 Board (NMI3-B), the NMI3 Advisory Committee (NMI3-AC) and Joint Research Activity Committees (JRAC) are outlined in Table 2.1.1.

The central body of NMI3 is the NMI3 General Assembly, which comprehensively integrates all aspects of neutron scattering and muon spectroscopy in Europe, with links to developments elsewhere in the world. Emphasis is given to integrating end users, rather than just the larger facilities and labs. The spirit of the decision making process within NMI3 relies on consensus within the General Assembly. Only where such consensus cannot be reached formal majority decisions have to be taken in the board.

Apart from the access providing national facilities both the multi-national Institut Laue Langevin and the European Spallation source are members of the governing bodies of NMI3.

Specific details are defined in the NMI3 Consortium Agreement. Participants are defined as all organizations that will receive funds via NMI3 and will therefore sign the contract, excluding those who will only receive travel support or funding via the European Neutron and Muon School.

The information in the tables is consistent with the structure and principles described in this project. The eventual membership of the various committees will of course depend on the final budget and implementation plan detailed in the contract.

<u>Coordinators and responsibilities</u>

The NMI3 coordinator is responsible to the NMI3 General Assembly and NMI3 Board for coordination of the consortium, for financial management and running the central management team. He acts as the contact point with DG-XII in Brussels.

The NMI3 coordinator, Prof. H. Schober, is a senior staff member of the ILL responsible for the Time-of-Flight and High-Resolution Group. He is coordinator of NMI3/FP7-I and was responsible for the networking activities under NMI3/FP6. The coordinating organization, the Institut Laue Langevin, is an international research centre at the leading edge of neutron science and technology, having long-standing experience with European projects. ILL scientists have coordinated various JRAs under NMI3/FP6 and NMI3/FP7-I. The ILL 20/20 project is part of the

ESFRI roadmap and has received a grant under the Preparatory Phase Proposal scheme (project number 212057).

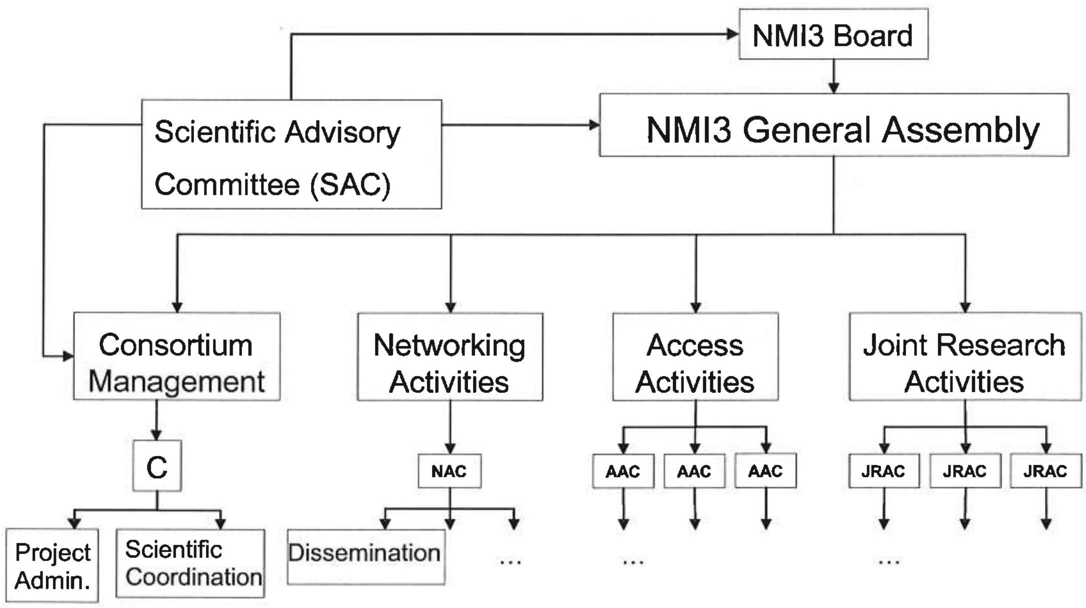
The central management team will comprise the coordinator, the project manager (100%), and the information services manager (100%). They will be supported by specialist central services (e.g. financial, legal, contractual) already existing within the coordinating organizations.

The NMI3 networking activities coordinator helps managing the aspects related to communication and dissemination. He in particular has direct responsibility for the information services manager.

The NMI3 access coordinator is assisting the NMI3 management in questions related to access. He keeps a close contact to the access mangers of the individual access providers.

The Networking, Access and Joint Research Activity Work Packages have individual coordinators who are responsible to the NMI3 General Assembly and the NMI3 Board for delivery of their specific activities, as defined in the Implementation Plan. They are responsible to the NMI3 coordinator for delivery of all required reports, financial statements etc. by the relevant deadlines.

Figure 2.1.1 Management structure of NMI3



C: (NMI3) Coordinator
AAC: Access Activity Coordinator
NAC: Networking Activities Coordinator
JRAC: Joint Research Activity Coordinator & Committee

Table 2.1.1 NMI3 Governance structure

Governance Body	Function, members and duties
NMI3 General Assembly **(NMI3-GA)**	NMI3 General Assembly members are: All coordinators: - NMI3 coordinator - Networking Activities coordinator - Access mangers of the individual access providers - (JÜLICH and HZG are considered for representation purposes as individual partners despite the fact that they pool the access to their instruments with TUM) - Joint Research Activity coordinators Multinational neutron providers not delivering access: - Institut Laue Langevin - European Spallation Source Countries with large user communities but no national source: - Italy (represented by CNR) - Spain (represented by CSIC) User organizations and user representatives: - European Neutron Scattering Association (ENSA) - International Society for Muon Spectroscopy – Europe (ISMS-E) - Two representatives nominated by ENSA (from organisations not otherwise represented in the NMI3-GA) Non-European observers: - USA (represented by SNS) - Japan (represented by JAEA) - Russia (represented by FLNP) - Australia (represented by ANSTO) - China (represented by CIAE) - Korea (represented by KAERI) - India (represented by BARC) Scientific Advisory Committee (current members see below): - Romano Rinaldi (University of Perugia, Italy) - Françoise Leclercq-Hugeux (CNRS Lille, France) - Götz Eckold (German Neutron Community) - Kenneth Herwig (Oak Ridge National Laboratory, USA) The NMI3-GA will invite additional observers as appropriate. Organisations that participate in the NMI3 consortium as partners in a JRA, but not in any other role, are not directly represented in the NMI3-GA. They are indirectly represented by the relevant JRA coordinator. The NMI3-GA will meet at intervals corresponding to the reporting periods fixed in the contract, meetings being hosted by different members on a voluntary basis. The NMI3 coordinator will chair the meeting.

Governance Body	Function, members and duties
NMI3 Board (**NMI3-B**) Membership given in Table 2.1.2	The NMI3 Board is formed by one representative from each of the organizations who are represented in the NMI3-GA (excluding observers). The NMI3-coordinator is considered as neutral and not representing his institution in the board. The NMI3-B is formally responsible for all decisions requiring a change to the Implementation Plan, though it can delegate decisions to the NMI3 coordinator. Organisations that are members of the NMI3-B can either be represented at NMI3-GA meetings by an appropriate Activity Coordinator, in which case costs are met by the Activity, or by a senior manager, in which case costs are met by the organization. Observers should cover their own costs. The aim will be to take all necessary decisions by consensus in the NMI3-GA. The NMI3-B will only vote (during a meeting of the NMI3-GA) on decisions when consensus cannot be reached. Each NMI3-B member will have a single vote. The coordinator abstains from voting if his institution is already represented in the NMI3-B. Decisions will require a 2/3 majority. NMI3-GA membership may be enlarged or restricted by a vote of 2/3 of the NMI3-B. Details about voting procedures and voting rights are dealt with in the consortium agreement.
NMI3 Scientific Advisory Committee (**NMI3-SAC**)	The NMI3-SAC advises the NMI3 coordinator, NMI3-GA and NMI3-B, on the content of the implementation Plan and any required changes. The NMI3-SAC consists of at least 5 members elected by the NMI3-B, plus the coordinator who will chair the NMI3-SAC. Members can be drawn from both inside and outside the consortium – preferably from outside. The NMI3-SAC will meet prior to the NMI3-GA meetings.
Joint Research Activity Committee(s) (**JRAC**)	Each JRA is managed by a committee consisting of one member from each organization participating in the JRA (excluding observers), chaired by the JRA coordinator. The JRAC will meet at least once per year. The JRA coordinator will then recommend to the NMI3 coordinator any necessary changes in the implementation plan for that JRA. The final decision on changes to JRA implementation plans will be made by the NMI3-B. Costs for JRAC meetings are included in JRA budgets. Each JRA coordinator will report informally to the NMI3 Coordinator on a six monthly basis, and formally according to the reporting periods. Short reports should be prepared in time for the NMI3-SAC meeting.
NMI3 Consortium **Management Team**	The NMI3 Consortium Management team will consist of the NMI3 Coordinator, Manager and Information Manager. They will be responsible for management of the project, all financial matters, liaison with DG XII Brussels, reporting etc. They will assist with the organization of NMI3 related meetings as requested. They will maintain all necessary documentations and the NMI3 web pages.

Table 2.1.2. NMI3 Management Board

Member	Coordinating ... Activity			Observer
Beneficiary	Management/ Networking	Joint Research	Access	Organisation/ Country
ILL	Mgt			
TUM	Networking		X	
STFC		X		
Jülich			X	
PSI			X	
HZB		X	X	
CEA		X		
HZG			X	
BNC-AEKI			X	
TUD			X	
NPI			X	
ESS		X		
CNR				Italy *
ICMA				Spain *
ENSA				European Neutron Scattering Association
ISMS-E				International Society for Muon Spectroscopy - Europe
User I				User representative
User II				User representative

* Note: Countries with a strong Neutron & Muon community but without national source are represented in the NMI3-Board. Board members will be represented by the beneficiary of the resp. Country (CNR and ICMA are partners in Joint Research Activities).

2.2 Individual participants

ILL (coordinator)

The Institut Laue-Langevin is an international research centre at the leading edge of neutron science and technology. The Institute operates the most intense neutron source in the world, feeding intense beams of neutrons to a suite of 40 high-performance instruments that are constantly upgraded. Every year, some 1200 researchers from over 30 countries visit the ILL. Over 700 experiments annually focus primarily on fundamental science in a variety of fields. These include condensed matter physics, chemistry, biology, nuclear physics and materials science. ILL is funded and managed by France, Germany and the United Kingdom, in partnership with 9 other European countries.
Within NMI3/FP7 ILL will assume the general coordination and management. In addition the ILL will participate in various JRAs and Networking activities.
The ILL has a long-standing experience with European projects. ILL scientists coordinated various JRAs under NMI3/FP6. The ILL 20/20 project is part of the ESFRI roadmap and has received a grant under the Preparatory Phase Proposal scheme (project number 212057).

- Helmut Schober is the co-ordinator of the present project. He is a senior staff member of the ILL responsible for the Time-of-Flight and High-Resolution Group. He was already responsible for the networking activities under NMI3/FP6 and is the coordinator of the current NMI3/FP7.
- Giovanna Fragneto holds the position of Senior Fellow for Soft Matter at the Institut Laue-Langevin. She is involved in the development of research activities in soft matter and biophysics at the ILL as well as the putting in place a Partnership for Soft Matter with the European Synchrotron Radiation Facility at the Grenoble site. She has worked in the last fifteen years on model membrane systems and will be coordinating the task on the model membranes platform (WP20).
- Eddy Lelièvre-Berna is head of the Sample Environment Service and was co-ordinator for the 3He Spin Filter JRA under NMI3/FP6. He plays a major role in the Sample Environment JRA of the current NMI3/FP7 project and will be leader of task 4 in the Advanced Neutron Tools for soft and Biomaterials (WP20).
- Albrecht Wiedenmann holds the position of a scientist in the Large Scale Structure group the Institute Laue-Langevin. He is involved in the development of techniques and instrumentation for new research activities on the field of fast kinetics and dynamics. He has worked in the last twenty years on magnetic nanomaterials such as magnetic glasses and colloids by pushing forward polarised small angle neutron scattering techniques for static and dynamic investigations. He will be leading task 2 in WP19.
- Mark Johnson is head of the Computing for Science group at the Institut Laue Langevin since 1999. The group's core business is data analysis but it also provides software and expertise for instrument and sample (molecular dynamics) simulations. The group has pursued a unified, coherent approach to data analysis software within the institute, giving key experience into the provision of software across instruments and techniques and insight into extending this approach across facilities. He will be coordinating the networking activity on data analysis standards (WP06).
- Miriam Förster is the project manager of the current NMI3/FP7-I project and will continue the management of the next project. She has now eight years of experience in EU project management, throughout FP5 to FP7. She will assure the management and possible synergies during the overlap of the NMI3/FP-I and NMI3/FP-II project (12 months).

STFC

The UK Science and Technology Facilities Council (STFC) is the UK funding agency responsible for all large research infrastructures in the UK, both national facilities and subscriptions to international facilities. It has both strategic and operational roles. STFC operates the pulsed spallation neutron source ISIS at the Rutherford Appleton Laboratory, the only such neutron source in Europe. STFC is also the UK stakeholder in the Institut Laue Langevin.

- Dr Philip King (ISIS contact for NMI3, coordinator WP 7) is responsible for the ISIS user programme and leader of the ISIS Muon Group. He has coordinated EU Access to ISIS muons through several FP. In the first FP7 NMI3 contract he is responsible for Networking and the ISIS Neutron Access programme.
- Dr Nigel Rhodes (coordinator WP 21) is leader of the ISIS Neutron Detector Group and has been involved in detector developments in the last four NMI3 FPs.
- Dr Stephen Cottrell (coordinator WP 20) is a member of the ISIS muon group. He has participated in the muon JRA in NMI3/FP6, and is co-ordinator of the muon JRA in the first FP7 NMI3 contract.
- Dr Adrian Hillier (coordinator, WP 8) is a member of the ISIS muon group and responsible for the MuSR muon spectrometer at ISIS. He is co-ordinator of ISIS Muon Access in the first FP7 NMI3 contract.
- Dr Martyn Bull (coordinator, WP2) is head of communications at ISIS and has many years of communications, education and public engagement experience. He has also has carried out neutron scattering research across Europe.
- Dr Uschi Steigenberger is Director of ISIS Operations and Head of ISIS Spectroscopy and Support Division, and Prof Robert McGreevy is Head of the ISIS Diffraction Division. Both have considerable experience of EU project coordination. In FP6 Prof McGreevy was coordinator of NMI3/FP6 and of the I3 Network. Dr Steigenberger has coordinated EU Access to ISIS neutrons through several FP. Both will continue to be involved in ISIS' NMI3 participation.

TUM

The Technische Universität München is one of the leading universities in Germany for natural science and engineering. It operated the first German neutron source from 1957 for 43 years and the successor, the FRM II, since 2004 as a user facility for national and international scientists. The user program has run with great success since 2005.

The international user program is directed by Dr. Jürgen Neuhaus, deputy scientific director of the FRM II. He will be in charge of the coordination of the networking activities and WP coordinator for the e-learning initiative (WP03) and participates in the outreach WP02. The networking initiative on data analysis standards WP06 is at the TUM in the responsibility of Dr. Peter Link.
The integrated user access networking initiative WP05 is coordinated by Dr. Thomas Gutberlet, head of the common FRM II and JCNS user office.
In the WP18, imaging, Dr. Burkhard Schillinger coordinates the activities at the TUM. He has build and is responsible for the imaging facilities at the FRM II. He has initiated international collaborations and workshops especially for imaging applications using pulsed neutron beams (NEWWAVE).
In the WP19 Dr. Wolfgang Häußler will work together with Dr. Robert Georgii on the modulated intensity Spin-Echo applied for pulsed sources. Both are responsible instrument scientists at the FRM II developing and using this technique with continuous beams.
Dr. Jürgen Peters will contribute and lead the task of the TUM in the Advanced Neutron Tools for Soft and Bio materials JRA (WP 20). He is the head of the sample environment group of the FRM II.
TUM is observer in the detector JRA (WP 21) which will be realized by Dr. Karl Zeitelhack who coordinates the Detector JRA in the current NMI3 project and who is in the same time coordinator of the international Detector working group. He is group leader of the detector and electronics team at the FRM II.

Jülich

The Forschungszentrum Jülich GmbH (Jülich) is one of the 16 Helmholtz Research Centres in the Federal Republic of Germany. It is established as a non-profit organisation which carries out research or technological developments as its main objectives. Co-founded by the Federal Republic of Germany and the Federal State of North Rhine-Westphalia, it has a total staff number of more than 4300 including about 1200 scientists and 300 PhD students.
Jülich participates in the transnational access activity at the FRM II neutron facility in Munich-Garching by providing access to the instruments operated by Jülich Centre for Neutron Science (JCNS) at the FRM II for external users. In previous access programmes Jülich has already successfully participated.
Responsible person for the Jülich access programme in FP7 is Flavio Carsughi, Head of User Office at JCNS.
Jülich participates in the Networking Activity "Integrated User Access" (WP5) which is coordinated by Jülich and is also envolved as partner or observer in the networking Activities on "Data Analysis Standards" (WP6), "NMI3 Schools" (WP4) and "E-learning" (WP3).
Jülich participates in the Joint Research Activity "Imaging" (WP 18).
Responsible scientist is Dr. Alexander Ioffe, head of JCNS Outstation at FRM II and a world leading scientist in the development of polarized neutron applications. He has been coordinator in the Polarized Neutron JRA in NMI3/FP6.
Jülich also participates as a partner in the JRA "ESS M&T" (WP19), "SoftBioMaterials" (WP20) and in the Detectors JRA (WP21).
Responsible scientist in WP19 is Dr. Michael Monkenbusch, senior scientists at JCNS with a strong activity in neutron spin echo instrumentation.
In WP 20 Dr. Henrich Frielinghaus coordinated the Jülich activities.
In WP21 responsible contact person is Dr. Jürgen Kemmerling, a well respected expert and senior staff member at FZJ in the development of neutron detector systems.

PSI

The Paul Scherrer Institute (PSI) is a multi-disciplinary research center for natural sciences and technology. The institute is active in solid state physics, materials sciences, elementary particle physics, life sciences, nuclear and non-nuclear energy research, and energy-related ecology. It is the largest national research institute with about 1350 members of staff, and is the only one of its kind in Switzerland. PSI is one of the world's leading user laboratories for the national and international scientific community and hosts the three major user facilities SLS (X-ray synchrotron), SINQ (spallation neutron source) and SmuS (Swiss muon source) on one site with approximately 2000 individual users and more than 1000 new proposals per year. PSI was already a full partner of NMI3 in FP6 and FP7. Just in the first 18 months of the NMI3/FP7 project SINQ and SmuS together provided more than 600 days of access.
Dr Stefan Janssen, coordinator of WP 10 (SINQ access) and WP 11 (SmuS access) is head of the PSI user office. He has been active in the field of neutron scattering since 1989 and already successfully coordinated the SINQ and SmuS access activities in NMI3/FP6 and NMI3/FP7. He is also PSI contact for WP5 (Integrated User Access) since in his group the Digital User Office software 'DUO' has been developed. Dr Joachim Kohlbrecher (PSI partner in WP 6, Data analysis standards) is head of the small angle scattering and reflectometry group at the PSI Laboratory for Neutron Scattering. He has worked in the field of small angle scattering for more than 15 years and is a well-known expert in the community in particular in the field of data analysis software (e.g. he is co-author of the BERSANS module). Prof Dr Elvezio Morenzoni (PSI partner in WP 17, the Muons JRA) is head of the the Laboratory for Muon Spectroscopy at PSI. He is one of the leading muSR scientists and is deeply involved in the development of high-pressure and high-magnetic field instruments for mu-SR as well as in the low energy muon activities. Dr Eberhard Lehmann (PSI partner in WP 18, JRA Imaging) is head of the neutron imaging group at the PSI. He has worked in the field of of neutron imaging since almost 20 years and developed both instruments for neutron imaging (NEUTRA and ICON) at SINQ in his group. Eberhard Lehmann is one of the leading experts in the field of neutron imaging worldwide.

HZB

The Helmholtz Zentrum Berlin (HZB) was founded in 2009 by merging the former Hahn-Meitner-Institut Berlin (HMI) and the Berliner Elektronenspeicherring-Gesellschaft für Synchrotronstrahlung (BESSY), two of Berlin's largest research centres. HZB is a scientific research institute with a focus on two areas: structural and energy research. Structural research covers the investigation of the structure, dynamics and function of condensed matter, both by neutron experiments at the research reactor BER II and synchrotron radiation experiments at the synchrotron radiation source BESSY II.
HZB is continuing the successful international user program at BER II that was started in 1993 by the Berlin Neutron Scattering Center (BENSC) of HMI. Unique research opportunities are provided by a world-leading sample environment for complex experiments under extreme conditions, e.g. highest magnetic fields, lowest temperatures and pressures up to 8 kbar.

Dr. Astrid Brandt is the beam time manager for BER II and will coordinate the NMI3 projects of the HZB and in particular the user access program (WP 12). She will also be involved the user access networking activity (WP 5).
The imaging JRA (WP 18) is coordinated by Dr. N. Kardjilov. He is responsible for the neutron tomography beam line V7 at HZB and for the development of new experimental imaging techniques using neutron optical devices.
Dr. Dirk Wallacher is deputy head of department of the sample environment group and will be task leader for the humidity cells (WP 20). He is the responsible scientist for the laboratory for gas adsorption measurements DEGAS at HZB.
The expert on gas detectors based on solid ^{10}B converters (WP 21) at HZB is Dr. Thomas Wilpert. He is the group leader of the detector group at HZB.
Dr. Jens-Uwe Hoffmann will be representing HZB in the data analysis standard JRA (WP 6). He is staff scientist and instrument responsible of the flat-cone diffractometer E2 and the representative for the neutron part of HZB in the Photon, Neutron, Ion - High Data Rate Initiative of the Helmholtz Society (PNI-HDRI) as well as in the NEXUS project.

CEA

The Commissariat à l'Energie Atomique (CEA) is a French government-funded technological research organisation involved in 4 programs: Defense & Security, Energy, Health & Information Technologies, Fundamental Research. Due to its expertise, it has been in charge of the reactor Orphée, located at the Centre d'Etudes de Saclay, since 1980. It provides funding to the Laboratoire Léon Brillouin, which gathers the physicists and material scientists who operate the neutron scattering spectrometers installed around the reactor Orphée. LLB is the national French neutron facility. The facility is open to external users who submit their proposals twice a year and are selected on the basis of scientific quality by expert groups (half of the experts are non-French Europeans).

CEA provides transnational access (WP11) and is involved in 4 JRAs: Integretad User Access (WP03), Imaging (WP18), Advanced neutron tools for Soft- and Biomaterials (WP20) and Detectors (WP21). The following persons are responsible for the work packages. Their responsibilities and expertise are:

- ACCESS: Alain Menelle, LLB director advisor, in charge of safety, instrumentation and LLB User Office.
- Integrated User Access: Alain Menelle, in charge of the LLB User Office, expert in intrumentation
- Imaging: Frédéric Ott, leader of the "Interface and Materials" group, expert in reflectometry
- SoftBioMaterials: Annie Brulet, expert in polymer physics, in charge of SANS instrumentation
- Detectors : Alain Delbart, expert in the Micromegas detector technology already used in nuclear physics

Helmholtz-Zentrum Geesthacht

The German Engineering Materials Science Centre (GEMS, http://gems.hzg.de) is operated by the Helmholtz-Zentrum Geesthacht, Centre for Materials and Coastal Research (http://www.hzg.de) near Hamburg. GEMS succeeds the Geesthacht Neutron Facility GeNF (which participated in the previous NMI3 projects) after the shutdown of the research reactor in Geesthacht in June 2010. Its modern instrumentation for research with photons and neutrons is unique worldwide in its focus on materials science. The neutron instruments are operated at the GEMS Outstation at the research reactor FRM II in Garching. A reflectometer (REFSANS) as well as a texture and residual stress diffractometer (STRESS-SPEC, joint operation with FRM II) are available to users. A small-angle scattering instrument (SANS-1, collaboration with FRM II) will be commissioned in 2011. A specialty of GEMS is the possibility to apply for complementary neutron and synchrotron radiation beam time for materials science projects.

- Prof. Dr. Andreas Schreyer (HZG contact for NMI3) is a director of the Institute of Materials Science at HZG and the director of GEMS. He has already been responsible for the HZG participation in NMI3 in the previous projects.
- Prof. Dr. Martin Müller (Access coordinator of HZG) is the head of the department "Structural Research on New Materials" operating the GEMS instrumentation.
- Dr. Klaus Pranzas (task coordinator in WP 5) has formerly coordinated the GeNF user programme and is now coordinating the user access to GEMS.

BNC

The KFKI Atomic Energy Research Institute is mainly active in the field of basic and applied research related to nuclear energy. The main research areas are reactor physics, thermal hydraulics, fuel behaviour studies, material sciences, related aspects of informatics (simulators, core monitoring, etc.), health physics, environmental investigations, nuclear electronics and chemistry. AEKI operates the 10 MW Budapest Research Reactor and several neutron beam facilities (radiography station, pneumatic rabbit system and neutron activation analysis, biological irradiation facility and Bagira irradiation rig). AEKI also hosts the Budapest Neutron Centre, whose major task is to coordinate the activities connected to the research reactor. BNC's 14 instruments have been continually developed and improved to increase their effectiveness. Currently, a polarised neutron diffractometer entered into the access program and a focusing small-angle neutron scattering spectrometer is under installation.
The BNC's Access programme will be coordinated by Rozsa F. Baranyai. She is heading the Neutron Physics Research Group and has been responsible for the Access programme in NMI3/FP7-FP6 and in FP5 in 'Improving Human Potential- Access to Research Infrastructure' Activity.

BNC-RISP

The primary mission of the institute is to conduct basic and applied research in the fields of theoretical and experimental solid state physics and materials science including metal physics, crystal physics and liquid crystal research, theoretical and experimental optics related to laser physics, quantum optics. Our experimental research activity is related basically to methodologies such as X-ray diffraction, NMR-, Mössbauer-, and optical spectroscopy as well as neutron scattering at the Budapest Neutron Centre. The Neutron Spectroscopy Department operates several cold and thermal neutron beam instruments at the 10 MW Budapest Research Reactor (BRR): a small angle scattering (SANS) spectrometer, a reflectometer (REFL), a three axis spectrometer (TASC) and a cold neutron beam test facility as well as a thermal beam three axis spectrometer (TAST) and time-of-flight diffractometer (TOFD). A new focusing small-angle neutron scattering spectrometer (FSANS) is currently being designed and constructed. The department is involved in development of neutron instrumentation, in particular in detectors and advanced neutron optical components. The research and development effort in the frame of JRA Detectors (WP 21) will be done by Dr. J. Füzi, senior researcher. Within this JRA the participants in Task 21.2 the participants are: Prof. Dr. L. Cser senior researcher and J. Orbán PhD student.

BNC- II HAS (Institute of Isotopes Hungarian Academy of Sciences)

The Institute of Isotopes is an independent institute of the Hungarian Academy of Sciences with a strong interest in the applied nuclear methods. The institute is located at the campus of Central Research Institute for Physics with a wide variety research infrastructure. Dr. T. Belgya is the leader of the Department of Nuclear Research, which is formed more than twenty-five years ago. The early works were concentrated for nuclear structure studies with gamma rays induced by fast neutrons provided by the local Budapest Research reactor. About ten years ago the reconstructed reactor became into operation where a new research direction, the Prompt Gamma Activation Analysis (PGAA), was initiated with slow neutrons using the installed neutron guide system. Since then the research around the reactor is co-ordinated by the Budapest Neutron Centre (BNC). The guide system was upgraded with a cold source and super mirror guides in the year 2000. The Department of Nuclear Research built a strong research group in PGAA with a number of applications, including nuclear research in archaeology, geology, catalyst, inactive tracing, and cross section measurements of nuclear wastes, nuclear structure and standards. Recently the Prompt Gamma Activation Imaging (PGAI) combined with cold Neutron Tomography (PGAI/NT) was developed as a new, neutron-based imaging approach, which will be applied for the 3D imaging of elemental composition of objects. The Department of Nuclear Research of Institute of Isotopes provides the following: a cold neutron beam at the NIPS facility, the complete PGAA system and method, some nuclear electronics. The II HAS's Imaging JRA will be coordinated by Zoltán Kis. He is a physicist with experience in Monte Carlo simulations, gamma spectrometry and medical imaging.

TUD

Delft University of Technology (in short TUD) is a Dutch engineering university, which carries out research and education at the highest academic level. The Reactor Institute Delft (RID) is embedded in the TUD and operates a 2 MW research reactor, since 1963, as a tool for scientific research and education. The reactor is used for material research in the topical fields of health and energy. In addition, the Delft Reactor Institute is the academic knowledge and education centre in the Netherlands in the area of nuclear energy. Over the years, RID became a center of innovation with a special position in the European and international landscape not only in neutron scattering but also in neutron activation analysis and positron research. This important international role was acknowledged by the International Atomic Energy Agency (IAEA), which designated RID as one of the world's thirteen Collaborating Centres in February 2009.
A number of highly innovative instruments developed at RID have been offering Transnational Access in NMI3/FP6 and FP7 and will continue to offer access within this project (WP 15). The contributions of the TUD to the "Imaging" and "Advanced Methods & Techniques" and Joint Research Activities of this project (WP 18 and 19 respectively) are based on the particular expertise in the manipulation of polarized neutron beams.

- Dr. Menno Blaauw is head of the user office and coordinates the NMI3 activities of RID. He is the responsible contact person for WP 15.
- Dr. Jeroen Plomp has a long experience in developing and implementing new techniques with polarized neutrons and is the responsible contact person for WP 19.
- Dr. Wim Bouwman is responsible of the Spin Echo SANS (SESANS), a world expert in the field of polarized neutrons and Larmor labeling and will contribute to WP 18.
- Dr. Niels van Dijk is responsible of the polarized instrument PANDA, an expert in the field of magnetism, and will contribute to WP 18.
- Prof. C. Pappas is head of the section "Neutron and Positron Methods in Materials" and responsible contact person for WP 18.

NPI

The Nuclear Physics Institute, v.v.i. (NPI), is a member institute of the Academy of Sciences of the Czech Republic (ASCR), the leading non-university basic research public institution in the Czech Republic. It will provide access, participate in "Imaging" JRA and in "Integrated User Access" networking activity.
The main tasks of NPI cover scientific research in nuclear physics, both theoretical and experimental, and in related fields including solid state physics and trace elements detection. Besides the other activities, the beams of thermal neutrons produced by the nuclear reactor LVR-15 of the neighbouring Nuclear Research Institute, plc., are employed for materials research using neutron diffraction, as well as for experiments in nuclear physics and for neutron activation analysis.
In order to perform neutron physics experiments according to the NPI research programme, as well as to provide experimental facilities and research experience to external users, the Neutron Physics Laboratory (NPL) was founded in the frame of NPI (**http://neutron.ujf.cas.cz/en/instruments/user-access**). Many of the experiments carried out during the last few years using neutron beams were performed by foreign research groups in the frame of international NPL-Access supported by NMI3/FP6 and FP7 programs.

NPL has a strong team of neutron physicists led by Dr. Pavol Mikula, the head of the Neutron Physics Department (DrSc – 1998). His research activity comprises neutron optics and instrumentation for strain/stress and small-angle neutron scattering measurements. Dr. Mikula is involved in numerous international committees. The administrator of the international Access programme at NPL, Dr. Pavel Strunz, gained international reputation in neutron scattering, particularly in the field of materials science and engineering.

CNR

IOM (Istituto Officina Materiali, **http://www.iom.cnr.it/**) is an institute of the National Research Council (CNR), the main Italian public research organisation. This Institute is devoted to interdisciplinary research for the knowledge of physical properties of materials and complex systems at the atomic scale and their functionality. The Institute is specially devoted to the use of synchrotron radiation and neutron scattering, including the development of advanced instrumentation. The Institute collected all the previous experience belonging to INFM, therefore it has a long experience, gained in previous Framework Programs, in developing innovative neutron detectors (solid state neutron detectors and front-end VLSI electronics) and neutron optics components (Fresnel zone plates and large size honeycomb collimators). The IOM-CNR laboratories located at the University of Perugia will contribute to the Detector development, particularly for what concerns the possible application of Si Photomultipliers.

The senior staff member is Francesco Sacchetti. He is "Professore Ordinario" (Full Professor) of Physics at the Università di Perugia. He has been the INFM representative in the General Assembly during NMI3/FP6 and he has been the coordinator of the INFM Neutron Commission and the president of the CNR Neutron Commission. He has 40 years experience in the use of neutron scattering techniques for various research applications from magnetism to statics and dynamics of disordered matter. He also has a long experience in the development of neutron instrumentation from PRISMA at ISIS to BRISP at ILL. He is the author of some 200 papers in condensed matter physics in the field of electron interactions, 3d magnetism and the statics and dynamics of liquids, as well as neutron scattering techniques. A second senior staff member is Caterina Petrillo. She is "Professore Ordinario" (Full Professor) of Physics at the Università di Perugia. She has been the coordinator of the INFM participation in previous EU programmes from FP3 to FP5. She has been the coordinator of the INFM Neutron Commission and at present she is the Italian delegate to the Capacities programme. She has more than 25 year of experience in condensed matter physics, including materials of biological relevance, by means of neutron and x-ray scattering techniques. She has been also deeply involved in the development of neutron instrumentation and she is the author of more than 120 papers concerning 3d magnetism and the statics and dynamics of liquids, as well as neutron scattering techniques.

UKBH

With over 38,000 students and more than 8,500 employees, the University of Copenhagen is the largest institution for research and education in Denmark and among the world top-50 universities in most rankings. The purpose of the University – to quote the University Statute – is to 'conduct research and provide further education to the highest academic level'.

The University of Copenhagen has a strong activity in X-ray and neutron scattering, led by Prof. Robert Feidenhans'l and Prof. Kim Lefmann. Kim Lefmann is an experienced neutron scatterer, co-founder of the leading simulation software package McStas, and presently coordinator of the neutron (Monte Carlo) simulation networking activity in NMI3/FP7. He is the leader of the instrument simulation activities for ESS and lecturing the popular Copenhagen course of neutron scattering. Kim Lefmann will be involved in WP3 (e-learning).

DTU

The Danish Technical University (DTU) is the primary educational institution in the Danish technical sciences. Roughly 7,000 students (apx. 700 PhD students) attend the DTU, backed by around 4500 employees.
In 2008, Times Higher Education ranked DTU 20th, among the world leading technical and engineering universities, based on citation impact, corresponding to a 3rd place in Europe after the Max Planck Society and ETH Zürich. DTU was ranked 7th among the top 100 European universities on the 2010 Leiden Ranking, using the so-called crown indicator.
Risø DTU is the historical Danish centre for neutron scattering, with current research activities centered around sustainable energy technologies. The Materials Research Division (AFM) scientific focal point is materials for energy technologies, and the division has recognized groups in both X-ray and neutron scattering disciplines. Risø DTU has been the main development centre for the McStas software activity since its foundation in 1997.

Senior development Engineer Peter Willendrup was employed at Risø DTU in 2002 as technical project manager for the McStas package. He has experience in simulation techniques, software development, neutron and X-ray scattering and was involved in SCANS and NMI3/FP6 neutron simulation activities. During the first phase of NMI3/FP7, he acted as consultant in relation to the UCPH activities in WP 16 (data analysis and Monte Carlo), WP 17 (Neutron Optics) and WP 19 (Polarised Neutrons). Through the Danish co-hosting of ESS, he is involved in simulation work toward day-one instruments at this future source.

ICMA

The **Materials Science Institute of Aragón** (ICMA) was founded in 1985 by the Spanish Research Council (CSIC) and the University of Zaragoza as a research center that depends on both Institutions. ICMA maintains its activity in the areas of Materials Science and Technology. The multidisciplinary composition of the ICMA includes chemists, physicists, biochemists and engineers. The main research areas are synthesis and functionalization of new organic materials with controlled architecture and properties, materials for energy applications and laser processing, materials for biological and health applications, theory and simulation in Material science and Magnetic materials covering the synthesis, characterization, theoretical analysis and search for applications. Moreover the scientists of this last area in their research often use larger international facilities (neutron sources and synchrotrons) being pioneers in some topics, and on the development in Spain of advanced neutron instrumentation. In particular they are responsible since 1998 for the operation of two Spanish diffractometers, D1B and D15, at the Institut Laue Langevin (Grenoble) in terms of Collaborative Research Group (CRG) and access by the Spanish community.
It is also important to mention that since 2008 the ICMA is leading the development of the third Spanish CRG at ILL, which concerns with the design and construction of a new neutron instrument called XtremeD. This instrument will be specially adapted to study crystallographic and magnetic properties in very small samples and under extreme conditions of high magnetic field and high pressures with the future goal to reach 50GPa and 15 Tesla.

The ICMA involvement in the NMI3 project will be coordinated by Dr. J. Campo who is the responsible for all Spanish neutron CRG.

ESS

The European Spallation Source is a joint European project supported by 16 European nations with the aim to build the brightest pulsed neutrons source in the world, with 30 times the peak flux of the ILL and the same time averaged flux as the ILL and a beam power 5 times higher than that of SNS. The activities of the ESS are focused to prepare for a Design Review Update (DRU) by 2012 while moving into a preparation to build stage. First neutrons operations are expected at 2019. The current activities at ESS are focused on accelerator design for ESS, as well as choice of target materials, choice of moderators and target-moderator optimization. The accelerator target system is designed to produce a 50 mA proton current at ~20 Hz in order to produce neutron pulses that are 2 ms wide. There are extensive activities in neutron scattering instrumentation, development of neutron optics and choppers as well as software projects on Monte-Carlo modelling and data analysis and visualization.

The participation of the ESS into this NMI3 program will be coordinated by Dimitri Argyriou. The "ESS related techniques" JRA will be coordinated by the Head of the Instruments Division, Ken Andersen, while participation into the Software Development JRA will be coordinated by Stig Skelboe, the Head of the ESS Data Management Center located at the University of Copenhagen.

2.3 Consortium as a whole

The proposed consortium is inclusive. Neutron and muon sources constitute large-scale facilities requiring big capital investments and have high operational costs. They are consequently relatively few in numbers. All of them are partners in this consortium. The term facility is here employed in the broader sense, i.e. it includes institutions like FZJ and GKSS that run access programs without an own source by operating suites of instruments at the FRM-II. Care is taken that for the user FRM-II is perceived as a single provider.

Within the consortium all access providers advertise a substantial oversubscription of their beam time. The experimental possibilities offered by the consortium are in some cases unique and in most cases complementary. Complementarity does not necessarily imply completely different instrument characteristics. It equally resides in sample environment and/or sample preparation possibilities. A particularly important aspect is the wide range of scientific expertise that the consortium offers as a whole to the European user community. Very often the success of an experiment depends on such expertise being available at the facility where the experiment is conducted. With a more and more diverse and fractured scientific environment it is impossible that single facilities cater to the needs of the whole community. Therefore, most of the facilities play a particular role in attracting, training and developing specific user communities.

The specificity of a facility may not only be topical but equally geographical. The geographical structuring of the user community is performed in particular by those facilities that show a high beam-time demand from the peripheral states of the Union.

A clear indicator of the complementary character of beam time offers is given by the high mobility of researchers in the neutron and muon field. They routinely use the full suite of experimental possibilities offered all over Europe to assure the optimum conditions for their investigations. They thus view the provision of neutron/muon beam time within Europe as a common task of the European Research Area, rather than as an exclusive task of their national facility. It is the prime goal of NMI3 to foster this mobility by additional building of capacity.

All access providers show a very strong commitment to their task. This is not surprising as NMI3 transnational access provides an ideal tool for raising the performance of these infrastructures via the expansion of the user base, both in terms of numbers and scientific range. Higher demand in terms of capacity and quality helps facilities to leverage funding for instrument improvements. This in turn makes the facilities more attractive. In this context the selective process based on scientific excellence as required by NMI3 is an efficient driver for improvements as it forces all the facilities to perform at international standards.

To help improve the instruments is the task of the Joint Research Activities. The funding within NMI3 is clearly insufficient to do this at a large scale. To put matters into perspective: the total JRA funding asked for in this project would be just sufficient to construct one of the cheaper neutron spectrometers. NMI3 JRAs thus address a small but well-chosen set of technological challenges that bear the promise of widespread application and thus considerable impact within the consortium. The partners of NMI3 are strongly committed to these tasks. Not only do they benefit from the direct results generated by the JRAs but equally greatly profit from the positive climate of cooperation, which is a by-product of the JRAs, to engage on further common activities. The majority of the expertise required to achieve the JRA objectives is evidently located within the facilities. However, where necessary expertise is located in other organisations, such as universities, then these are included.

NMI3 has an excellent track record of translating JRA developments directly into components used at the instruments. In some cases this involves in-house construction, in other cases it involves contracting an SME. Given the relatively small size and unpredictability of the 'market' for these developments there is no strong case for directly involving an SME in NMI3.

To demonstrate the impact of NMI3 actions we can mention the development of simulation code. This code has in the meantime become an indispensible prerequisite for any instrument upgrade. It is used both by the facilities as well as by the SMEs supplying components for neutron instrumentation. The fact that neutron instruments could gain orders of magnitude in efficiency while the neutron sources did not evolve is to a large extent the merit of such simulations. The most telling example is certainly the concept of elliptically focussing neutron guides. Such guides are now one of the most important components for the planned instrumentation at the future ESS.

i) Sub-contracting:
There is no sub-contracting in the project, despite for the establishment of the "Certificates of Financial Statement". Some beneficiaries will have to contract external consultant companies for these audit certificates, whereas others do have internal auditers. An amount of 21000 EUR has been set as a contingency for these certificates.

ii) Other countries:
There is no other country partner of the project.

iii) Additional partners:
No as-yet-unidentified partners are planned for.

2.4 Resources to be committed

All the partners consider the contribution of the Commission essential for improving the quality and quantity of the services they can offer. This contribution may appear small if compared to the overall budgets of the facilities. It is, however, substantial with respect to the resources available for development and capacity building. Its benefit is broadly recognized and leads to a strong commitment of the partners towards NMI3. It is agreed that the EU contribution is in itself insufficient to achieve the broader goals of the project. The facilities, therefore, mobilize considerable additional resources to achieve the desired output.

A detailed financial breakdown of the EU contribution to the various activities is provided in the following tables. The consortium considers that the distribution of resources that is proposed will best benefit European Neutron and Muon spectroscopy, at least within the funding ceiling of 15 M€. The proposed distribution tries to carefully balance the impact of the various types of activities (Access, JRAs, Networking) applying a holistic view to the knowledge creation process. Indirect benefits that e.g. arise from the simple fact of setting up new collaborations are given full consideration. NMI3 thus attempts to include as many partners as possible in a given work package. Care is, however, taken to avoid that individual contributions per task and partner become subcritical and thus lead to an inefficient use of the resources.

Management is kept lean and additional gains in efficiency are achieved by using a common management for NMI3/FP7-I and NMI3/FP7-II during the one year of overlap. The coordinating organization puts in considerable resources of its own via the Coordinator and the financial and administrative services. Only the Project manager is fully charged to the project.

Networking and dissemination activities will rely to a very large extent on contributions not financed by the consortium. E.g. the teaching material required in the framework of e-learning will be provided by the broader neutron and muon community. The NMI3 contribution to the training in the context of the European Neutron and Muon School will not surpass 20 % of the actual costs of the events. Dissemination relies to a very large extent on input from staff not financed by NMI3. In general the Networking activities will only provide the structuring frameworks and governance for training and dissemination. They thus have a very high leveraging power.
Within ACCESS the costs charged to NMI3 are largely inferior to the costs of the provided services, either because more days of beam time are granted within the Access framework than can actually be charged to the project or because only a fraction of the actual unit costs is taken as the basis for imputation. In addition the unit cost do not include the investments. These investments are, however, indispensible to guarantee the quality of the services at an international level.
Within the JRAs basically only the costs for core staff and travel are charged to the project. All the equipment necessary for completion of the tasks is provided by the facilities. All tasks require an

appreciable contribution from supporting staff that is not charged to the project and thus represents an additional contribution from the partners.

Total EU requested contribution

No	Participant short name	WP1 (MGT)	WP2-6 (Netw)	WP7-16 (TAA) beam fee	WP7-16 (TAA) travel & sub.	WP17 (JRA)	WP18	WP19	WP20	WP21	TOTAL JRA EC contribution	TAA	Management & Networking	TOTAL facility EC contribution
1	ILL	731,400	734,341	-	-			113,520	440,400		553,920		1,465,741	2,019,661
2	STFC		40,100	1,300,992	101,455	203,644	17,550	97,230	124,125	189,633	632,182	1,402,447	40,100	2,074,728
3	TUM		677,845	1,524,600	71,043		172,800	130,320	126,000	189,600	618,720	1,595,643	677,845	2,892,208
4	Jüllch		5,000	-	-		169,868	118,410	160,425	192,453	641,156	-	5,000	646,156
5	PSI		50,397	1,115,557	92,818	193,500	172,800				366,300	1,208,375	50,397	1,625,072
6	HZB		6,000	748,062	120,947		183,000		136,125	190,313	509,438	869,009	6,000	1,384,447
7	CEA		5,000	908,647	90,572		172,875		145,500	53,250	371,625	999,219	5,000	1,375,844
8	HZG		19,945	-	-						-		19,945	19,945
9	BNC-AEKI		5,350	239,894	28,959						-	268,853	5,350	274,203
10	BNC-RISP			-	-			-		66,750	66,750	-	-	66,750
11	II HAS			-	-		19,800				19,800		-	19,800
12	TUD		6,000	181,176	19,211		51,070	58,957			110,027	200,387	6,000	316,414
13	NPI		5,350	110,737	13,749		19,688				19,688	124,485	5,350	149,523
14	CNR			-	-					50,126	50,126		-	50,126
15	UCPH		193,670	-	-						-		193,670	193,670
16	DTU		19,688	-	-						-		19,688	19,688
17	ICMA			-	-			86,640			86,640		-	86,640
18	ESS			-	-			135,120			135,120		-	135,120
	TOTALS	**731,400**	**1,768,686**	**6,129,663**	**538,755**	**397,144**	**979,450**	**740,197**	**1,132,575**	**932,125**	**4,181,491**	**6,668,418**	**2,500,086**	**13,349,994**

Summary Staff effort on EC supported man months

Participant no./short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7-16	WP17	WP18	WP19	WP20	WP21	Total person months
ILL	**36**		16	**coord.**		**24**				16	65	0	**157**
STFC		**coord.**					x	**24**	1	8	14	**19**	**66**
TUM		51	**32**		33		x		24	18.5	16	20	**194.5**
Jülich					**coord.**				16	13	13	19	**61**
PSI		4					x	24	24				**52**
HZB							x		**26**		18	24	**68**
CEA							x		28		**20**	7	**55**
HZG					2								**2**
BNC-AEKI							x						**0**
BNC-RISP												9	**9**
II HAS									5				**5**
TUD							x		6	7			**13**
NPI							x		4				**4**
CNR												12	**12**
UCPH			30										**30**
DTU			3										**3**
ICMA										12			**12**
ESS										**18.5**		0	**18.5**
TOTAL	**36**	**55**	**81**	**0**	**35**	**24**	**0**	**48**	**134**	**93**	**146**	**110**	**762**

Management & Networking Budget Tables

WP1 Management

Management														
Acronym (1)	Title	Justification	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
ILL	NMI3 coordinator	Consumables (preparation of reports etc), travel (NMI3 GA, SAC, EC meetings, conferences etc)	12	0	0	0	20,000	25,000	0	60%	27,000	72,000	100%	72000
ILL	General organisational cost	venue rental, catering for 3 GA, SAC and evtl joint JRA meetings @20000 EUR each		0	0	0	66,000	0	0	60%	39,600	105,600	100%	105600
ILL	Innovation workshops	Venue rental, catering for 3 workshop targeting Innovation and economic matters (Industry involvement)		0	0	0	30,000			60%	18,000	48,000	100%	48000
ILL	Travel & subsistence cost	for EU country or organisation representatives not funded by individual activities to assist GA meeting 3x5 people @800 EUR each		0	0	0	0	12,000	0	60%	7,200	19,200	100%	19200
ILL	SAC	Travel & subsistence cost for SAC members 3x6 people @800 EUR each		0	0	0	0	20,000	0	60%	12,000	32,000	100%	32000
ILL	NMI3 project manager	Salary, consumables (general office cost), travel (NMI3 and EC meetings)	48	36	252,000	0	10,000	9,000	0	60%	162,600	433,600	100%	433,600
ILL	Audit cost	Provision for 3*7@1000 each		0	0	21,000	0	0	0	0%	-	21,000	100%	21,000
TOTALS			**60**	**36**	**252,000**	**21,000**	**126,000**	**66,000**	**0**		**266,400**	**731,400**		**731,400**

WP2 Dissemination / Outreach (Networking)

Dissemination / Outreach														
Acronym (1)	Title	Justification	Staff effort allocated to project	Staff effort charged to project	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
STFC		Dissemination material, print and editorial office	6		0	0	30,000	5,100	0	7%	-	35100	100%	35,100
TUM	Software engineer	Internetplatform administration	15	15	67,000	0	0	0	0	7%	4,690	71690	100%	71,690
TUM	NMI3 Dissemination manager	Salary, consumables (general office cost), travel (NMI3 and community related meetings)	36	36	173,000	0	11,000	16,000	0	7%	14,000	214,000	100%	214000
PSI	Muon facility m	Muon community networking	6	4	13,000	0	15,000	13,100	0	7%	2,877	43977	100%	43,977
TOTALS			63	55	253000	0	56000	34200	0		21,567	364,767		364,767

WP3 E-learning (Networking)

E-learning														
Acronym (1)	Title	Justification	Staff effort allocated to project	Staff effort charged to project	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
TUM	Scientists	Development of neutron	32	32	182,500	0	0	8,000	0	7%	13,335	203835	100%	203,835
ILL	&	related education material	16	16	91,300	0	0	8,000	0	7%	6,951	106251	100%	106,251
UCPH	Software	provided via online based	30	30	173,000	0	0	8,000	0	7%	12,670	193670	100%	193,670
DTU	engineers	training	3	3	14,500	0	0	3,900	0	7%	1,288	19688	100%	19,688
TOTALS			81	81	461,300	0	0	27,900	0		34,244	523,444		523,444

WP4 European Neutron & Muon Schools (Networking)

Schools														
Acronym (1)	Title	Justification	Staff effort allocated to project	Staff effort charged to project	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
ILL	Schools coordinator	Support of selected European Neutron & Muon Schools	6	0	0	0	8,000	415,000	0	7%	29,610	452610	100%	452610
STFC		Organisation of exchange meetings of the head of schools	2	0	0	0	0	0	0	7%	-	0	100%	0
TOTALS			**8**	**0**	**0**	**0**	**8,000**	**415,000**	**0**		**29,610**	**452,610**		**452,610**

WP5 Integrated user Access (Networking)

Integrating user access														
Acronym (1)	Title	Justification	effort allocated to project (man months)	effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project(2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
HZB		Study &	8	0	0	0	0	6000	0	7%	-	6,000	100%	6000
TUM	Software	development	48	33	168000	0	0	8000	0	7%	12,320	188,320	100%	188320
BNC-AEKI	engineer	of an	4	0	0	0	0	5000	0	7%	350	5,350	100%	5350
HZG		integrated	8	2	12640	0	0	6000	0	7%	1,305	19,945	100%	19945
Jülich		user access	4	0	0	0	0	5000	0	7%	-	5,000	100%	5000
ILL		for the	4	0	0	0	0	5000	0	7%	350	5,350	100%	5350
STFC		Neutron &	4	0	0	0	0	5000	0	7%	-	5,000	100%	5000
CEA		Muon	8	0	0	0	0	5000	0	7%	-	5,000	100%	5000
NPI		facilities	2	0	0	0	0	5000	0	7%	350	5,350	100%	5350
PSI			4	0	0	0	0	6000	0	7%	420	6,420	100%	6420
TUD			2	0	0	0	0	6000	0	7%	-	6,000	100%	6000
TOTALS			**96**	**35**	**180,640**	**0**	**0**	**62,000**	**0**		**15,095**	**257,735**		**257,735**

WP6 Standards for Data Analysis Software (Networking)

Data analysis standards														
Acronym (1)	Title	Justification	Staff effort allocated to project (man	Staff effort charged to project (man	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	eligible Overhead rate	Eligible Indirect cost	Total	%	EU contribution
ILL	Development of standards for data analysis software	Software engineer	28	24	141,000		8,000	10,000		7%	11,130	170130	100%	170130
STFC			4							7%		0		0
PSI			4							7%		0		0
TUM			4							7%		0		0
Jülich			4							7%		0		0
HZG			4							7%		0		0
HZB			4							7%		0		0
CEA			4							7%		0		0
ESS			4							7%		0		0
BNC-AEKI			4							7%		0		0
TOTALS			64	24	141,000	0	8,000	10,000	0		11,130	170,130		170,130

Joint Research Activity Budget Tables

WP17 Muons

Muons											
Acronym (1)	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	Overhead Costs (3)	Total	%	EU contribution
STFC	36	24	110500	0	25000	20000	0	116025	271525	75%	203644
PSI	36	24	190000	0	5000	20000	0	43000	258000	75%	193500
TOTALS	72	48	300,500	0	30,000	40,000	0	159,025	529,525		397,144

WP18 Structural and Magnetic Imaging at the Micro and Nano Scale

IMAGING											
Acronym (1)	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	Overhead Costs (3)	Total	%	EU contribution
HZB	38	26	130000	0	11500	5000	0	97500	244000	75%	183000
CEA	41	28	140000	0	1500	5000	0	84000	230500	75%	172875
Jülich	28	16	107000	0	0	5000	0	114490	226490	75%	169868
PSI	34	24	188000	0	0	4000	0	38400	230400	75%	172800
TUM	35	24	137000	0	3000	4000	0	86400	230400	75%	172800
TUD	10	6	30480	0	0	5000	0	32614	68094	75%	51070
II HAS (BNC)	11	5	11000	0	1500	4000	0	9900	26400	75%	19800
NPI	6	4	13500	0	0	4000	0	8750	26250	75%	19688
STFC	2	1	8000	0	3000	4000	0	8400	23400	75%	17550
TOTALS	205	134	764,980	-	20,500	40,000	-	480,454	1,305,934		979,450

WP 7-16 Transnational Access Activity

Parti-cipant number	Organisation short name	Short name of infrastructure	Operator country code	Min quantity of access to be provided	Estimated unit cost (€)	Fraction of unit cost charged to EC project	Estimated total quantity of access to be provided over project period	Estimated Access cost	Estimated number of experiment	Estimated cost per experiment (without T&S)	Estimated number of users	Estimated number of days spent at the facility	Estimated Travel & Subsistence cost incl indirect cost (7%)
2	**STFC**	ISIS Neutrons	UK	68	15865.75	100%	11004	1,078,871	64	16857	125	430	82,707
2	**STFC**	ISIS Muons	UK	14	15865.75	100%	11004	222,121	13	17086	26	90	18,748
3	**TUM**	FRM II	DE	462	3300	48.1%	21120	1,524,600	120	12705	215	660	71,043
5	**PSI**	SINQ	CH	262	2899.93	52.5%	6750	759,014	80	9488	110	550	62,543
5	**PSI**	SμS	CH	123	2900.08	63.2%	2700	356,543	50	7131	65	330	30,275
6	**HZB**	BER II	DE	300	2493.02	56.7%	19800	748,062	75	9974	150	975	120,947
7	**CEA**	LLB	FR	271	3347.46	70%	16560	908,647	54	16827	92	283	90,572
9	**BNC-AEKI**	BRR	HU	150	1599.29	55%	1800	239,894	32	7497	45	210	28,959
12	**TUD**	RID	NL	90	2013	89%	6400	181,176	10	18118	20	9	19,211
13	**NPI**	NPI	CZ	92	1260	100%	2688	110,737	10	11074	17	112	13,749

WP19 Advanced Methods and Techniques

Advanced Methods & Techniques											
Acronym (1)	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	Overhead Costs (3)	Total	%	EU contribution
ESS	48	18.5	103600	0	4000	5000	0	67560	180160	75%	135120
ILL	42	16	89600	0	0	5000	0	56760	151360	75%	113520
TUM	40	18.5	103600	0	0	5000	0	65160	173760	75%	130320
STFC	20	8	60800	0	0	5000	0	63840	129640	75%	97230
Jülich	36	13	72800	0	0	5000	0	80080	157880	75%	118410
TUD	17	7	35560	0	0	5000	0	38049.2	78609	75%	58957
ICMA	30	12	67200	0	0	5000	0	43320	115520	75%	86640
TOTALS	233	93	533,160	-	4,000	35,000	-	414,769	986,929		740,197

WP20 Advanced Neutron Tools for Soft- and Bio-Materials

SBM											
Acronym (1)	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	Overhead Costs (3)	Total	%	EU contribution
CEA	28	20	100000	0	20000	14000	0	60000	194000	75%	145500
HZB	25.2	18	90000	0	15000	9000	0	67500	181500	75%	136125
Jülich	18	13	89000	0	20000	7000	0	97900	213900	75%	160425
ILL	91	65	324000	0	25000	18000	0	220200	587200	75%	440400
TUM	22.4	16	82000	0	15000	8000	0	63000	168000	75%	126000
STFC	19.6	14	70000	0	15000	7000	0	73500	165500	75%	124125
TOTALS	204.2	146	755,000	0	110,000	63,000	0	582,100	1,510,100	75%	1,132,575

WP21 Detectors

DETECTORS											
Acronym (1)	Staff effort allocated to project (man months)	Staff effort charged to project (man months)	Staff cost	Sub-contract	Consumables	Travel	Equipment charged to project (2)	Overhead Costs (3)	Total	%	EU contribution
STFC	30	19	99875	0	38100	10000	0	104869	252844	75%	189633
Jülich	29	19	129086	0	21000	8800	0	97718	256604	75%	192453
TUM	31	20	105000	0	44000	9000	0	94800	252800	75%	189600
HZB	36	24	112000	0	47750	10000	0	84000	253750	75%	190313
CNR	24	12	33000	0	5095	3000	0	25740	66835	75%	50126
BNC-RISP	18	9	32625	0	15000	8000	0	33375	89000	75%	66750
CEA	12	7	35000	0	10000	5000	0	21000	71000	75%	53250
ILL	observer	0	0	0	0	0	0	0	0		0
ESS	observer	0	0	0	0	0	0	0	0		0
TOTALS	180	110	546,586	-	180,945	53,800	-	461,502	1,242,833		932,125

WP7 ISIS NEUTRONS

Participant number	2	**Organisation short name**		**STFC**	
Short name of Infrastructure	**ISIS Neutrons**	**Installation number**		**Short name of Installation**	**ISIS Neutrons**
Name of Installation	**ISIS Neutrons**			**Unit of access**	**Beam day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .			**Eligible Costs (€)**
	Target station operations			3,969,576
	Accelerator operations (pre-injector, linac, synchrotron and EPBs)			55,574,052
	Instrumentation and data acquisition support			4,158,604
	Scientific infrastructure and support (instruments, sample environment, etc)			30,811,464
			Total A	**94,513,696.00**
			of which subcontracting (A')	
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**		**Person-Months**	**Personnel Costs (€)**
	Band G Senior Management	52,168	58.38	3,045,568
	Band F Group leaders, science, technical	215132	46.75	10057421
	Band E Scientists, technicians	607828	38.42	23352751.76
	Band D Scientists, technicians	691956	30.68	21229210.08
	Band C Support staff	355400	24.24	8614896
	Band B Support staff	79248	19.77	1566732.96
	Band A Support staff	42564	18.44	784880.16
			Total B	**68,651,459.80**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		**max**	**11421560.91**	11,421,561
D. Total estimated access eligible costs = A+B+C				174,586,716.71
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time				11,004
F. Fraction of the Unit cost to be charged to the project [2]				100.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)				**15865.75**
H. Quantity of access offered under the project (over the whole duration of the project)				68
I. **Access Cost charged to the project [3][4] = G x H**				**1,078,871.00**

WP8 ISIS MUONS

Participant number	**2**	**Organisation short name**		**STFC**	
Short name of Infrastructure	**ISIS Muons**	**Installation number**		**Short name of Installation**	**ISIS Muons**
Name of Installation	**ISIS Muons**			**Unit of access**	**Beam day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .			**Eligible Costs (€)**
	Target station operations			3,969,576
	Accelerator operations (pre-injector, linac, synchrotron and EPBs)			55,574,052
	Instrumentation and data acquisition support			4,158,604
	Scientific infrastructure and support (instruments, sample environment, etc)			30,811,464
	Total A			**94,513,696.00**
	of which subcontracting (A')			
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**		**Person-Months**	**Personnel Costs (€)**
	Band G Senior Management	52,168	58.38	3,045,568
	Band F Group leaders, science, technical	215132	46.75	10057421
	Band E Scientists, technicians	607828	38.42	23352751.76
	Band D Scientists, technicians	691956	30.68	21229210.08
	Band C Support staff	355400	24.24	8614896
	Band B Support staff	79248	19.77	1566732.96
	Band A Support staff	42564	18.44	784880.16
	Total B			**68,651,459.80**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		**max**	**11421560.91**	11,421,561
D. Total estimated access eligible costs = A+B+C				174,586,716.71
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time				11,004
F. Fraction of the Unit cost to be charged to the project [2]				100.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)				**15865.75**
H. Quantity of access offered under the project (over the whole duration of the project)				14
I. **Access Cost charged to the project [3][4] = G x H**				**222,120.50**

WP9 FRM II (incl. Former JCNS and GeNF)

Participant number	3	**Organisation short name**		TUM	
Short name of Infrastructure	**FRM II**	**Installation number**	**1**	**Short name of Installation**	**FRM II**
Name of Installation	**Forschungsneutronenquelle Heinz Maier-Leibnitz**			**Unit of access**	**Beam day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
	Reactor operation	25,400,000
	Radioprotection and security	10,000,000
	Instruments (Maintanance, developments and consumables)	18,400,000
	fuel and waste management	11,200,000
	central services, infrastructure for scientific use	11,400,000
	Total A	**76,400,000.00**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	reactor management	480	3,910,856.00
	reactor operation	1184	7,609,568.00
	Technical service	2340	13,078,608.00
	Scientific instruments responsibles	1108	8,994,968.00
	Technical support experiments	772	4,314,824.00
	Scientific service	672	5,449,248.00
	Technical service science	1104	7,095,408.00
	Scientific technical support	1344	8,637,888.00
	Total B		**59,091,368.00**

C. Indirect eligible costs < = 7% x ([A-A']+B)[1] max **9484395.76**	9,484,392.00
D. Total estimated access eligible costs = A+B+C	144,975,760.00
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	21,120
F. Fraction of the Unit cost to be charged to the project [2]	48.1%
G. **Estimated Unit cost charged to the project** = F x (D/E)	**3300**
H. Quantity of access offered under the project (over the whole duration of the project)	462
I. **Access Cost charged to the project [3][4] = G x H**	**1,524,600.00**

WP10 SINQ NEUTRONS

Participant number	5	**Organisation short name**		PSI	
Short name of Infrastructure	**SINQ**	**Installation number**	**1**	**Short name of Installation**	**SINQ**
Name of Installation	**SINQ**			**Unit of access**	**Beam day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
	Maintenance of proton accelerator and SINQ halls	1,477,260.00
	Operation of proton accelerator and SINQ halls	2,382,408.00
	Operation of SINQ source	2,041,020.00
	Operation of SINQ instruments	1,717,380.00
	Total A	**7,618,068.00**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	Accelerator scientist	225	1,990,800.00
	Accelerator technician	1019	8,125,506.00
	SINQ source scientist	97	858,256.00
	SINQ source technician	440	3,508,560.00
	SINQ instrument scientist	847	7,494,256.00
	SINQ instrument technician	654	5,214,996.00
	Total B		**27,192,374.00**

C. Indirect eligible costs < = 7% x ([A-A']+B) [1] max **2436730.94**	2,436,730.00
D. Total estimated access eligible costs = A+B+C	37,247,172.00
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	6,750
F. Fraction of the Unit cost to be charged to the project [2]	52.5%
G. **Estimated Unit cost charged to the project** = F x (D/E)	**2897**
H. Quantity of access offered under the project (over the whole duration of the project)	262
I. **Access Cost charged to the project** [3][4] **= G x H**	**759,014.00**

WP11 SμS MUONS

Participant number	5	Organisation short name	PSI		
Short name of Infrastructure	SmuS	Installation number	2	Short name of Installation	SmuS
Name of Installation	SmuS			Unit of access	Beam day

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		Eligible Costs (€)
	Maintenance of proton accelerator and SmuS halls		536,094.00
	Operation of proton accelerator and SmuS halls		864,954.00
	Operation of SmuS instruments		623,790.00
	Total A		2,024,838.00
	of which subcontracting (A')		
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	Category of staff	Person-Months	Personnel Costs (€)
	Accelerator scientist	82	725,536.00
	Accelerator technician	370	2,950,380.00
	SmuS instrument scientist	479	4,238,192.00
	SmuS instrument technician	205	1,634,670.00
	Total B		9,548,778.00
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		max 810153.12	810,153.00
D. Total estimated access eligible costs = A+B+C			12,383,769.00
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			2,700
F. Fraction of the Unit cost to be charged to the project [2]			63.2%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**2898.72**
H. Quantity of access offered under the project (over the whole duration of the project)			123
I. **Access Cost charged to the project [3][4] = G x H**			**356,542.56**

WP12 BER II

Participant number	6	**Organisation short name**	HZB		
Short name of Infrastructure	**BER II**	**Installation number**	**1**	**Short name of Installation**	**BER II**
Name of Installation	**BER II**			**Unit of access**	**Beam days**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		**Eligible Costs (€)**
	utilities		924,000.00
	maintenance		7,504,000.00
	reactor fuel		4,152,000.00
	depreciation		24,812,000.00
	consumables		7,292,000.00
	security and physical health		6,540,000.00
	other direct costs		2,644,000.00
		Total A	**53,868,000.00**
		of which subcontracting (A')	***4,808,000.00***
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	scientific staff	1935	12,390,800.00
	technical staff	3508	15,435,200.00
		Total B	**27,826,000.00**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		**max** **5382020**	5,382,020.00
D. Total estimated access eligible costs = A+B+C			87,076,020.00
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			19,800
F. Fraction of the Unit cost to be charged to the project [2]			56.7%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**2493.54**
H. Quantity of access offered under the project (over the whole duration of the project)			300
I. **Access Cost charged to the project [3][4] = G x H**			**748,062.00**

WP13 LLB

Participant number	7	**Organisation short name**		CEA	
Short name of Infrastructure	LLB	**Installation number**	1	**Short name of Installation**	LLB
Name of Installation	Laboratoire Léon Brillouin - Orphée			**Unit of access**	Beam day

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		**Eligible Costs (€)**
	Fluids reactor		2,616,000.00
	Reactor (maintenance, utilities, security)		9,900,000.00
	fuel (purchase and nuclear waste reprocessing)		11,120,000.00
	Maintenance,utilities and consumable costs of LLB		9,080,000.00
	Instruments (upgrade, sample environments)		5,200,000.00
	Total A		**37,916,000.00**
	of which subcontracting (A')		
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	Reactor staff (54)	2592	13,527,859.20
	LLB technical staff (32)	1536	6,361,804.80
	LLB scientific staff (49)	2352	16,326,055.20
	Total B		**36,215,719.20**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		**max 5189220.344**	5,189,220.34
D. Total estimated access eligible costs = A+B+C			79,320,939.54
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			16,560
F. Fraction of the Unit cost to be charged to the project [2]			70.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**3352.94**
H. Quantity of access offered under the project (over the whole duration of the project)			271
I. **Access Cost charged to the project** [3][4] **= G x H**			**908,646.74**

WP14 BRR

Participant number	9	**Organisation short name**		BNC-AEKI	
Short name of Infrastructure	BRR	**Installation number**	1	**Short name of Installation**	BRR
Name of Installation	Budapest Research Reactor			**Unit of access**	day

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		**Eligible Costs (€)**
	Reactor fuel elements		1,636,364.00
	Utilities		269,090.00
	Maintanence		545,454.00
	Consumables		54,545.00
	Total A		**2,505,453.00**
	of which subcontracting (A')		
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	Senior scientists	122.08	464,640.00
	Research scientists	149.83	466,560.00
	PhD students	166.47	336,960.00
	Senior engineers	99.88	340,416.00
	Operators	149.83	440,640.00
	Technical staff	149.83	336,960.00
	Total B		**2,386,176.00**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		max **342414.03**	342,414.00
D. Total estimated access eligible costs = A+B+C			5,234,043.00
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			1,800
F. Fraction of the Unit cost to be charged to the project [2]			55.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**1599.29**
H. Quantity of access offered under the project (over the whole duration of the project)			150
I. **Access Cost charged to the project [3][4] = G x H**			**239,893.50**

WP15 RID

Participant number	**12**	**Organisation short name**		**TUD**	
Short name of Infrastructure	**RID**	**Installation number**	**1**	**Short name of Installation**	**RID**
Name of Installation	**Reactor Institute Delft**			**Unit of access**	**Beam day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		**Eligible Costs (€)**
	reactor fuel cycle		2,212,000.00
	Consumables		668,000.00
	Maintenance, utilities		1,000,000.00
	Computing		220,000.00
	Total A		**4,100,000.00**
	of which subcontracting (A')		
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	scientists	24.4	2,103,828.44
	scenior scientists	4	410,238.72
	scenior engineers	16	1,156,377.60
	operators and technical staff	115	5,758,547.52
	Total B		**9,428,992.28**
C. Indirect eligible costs < = 7% x ([A-A']+B)[1]		**max 947029.4596**	947,029
D. Total estimated access eligible costs = A+B+C			14,476,021.74
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			6,400
F. Fraction of the Unit cost to be charged to the project [2]			89.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**2013.07**
H. Quantity of access offered under the project (over the whole duration of the project)			90
I. **Access Cost charged to the project [3][4] = G x H**			**181,176.30**

WP16 NPI

Participant number	13	**Organisation short name**		NPI	
Short name of Infrastructure	NPL	**Installation number**		**Short name of Installation**	
Name of Installation	NPL			**Unit of access**	day

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .		**Eligible Costs (€)**
	The reactor operation and beam costs corresponding to 7 offered facilities (NRI, plc.)		428,652.00
	Costs for laboratory maintenance, consumables and utilities		308,860.00
	Total A		**737,512.00**
	of which subcontracting (A')		
B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff**	**Person-Months**	**Personnel Costs (€)**
	Scientists (10x) full time	480	1,613,185.00
	Technicians (9x) full time	432	821,560.00
	Total B		**2,434,745.00**
C. Indirect eligible costs < = 7% x ([A-A']+B) [1]		**max** **222057.99**	222,057.99
D. Total estimated access eligible costs = A+B+C			3,394,314.99
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			2,820
F. Fraction of the Unit cost to be charged to the project [2]			100.0%
G. **Estimated Unit cost charged to the project** = F x (D/E)			**1203.66**
H. Quantity of access offered under the project (over the whole duration of the project)			92
I. **Access Cost charged to the project [3][4] = G x H**			**110,736.72**

3. Potential Impact

3.1 Strategic impacts

The Europe 2020 strategy, and in particular the Innovation Union flagship initative, set the objectives of sustainable and inclusive growth. In Europe, with its limited natural resources, this can only be achieved by developing the skills and knowledge necessary for a continuous process of innovation. NMI3 will impact on this process in two ways: (i) it will provide Europe with a better-trained and more mobile scientific work force and (ii) it will, via the research carried out, contribute directly to technological solutions to our society's most pressing challenges.
Neutron and muon spectroscopy are analytical tools with unique properties. They often give information that is indispensible for the development and technological exploitation of new materials. This holds in particular for the early stages of development requiring the characterization of basic physical, chemical and biological processes. It thus touches all types of technological challenge, from energy to health.
Europe still leads the world in neutron and muon spectroscopy despite large investment in other countries. Probably the main reason for this success lies in the fact that Europe has managed to maintain excellence at all stages of knowledge creation from the scientific proposal, via the experiment and on to exploitation of the results. NMI3 is an essential tool for consolidating this success by optimizing the use of resources and building critical mass for common development strategies.
The research infrastructure in the fields of neutron scattering and muon spectroscopy is necessarily composed of large-scale facilities. In Europe these facilities are mainly funded nationally, with the exception of the ILL and the future ESS which are multinational institutions. The NMI3 project will integrate these independent centres into a distributed pan-European infrastructure with a high level of cohesion.

The NMI3 strategy for maintaining world leadership rests on three pillars, namely open access to first class instruments for research all over Europe, Joint Research Activities to optimise the use of neutron and muon beams and dedicated networking activities including support for training schools and an e-learning initiative.
The vast majority of neutron and muon experiments in Europe are undertaken at the national centres that participate in the NMI3 access program. The European Commission, via NMI3, thus ensures a substantial build-up of research capacity within the ERA in an open and competitive manner. The open character of transnational access, coupled with strict selection, will ensure that the most relevant subjects are investigated. However, NMI3 will not only build capacity but also structure the user community. In particular it will provide access to researchers from countries without national sources, including the peripheral member states of the Union.
Ongoing developments aimed at improving the instrumentation performance is supported by the collaborative R&D work in this program. NMI3 thus helps to build expertise and fosters knowledge exchange. Both contribute to a more efficient use of research funding. This efficiency is a prerequisite for retaining international competitiveness in spite of the emerging new facilities in the United States (SNS) or Japan (JSNS). NMI3 does not pretend to be able to integrate European Neutron and Muon infrastructures on its own. Given its limited resources, NMI3 cannot compete with the national funds that are committed all over Europe for the use and development of neutron scattering and muon spectroscopy. This becomes most obvious in the area of collaborative R&D, where NMI3 cannot even try to reach all the relevant aspects of methodological and technical development. NMI3 has, however, a crucial catalysing role by enabling partners to work together and to exchange know-how. NMI3 has a proven track record of effectively leveraging collaborations beyond the formal area of its activities, while maintaining the genuine climate of competition necessary to maintain the high overall quality of the services offered.

Service oriented analytical facilities can only perform as well as their users. It is therefore essential to continuously invest in the training of young people. NMI3 will put more emphasis on this area than ever before. The newly created European Neutron and Muon School will provide a more harmonized pedagogical offer via exchange of good practice and common dissemination methods. E-learning will exploit modern communication technologies to attract new generations of users.

Aside from direct integration actions, NMI3 has an indirect structuring role by fostering friendly internal competition among its partners. A major driver for such competition is the free circulation of researchers among the large-scale facilities represented in the NMI3 consortium. This competition for the best scientists is an important regulator for the entire collaboration. Another driver is the optimisation of the use of institutional resources needed in order to stay competitive, but this also opens up the possibility for specialization at smaller facilities that have already operated their neutron sources over several decades. Collaborative development of technology and methodology will enable the right choices for investment in future instrument upgrades. Through concerted action in the area of instrument construction the financial burden of such necessary development will be shared by the partners, thus enhancing European competitiveness in this sector.

Neutron and muon spectroscopy has to maintain its potential in competition with other analytical probes, but also its complementarity. In this context it is essential to foster collaboration and pooling of resources on a global scale. NMI3 will continue to pull together a dense network of international contacts. International observers and guests invited to the general assembly will ensure a close exchange of ideas and the dissemination of results beyond the borders of Europe.

It is evident that NMI3 is the most efficient way of fostering transnational access and facility integration of European neutron and muon providers. The administrative burden involved in bi- or multinational agreements is far too high to make such schemes attractive to the larger number of facilities. Indeed, such inefficient actions would be contrary to the whole purpose of the European Research Area as they would constitute a suboptimal use of European resources.

3.2 Plan for the use and dissemination of foreground

Dissemination

Dissemination of knowledge is one of the major duties of the consortium. NMI3 comprehensively includes all major neutron scattering and muon spectroscopy facilities in Europe. The European user organization ENSA and the major user communities without a national source are represented in its governing bodies. A broad direct dissemination of information is thus built into the organizational structure. In addition, the networking activities within NMI3 place strong emphasis on dissemination of information via the employment of an information services manager. He/she will provide information about NMI3 directly to scientists and the wider public. The tools employed will comprise a renewed website, brochures and newsletters, as well as posters and presentations at conferences and workshops.

Based on the substantial success of the access program, NMI3 has established a high level of awareness in the scientific community. To foster this kind of branding of the EU funded opportunities, a dedicated Internet site WWW.NMI3.EU will be launched maintaining the previously established portal www.neutron-eu.net with connections to community web-sites like ENSA, ISMS-E and the I3-Forum.

The major mechanisms for disseminating the results of NMI3 are described under WP2. In this work package dissemination will be extended to the general public, i.e. outside the scientific community that directly takes advantage of the NMI3 program. Some of the major activities are:

- Joint NMI3-GA meeting sessions (together with ENSA/ISMS-E whenever possible). NMI3 results are thereby disseminated to the wider European user community.
- At least two of the annual meetings of the NMI3-GA will be coordinated with meetings of the JRAs, and individual JRA will be encouraged to have joint meetings where possible. This ensures the widespread dissemination of technical developments.

- JRA 'observers'. Those NMI3 partners who are not specifically involved in a particular JRA, but who can benefit from the developments being made, can participate in meetings and access written reports on the dedicated sections at the NMI3 platform.
- Joint user meetings for Access Activities and NMI3-GA meetings will be organized as satellites to major neutron/muon conferences where possible (e.g. ECNS 2015). NMI3 activities will be advertised at relevant topical conferences and workshops.
- Advertising of NMI3 and placement of regular articles in Neutron News (circulation several thousand copies worldwide) and Notizario Neutroni (circulation several hundred copies, mainly in Italy but also Europe) have motivated participating scientists to publish recent instrumentation developments and to promote the new opportunities originating from JRA developments.
- Participation at appropriate European science dissemination events, e.g. Euroscience Open Forum 2012 in Dublin and other high profile events organised by the European Commission.
- Publication of results in the open literature. This is the main route for disseminating the results of JRAs and scientific projects supported by the Access Activities to the wider scientific community. This activity comprises both peer reviewed journals and the distribution of internal technical reports on the NMI3 portal.
- New methodological developments of neutron scattering, as developed in the JRAs, will be incorporated directly into the e-learning work package (WP3) to train students as well as experienced scientists with up-to-date information material.

Exploitation / IPR

The commercial market for neutron scattering instrumentation and components relies on a small number of specialized companies. Particular efforts have to be made to collaborate with companies willing to develop relevant products and to enable a sustainable market. This, however, is the task of the individual facilities as NMI3 does not hold any patents or IPR. In addition, excessive IPR protection can actually raise a high barrier to a profitable investment-to-return ratio and thus hamper the widespread commercial availability of new techniques. The main principle underlying IPR management within NMI3 is therefore rapid publication of results in the open literature to ensure that they can be of as widespread benefit to as many facilities as quickly as possible. The same principle will apply to collaborations between NMI3 and non-European countries, and is a condition placed on non-partner participation in technical JRA meetings. The significant investment in neutron scattering and related developments that are currently made in the USA and Japan imply that NMI3 partners have much to gain by close collaboration closely with these countries. Only in those rare cases where a development may find a broader commercial application, will the management of IPR be more protective. Details will be specified in the consortium agreement.

4. Ethical issues

The Networking and Joint Research Activities in this project do not involve any ethical issues.

Any individual proposals for Access that do involve ethical issues will not be accepted.

The only personal data that will be collected for the purpose of the project will be location information for participants (e.g. name, address) and that requested by the Commission for reporting purposes (e.g. information on Access users). Any individual for whom such information is collected will be informed of this according to the data protection regulations of the country in which the information is collected. Personal data will not be used for the purposes of research. Such information will only be published in statistical form.

Data protection issues: The consortium declares to avoid any unnecessary collection and use of personal data. In the Networking activities WP5 "Integrated User Access" the consortium members are working on that specific topic and address in particular the privacy issue of personal data collected via the proposal system within each facility.

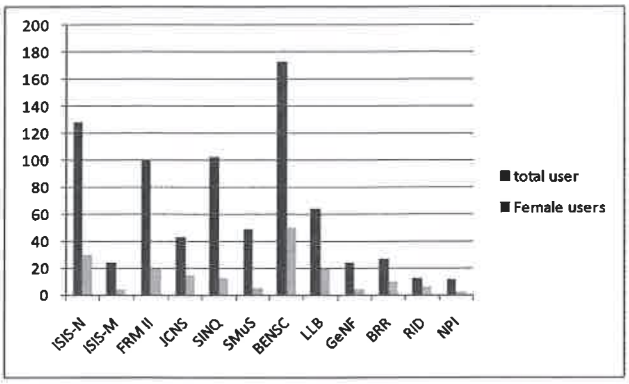
5. Consideration of gender aspects

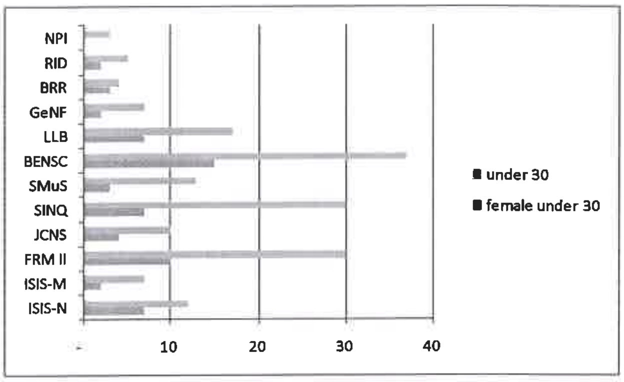
The 7th Framework Programme of the European Commission strives to promote gender equality in scientific research, by facilitating the participation of women scientists and integrating the gender dimension into the research content in all research areas. NMI3 within its limited realm of action wants to actively contribute to this effort. In order to promoting women in science a specific section titled "women in Neutron Science" has been created on the neutron portal (http://neutron.neutron-eu.net/n_about/Women). Prominent female researchers in the field of neutron science are invited to contribute their experience in order to encourage women to pursue similar careers. They express themselves in written contributions and interviews with a particular emphasis on the challenges they have faced as women. An article on the subject was published in the Neutron News Magazine: *Neutron News, 21 Number 3, Page 26 - 27. Women in Neutron Science.* Under the current project NMI3 will continue with this effort.

NMI3 gender actions are indirect, as NMI3 does not directly employ or recruit staff and is thus restricted by the normal recruiting practices of the partner organisations. The current gender balance varies widely between scientific and technical areas and from country to country. During the previous NMI3 projects we have always encouraged beneficiaries to be flexible regarding issues such as maternity/paternity leave or child care arrangements, restructuring the project work as necessary to compensate. This worked well and will be continued.
Many of the individual beneficiaries have activities targeting the wider public, such as schools, where a nearly 40% rate of female participants was stated by most of the school organisers.

The gender balance of scientists benefiting from the Access programme is not intended to be under the influence of NMI3. The general rule is that the access is given based on the scientific merit of the proposed experiment. All centres guarantee through their independent review systems that no discrimination can occur in terms of gender or ethical issues. We note that previously in NMI3 the proportion of females benefiting from Access was 25%, which is the figure that would be expected based on the gender balance amongst scientists working in the research fields covered.

Below there is a graphical representation of the proportion of female users amongst the total transnational users transnational access activity of the current NMI3/FP7 project.





The second graph shows that amongst the young researchers taking part in the transnational access activity, the proportion of female users is far higher, between 30-40%.