

# Instrument Update Sheets

May 2016

Instrument: BEER

27/04/2016

Materials Engineering Diffractometer offering broad resolution and intensity ranges

Instrument Consortium Executive Board members

Proposer: A. Schreyer, HZG, P. Lukas, NPI  
Lead scientist: P. Beran, NPI, J. Fenske, HZG  
Lead engineer: D.-J. Siemers, HZG, TBD, NPI  
Lead institution: NPI and HZG  
ESS representative: M. Strobl

Project budget: 21.8 MEu  
Budget status: from proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: preparing for start of Phase 1 90% complete

STC approval: October 2014 Tranche 1  
- pending 2015 SAC review

Phase 1 - Preliminary Design

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Start date: expected May 2016  
Budget: status:  
Scope-setting meeting date: expected 10/2016 (ww41)  
TG2 date: TBD outcome:

Phase 2 - Detailed Design

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Start date:

Phase 3 - Procurement, Construction, Installation

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Start date:

Phase 4 - Cold Commissioning

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Start date:

Phase 5 - Hot commissioning

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Start date:

Phase 6 - User operations

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Start date:

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions		90 %	draft budget

Current status of instrument (27/04/2015):

The overall phase 1 costs for BEER are finalised. The discussions with ESS technical groups and DMSC about the work for Phase 1 are taking place. A draft version of the MoU is in preparation.

The in-kind contribution of HZG for phase 1 will be managed by an order of ESS. The German funding agency BMBF will increase, therefore, the cash contribution to ESS. The official quotation of HZG for phase 1 is in preparation and will be send to ESS soon.

In-kind contribution agreement between ESS and NPI was signed December 10, 2015. Funding of a part of the BEER instrument construction as a Czech in-kind contribution was granted by the Czech Ministry of Education (MEYS) for period 2016-2019 in amount of 6 M€. Further funding until 2022 (additional 5 M€) will be a subject of the project extension. Schedule Scope of Work annex document for the instrument BEER Phase 1 between ESS and NPI is expected to be signed before May 2016.

Instrument: BIFROST

5/5 2016

BIFROST is an indirect time-of-flight spectrometer optimized for studies of materials under extreme conditions of temperature, magnetic field and temperature.

Instrument Consortium Executive Board members

Proposer: Henrik M. Rønnow, EPFL Lausanne  
Lead scientist: Rasmus Toft-Petersen, Technical University of Denmark  
Lead engineer: NN, Technical University of Denmark  
Lead institution: Technical University of Denmark  
Technical University of Denmark representative : Niels Bech Christensen  
University of Copenhagen representative : Kim Lefmann  
EPFL Lausanne representative : Henrik M. Rønnow  
Paul Scherrer Institute representative : Christof Niedermayer  
Wigner Research Centre for Physics representative : Marton Marko  
Institute for Energytechnology representative : Isabel Jansa Llamas  
ESS representative : Jon Taylor

Project budget: 14.25 M€ (Including 0.5 M€ 10T magnet)

Budget status: 14.25 M€ refers to a revised budget where polarisation analysis and most of the sample environment suite envisaged in our original proposal has been removed (Polarisation analysis will be an upgrade option, while sample environment will require national/international research funding applications). We take note that ESS sees BIFROST as a category B (12 M€) instrument. Phase 1 will decide what a realistic budget for the instrument will be.

Staging plan budget: TBA  
Staging plan funding: TBA

Current status: Phase 0                      100% complete

STC approval: July 2014                      Tranche 2

Phase 1 - Preliminary Design

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Start date: 1/5 2016  
Budget: Category B                      status:  
TG2 date: 31/1 2017                      outcome: unknown

Phase 2 - Detailed Design

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Start date: TBD

Phase 3 - Procurement, Construction, Installation

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Start date: TBD

Phase 4 - Cold Commissioning

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Start date: TBD

Phase 5 - Hot commissioning

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Start date: TBD

Phase 6 - User operations

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Start date: TBD

#### Major in-kind components

Component	Provider	Value	Status
Guide design, Secondary spectrometer tank	Denmark	3.998 M€	Final budget to be set in phase 1
Guides and Graphite analyzers	Switzerland	4.293 M€	Final budget to be set in phase 1
Slow Choppers	Hungary	0.300 M€	Final budget to be set in phase 1
Fast Choppers and Detectors	France	2,022 M€	Final budget to be set in phase 1
Shielding	Norway	3,142 M€	Final budget to be set in phase 1
10T magnet		0,500 M€	Unassigned. The ESS-provided sample environment suite is unlikely to fully cover the wishes of BIFROST. If funding for a magnet is not present in the final instrument budget, we plan national/international research infrastructure funding applications.
Total value of in-kind contributions		9.757 M€	Sum of Swiss, Hungarian, French and Norwegian contributions.

Current status of instrument (5/5 2016):

The BIFROST spectrometer was accepted (under the name CAMEA) by the ESS SAC in July 2014 and endorsed by the ESS STC in October 2014.

The Technical University of Denmark leads construction of BIFROST with a maximum Danish contribution of 30% to the final instrument cost. The final budget will be decided during phase 1. When the final budget is known, the Danish contribution will be appropriately adjusted.

Discussions on the MoU are ongoing on the French side. It is expected that the MoU can be signed within the next 6 months.

In the first four months of 2016, we have been preparing to enter phase 1, by discussing the distribution of tasks between the partners, the mutual coordination of tasks (for example the coordination of guide and shielding work), and by identifying and discussing critical questions to be addressed before the scope setting meeting.

Work on BIFROST has entered phase 1, with the hiring by the Technical University of Denmark of instrument scientist, Rasmus Toft-Petersen, starting 1<sup>st</sup> of May 2016. A solution for the instrument engineer is expected to be found swiftly.

Work will now proceed towards producing the documentation required for phase 1. The STAP meeting is planned for September 2016 and the Scope Setting Meeting for October 2016. The TG2 review is expected to take place at the end of January 2017.

Instrument: C-SPEC  
Cold chopper spectrometer

02/05/2016

Instrument Consortium Executive Board members (preliminary)

Proposer: Wiebke Lohstroh, TUM  
Lead scientist: Pascale Deen, TUM/ESS  
Lead engineer: Joseph Guyon le Bouffy LLB  
Lead institution: TUM  
TUM representative: Wiebke Lohstroh  
LLB representative: Stephane Longeville  
Other representatives: TBD

Project budget: 18.795 MEu  
Budget status: from proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: Phase 1 30% complete

STC approval: July 2014 Tranche 1

Phase 1 - Preliminary Design

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Start date: April 2016  
Budget: **484, 256** Eu status: Current  
TG2 date: December 2016

Phase 2 - Detailed Design

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Start date: February 2017

Phase 3 - Procurement, Construction, Installation

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Start date:

Phase 4 - Cold Commissioning

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Start date:

Phase 5 - Hot commissioning

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Start date:

Phase 6 - User operations

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Start date:

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions		90%	draft budget

Current status of C-SPEC (updated 11/9/2015):

The C-SPEC team is in the process of establishing its consortium with the planning the distribution of tasks and resources. Preparations to enter phase 1 are underway. Interviews for the Lead Project Engineer have just taken place and a decision is expected within the next weeks.

Current status of C-SPEC (updated 02/5/2016):

The C-SPEC team is updating the instrument to incorporate the changes brought about by the butterfly moderator and to take into account engineering realities of the facility. We are working towards a STAP meeting in September with a Scope setting meeting in October 2016.

Instrument: DREAM

2.5.2016

Instrument description: Time-of-flight powder diffractometer for general purpose applications using bispectral moderator with flexible resolution.

Instrument Consortium Executive Board members

Proposer: Werner Schweika, JCNS and ESS  
Lead scientist: Mikhail Feygenson, Werner Schweika, JCNS and ESS  
Lead engineer: Peter Harbott, JCNS  
Lead institution: JCNS  
ESS representative: Paul Henry  
LLB representative: Florence Porcher

Project budget: 16.3 MEu / 12 MEu  
Budget status: from proposal / ESS Cost Category B  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: start of Phase 1 0% complete

STC approval: October 2014 Tranche 1

Phase 1 - Preliminary Design

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Start date: May 2016  
Budget: 427862 Eu (JCNS+LLB) status: agreed

Scope Setting Meeting date: September 2016  
TG2 date: November 2016 outcome: pending

Phase 2 - Detailed Design

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Start date: January 2017 (projected)

Phase 3 - Procurement, Construction, Installation

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Start date: -

Phase 4 - Cold Commissioning

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Start date: -

Phase 5 - Hot commissioning

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Start date: -

Phase 6 - User operations

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Start date: -

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions		100%	draft budget



Current status of DREAM (updated 2.5.2016):

DREAM has been approved by the SAC in May 2014. In October 2014, the ESS Steering Committee has decided to commence the Preliminary Engineering Design (Phase-1).

The instrument is fully funded by two in-kind contributions from Germany (JCNS/FZJ 75%) and France (LLB 25%) as agreed in an MoU between the two partners. The aim is to deliver the instrument for day-1, hot commissioning in 2021 and full user operation in 2023.

DREAM is a cost category B instrument (12 ME). The preliminary full scope budget was of 16.3 ME. A more detailed budget is under preparation for presentation to the STAP (22/23 June 2016) and scope setting (September 2016) meetings. Most of the budget's uncertainty and risk is currently seen in the evaluation of shielding costs.

JCNS has employed a new Instrument Scientist in March 2016.

The Phase 1 work on key components is in common preparation with ESS.

Shielding calculations have been agreed with ESS.

The guide system has been updated and optimized for the new chopper positions as well as for the recent baseline change of the moderators.

The specifications of the DREAM detectors are in progress and in detailing.

Instrument: *Estia*

28/04/2016

Focusing reflectometer for small samples with high-flux option

Instrument Consortium Executive Board members

Proposer: Jochen Stahn, PSI  
Lead scientist: Artur Glavic, PSI  
Lead engineer: Sven Schütz, PSI  
Lead institution: PSI  
ESS representative: TBD

Project budget: 12.4 M€  
Budget status: from proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: phase 1 80% complete

STC approval: July 2014 Tranche 1

Phase 1 - Preliminary Design

Start date: 15. 06. 2015  
Budget: 450 k€ status: ongoing  
Scope-setting: July 2016  
TG2 date: September 2016

Phase 2 - Detailed Design

Start date: October 2016

Phase 3 - Procurement, Construction, Installation

Start date: October 2017

Phase 4 - Cold Commissioning

Start date: July 2020

Phase 5 - Hot commissioning

Start date: July 2021

Phase 6 - User operations

Start date: July 2023

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions			

Current status of *Estia* (updated 14/09/2015):

During the phase 1 effort the project team was able to find solutions for all challenging areas of the instrument. To achieve the high alignment precision of the elliptical guides ( $\sim 1.5\mu\text{m}$  adjustment accuracy) a thermally stabilized granite block will house the motorized mirror segments and two measurement approaches with and without neutron beam have been found, that allow the precise positioning of the reflectors. A shielding concept was proposed and the in-bunker instrument parts have been specified. The instrument vacuum with 5 segments will provide only two additional neutron windows between source and sample. A polarization analysis concept with  $>99\%$  polarization and  $<20\%$  loss will be implemented.

The instrument team has finished the preliminary instrument design and implemented the favored option into a CAD model. The concept of operations (ConOps) document has been finalized.

The other documentation for TG2 are being drafted with an initial version being aimed for June 2016. The phase 1 STAP meeting is scheduled in June 2016, scope-setting meeting in July 2016 and TG2 September 2016.

Instrument: FREIA

8 September 2015

A high-flux horizontal reflectometer for soft matter, liquid interfaces and kinetics

Instrument Consortium Executive Board members

Proposer: Hanna Wacklin, ESS  
Lead scientist: TBD, currently Hanna Wacklin, ESS  
Lead engineer: Jim Nightingale  
Lead institution: STFC, UK  
Institution A representative: TBD  
Institution B representative: TBD

Project budget: proposed budget 15.85M€, preliminary cost category A: 9M€

Budget status: from proposal

Staging plan budget: TBD

Staging plan funding: TBD

Current status: in Phase 0 0% complete

STC approval: July 2014 Tranche 1 or Tranche 2

Phase 1 - Preliminary Design

Start date: 2016

Budget: TBD status:

TG2 date: TBD outcome:

Phase 2 - Detailed Design

Start date: TBD

Phase 3 - Procurement, Construction, Installation

Start date: TBD

Phase 4 - Cold Commissioning

Start date: TBD

Phase 5 - Hot commissioning

Start date: TBD

Phase 6 - User operations

Start date: TBD

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions			

Current status of instrument:

A development and testing of the fast shutter technology (100k€) has received interest from Swiss companies.

The ESS detector group has designed a second tilted  $^{10}\text{B}$  layer detector prototype suitable for FREIA which has been tested in Budapest.

Clara Lopez was appointed as the Integration Engineer for FREIA.

In-kind contributions: ISIS signed and MoU for the FREIA construction project in December 2015 and appointed a lead engineer (Jim Nightingale) who started working part time on the project in April 2016.

Instrument: HEIMDAL

29/04/2016

Neutron powder diffractometer with small angle scattering and imaging capabilities.

Instrument Consortium Executive Board members

Proposer: Mogens Christensen, AU/DK  
Lead scientist: Paul Henry, ESS (from 1/5/16 for Phase I)  
Lead engineer: NN, AU/DK (recruitment underway)  
Lead institution: AU  
Other representatives: Jürg Schefer, PSI/CH, Bjørn Hauback, IFE/NO, Birgit Schjøtt, AU/DK, Kim Lefmann, KU/DK, Ken Andersen, ESS

Project budget: ~12.5 M€

Budget status: 12M€ from cost category letter

Staging plan budget: ~6M€ to reach proposal specification

Staging plan funding: TBC

Current status: Phase 1

0% complete

STC approval: July 2014

Tranche 2

Phase 1 - Preliminary Design

Start date: May 2016

Budget: 327.4k€

status: budget and scope yet to be agreed

Scope setting meeting: Q4 2016

TG2 date: expected Q1 2017

Phase 2 - Detailed Design

Start date: expected Q2 2017

Phase 3 - Procurement, Construction, Installation

Start date:

Phase 4 - Cold Commissioning

Start date:

Phase 5 - Hot commissioning

Start date:

Phase 6 - User operations

Start date:

Major in-kind components:

Component	Rate	Value (M€)	Partners	Diffracton upgrade		SANS upgrade		Imaging upgrade	
Guides	35%	4.3	CH						
Shielding	16%	2.0	N	0.3	N	0.3	N		
Choppers	7%	0.9	N						
Detectors									
Diffracton	18%	2.3	DK,N,CH	1.7					
SANS						2.0	I		
Imaging								0.1	
Sample area	16%	2.0	DK	0.7	DK	0.4	DK		
Sample environment				0.4	DK				
Scientist/engineer (~10 m.y.)	8%	1.0	DK						
Total cost (incl. 10% contingency)	100%	12.5		3.1		2.7		0.1	

### **Current status of instrument (29/04/2016):**

Work continued to form a viable consortium within the financial model for Danish proposed instruments (similar to ESS hosted instruments) of 30% cash and 70% in-kind. The final consortium members are Denmark as the lead country with Aarhus University as the lead partner institute (30% as 'cash'), Switzerland, led by PSI (35% as in-kind) and Norway, led by IFE (35% as in-kind) with the contributions from each partner listed in the Table. ESS has assigned a cost category B (12 M€) cf. the original proposal budget of 19M€. Work on the instrument costing and implications to the scientific case of HEIMDAL are described below. Recently, an interim agreement has been put in place for Paul Henry (ESS) to lead the Phase I development of HEIMDAL in order to meet the ESS deadline for scope setting of the instrument by mid Q4 2016. The MoU has been signed by Norway and recently (28/4) by Denmark. PSI is expected to sign during early May, allowing recruitment of the lead engineer to proceed. A post doc to cover the shielding calculations at IFE is recruited and resources are available at KU/DK for beam transport optimisation. Phase I schedule and cost has been agreed by the instrument consortium and awaits ESS approval.

**Initial cost reductions:** Compared to the original proposed cost of the instrument, some components have been moved from the instrument budget to the central ESS contribution and several modifications made to the overall instrument design:

- 'Electronics and computing' and 'primary shielding' to 30 m are now covered by ESS.
- Reducing the length of instrument by 7 m reduces the overall guide costs by 5% and removes the need for a building extension to host the SANS tank
- The cold and thermal beam can share the mechanical support and shielding.
- Guide optimization, going from partly  $m=5$  guides to  $m=2$ , reduces the guide cost
- A new SANS detector cost estimate obtained from LOKI with lower costs.

**Development work:** There is a large degree of uncertainty in the shielding costs as guidance has yet to be received from ESS. A workshop on guide and shielding optimization will be held in May, after which we expect better-defined boundary conditions.

PSI held a detector workshop in March and identified the possibility to develop scintillator-based detectors to match the requirements of HEIMDAL. Potential in-kind partners have been found to perform the work (cost book value  $\sim 0.5\text{M€}$ ). However, the work unit originally available within the ESS detector group budget was cut end-March in an internal review. HEIMDAL is now dependent on the CDT inclined geometry boron detectors, which the detector group classifies as carrying high technology/schedule risk, as the technology is not yet implemented on a working instrument. The risk concerns both cost and delivery schedule.

**Approaching cost category B:** requires significant parts of the instrument to be moved into the staging plan/upgrades. It is not possible to build the proposed powder diffraction and SANS capability within cost category B, so we propose the SANS detector and SANS tank are moved to a SANS upgrade, (estimate 2.7 M€). Part of the diffraction detector coverage is moved to a diffraction upgrade (estimate 3.1 M€). The imaging upgrade is estimated at 0.1 M€. Further work is also required on the beam transport system as a result of proposed changes to the ESS baseline moderator set-up.

**Conclusion:** HEIMDAL can be built with the 30%/70% model proposed by ESS by the consortium of partner countries: Switzerland, Norway and Denmark. **However, the assignment of cost category B means that HEIMDAL cannot fulfil the original scientific scope of the instrument in the accepted proposal in its day-1 configuration.** Further, planned changes to the ESS baseline may require redesign of the beam transport system and the detector technology for the diffraction instrument class is unproven, increasing cost, risk and schedule uncertainty.

Instrument: LOKI  
Broad-band SANS for multi-scale systems

9/9/2015

Instrument Consortium Executive Board members (preliminary)

Proposer: Andrew Jackson and Kalliopi Kanaki, ESS  
Lead scientist: Andrew Jackson, ESS  
Lead engineer: David Turner, STFC/ISIS  
Lead institution: STFC/ISIS  
STFC/ISIS representative: TBD  
ESS representative: Andrew Jackson  
Other representatives: TBD

Project budget: 12.19 MEu  
Budget status: TG2-approved  
Staging plan budget: 2.4 MEu  
Staging plan funding: TBD

Current status: Phase 2 15% complete

STC approval: September 2013 Tranche 1

Phase 1 - Preliminary Design

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Start date: January 2014  
Budget: 420 kEu status: agreed  
Scope-setting meeting date: 05/12/2014  
TG2 date: 12/12/2014 outcome: pass, with recommended changes

Phase 2 - Detailed Design

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Start date: January 2016

Phase 3 - Procurement, Construction, Installation

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Start date:

Phase 4 - Cold Commissioning

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Start date:

Phase 5 - Hot commissioning

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Start date: December 2020

Phase 6 - User operations

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Start date: March 2023

Major in-kind components

Component	Provider	Value	Status
LoKI	STFC/ISIS	8.9 M€ *	MoU signed
Detectors	Milano-Bicocca University, Italy	~2.5M€	under discussion
Total value of in-kind contributions		~94%	draft budget

\* Cost book value minus ESS cash spend to end 2015 and estimated value of detector workpackage.



Current status of LOKI (updated 04/29/2016):

As of December 2015, the LOKI project is now led by STFC/ISIS. Andrew Jackson remains as lead scientist, with David Turner from ISIS as lead engineer. Clara Lopez, formerly lead engineer, is now taking the role of integration engineer for LOKI and any other instruments that ISIS will lead. Richard Heenan will be working part-time on LOKI in support of the lead scientist. The lead scientist is spending up to 2 weeks per month at ISIS working directly with the engineering team.

The model chosen by ISIS is such that they are "prime contractor" and as such take responsibility for the delivery of the whole instrument. The design and procurement work will take place primarily at ISIS by ISIS staff. The instrument will then be largely pre-assembled at ISIS, by ISIS staff, for testing of fit and mechanical function and will then be shipped to ESS for re-assembly by ESS staff. The integration engineer will be responsible for managing the installation work at ESS in addition to being the engineering interface between ISIS and ESS.

A large rectangular cross-section detector vessel concept has been chosen that should allow for various possible detector options to be installed.

Work in 2016 has been primarily focussed on adapting to the new bunker shielding design, with the goal of removing mechanical components from the bunker wall.

The BAND-GEM detector development continues well and demonstrator modules will be tested at ISIS in May 2016. A full size detector module will be tested in late summer 2016, with final specifications and a technical annexe for production planned for the end of 2016.

Instrument:    MAGiC  
Polarized Single Crystal Diffractometer

27/04/2016

Instrument Consortium Executive Board members

Proposer: Xavier Fabrèges, LLB  
Lead scientist: Xavier Fabrèges, LLB  
Lead engineer: Sergey Klimko, LLB  
Lead institution: LLB  
LLB representative: Xavier Fabrèges  
JCNS representative: Werner Schweika  
PSI representative: Uwe Filges

Project budget: 15 M€  
Budget status: from proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: in phase 1                      0% complete

STC approval:                      October 2015                      Tranche 2

Phase 1 - Preliminary Design

Start date: March 2016  
Budget: 423 kEu                      status: pending  
Scope Setting Meeting date: October 2016  
TG2 date: January 2017 (projected)

Phase 2 - Detailed Design

Start date: February 2017 (projected)

Phase 3 - Procurement, Construction, Installation

Start date:

Phase 4 - Cold Commissioning

Start date:

Phase 5 - Hot commissioning

Start date:

Phase 6 - User operations

Start date:

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions		100%	draft budget

### Current status of MAGiC:

MAGiC has been accepted by the SAC in May 2015 and has entered Phase-1 in March 2016. The instrument is fully funded by three in-kind contributions of France (LLB 60%), Germany (JCNS, 25%) and Switzerland (PSI, 15%). A MoU between the three partners is in preparation and should be signed soon. The instrument consortium will be led by LLB with the aim of delivering it for hot commissioning in 2021 and user operations in 2023.

MAGiC is a cost category B instrument (12 M€). The preliminary full scope budget from the proposal was of 15 M€. A more detailed budget is under preparation for presentation to the STAP (22/23 June 2016) and scope setting (October 2016) meetings. Most of the MAGiC components have now been budgeted at the exception of shielding. Intensive simulations are undergoing to reach an accurate estimate.

Instrument: MIRACLES 27/04/2016  
TOF Backscattering Spectrometer, with flexibility between flux and resolution.

Instrument Consortium Executive Board members

Proposer: H.N. Bordallo, N. Tsapatsaris, R.E. Lechner, M. markó  
Lead scientist: J. Bermejo  
Lead engineer: I. Herranz, F. Sordo, M.Magán, P. Luna  
Lead institution: ESS Bilbao  
ESS representative: TBD

Project budget: 14.5 M€  
Budget status: According to ESS-0044664  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: Phase 1. Reoptimization of the instrument and review of the budget.  
The current estimation of the scope setting meeting date is very end October 2016

STC approval: 2015

Tranche 1

Phase 1 - Preliminary Design

Start date: 1/2/2015

Budget: 520000.0 € status: budget estimation for phase 1

TG2 date: TBD outcome:

Phase 2 - Detailed Design

Start date: TBD

Phase 3 - Procurement, Construction, Installation

Start date: TBD

Phase 4 - Cold Commissioning

Start date: TBD

Phase 5 - Hot commissioning

Start date: TBD

Phase 6 - User operations

Start date: TBD

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions		14.0 M€	draft budget

Current status of instrument (27/04/2016):

The MIRACLES team is now studying how to redesign the primary spectrometer of the instrument, since the proposal of this instrument was based in the TDR moderator (and the final one is the butterfly). This affects the flux of the instrument and also the divergence distribution that could have significant impact on the scientific performance of the instrument, point that is under study in this moment.

Apart from this point, the instrument has to adapt to other two modifications, that are the beamport allocation (West 5), that was not fixed when the proposal concept was decided, and the position of the first chopper (that was 6,5 m according to the proposal and now is 7,0 m).

The new team for MIRACLES started a few months ago and is expected to finish the phase I in one year (02/2017).

Instrument: NMX

3.5.2016

Instrument description: NMX is a time-of-flight quasi-Laue diffractometer optimised for small samples and large unit cells in macromolecular crystallography and materials science.

Instrument Consortium Executive Board members (tentative)

Proposer:	Esko Oksanen, ESS
Lead scientist:	Esko Oksanen, ESS
Lead engineer:	Giuseppe Aprigliano, ESS
Lead institution:	ESS
IBS representative:	Jean-Luc Ferrer
Wigner representative:	Marton Marko
EK representative:	Szabina Török
BRC representative:	Sandor Brockhauser
UiB representative:	Petri Kursula
Project budget:	11 670 196 €
Budget status:	TG2-approved
Staging plan budget:	300-1000 k€ (Stage 1, detector coating upgrade)
Staging plan funding:	To be determined

Current status: 6% complete

STC approval: 10.10.2013 Tranche 1

Phase 1 - Preliminary Design

Start date:	7.1.2014	
Budget:	343 560 €	status: agreed
TG2 date:	11.12.2014	outcome: passed, with recommended changes

Phase 2 - Detailed Design

Start date: 1.6.2016 (projected)

Phase 3 - Procurement, Construction, Installation

Start date: 1.7.2017 (projected)

Phase 4 - Cold Commissioning

Start date: 1.6.2019 (projected)

Phase 5 - Hot commissioning

Start date: 1.1.2020 (projected)

Phase 6 - User operations

Start date: TBD

### Major in-kind components

Component	Provider	Value	Status
Engineer secondment	Wigner institute	182 k€	TA signed
Chopper system	Wigner institute	357 k€	TA signed
Shielding design	Energy Research Institute	160 k€	TA signed
Neutron optics	Wigner institute	~900 k€	Waiting design study
Shielding	Energy Research Institute	~1700 k€	Waiting design study
Detector positioning system	IBS	~500 k€	Discussions ongoing
Detector readout	University of Bergen	~700 k€	Discussions ongoing
Sample preparation area	University of Bergen	~400 k€	Discussions ongoing
Projected total value of in-kind contributions		8150 k€	

The NMX work package completed preliminary engineering design in 2014 and successfully passed Tollgate 2 (TG2) in December 2014. The baseline design presented at TG2 delivers the scientific performance outlined in the instrument proposal with the allocated budget of ca. 11.7 M€. The recommendations of the TG2 panel were implemented in early 2015 and instrument consortium established. The detailed design phase is stalled waiting for the target engineering design and the bunker design, to which the optics and shielding design is being adapted (as an in-kind from Hungary). The detailed design phase will culminate in in Tollgate 3 (scheduled in June 2017) after which procurement will begin. Early procurement (through an-kind contract) is foreseen for the neutron optics, where Wigner Institute will do the engineering design.

The detector technology will be chosen in December 2016 and the ESS Detector Group in collaboration with CERN are making strong progress in R&D for Gd-GEM detectors funded by the BrightnESS project. In-kind partners will be selected one the design is available.

Instrument: ODIN

27/4/2016

Instrument description: Multi Purpose Imaging Beamline

Instrument Consortium Executive Board members

Proposer: M Strobl, ESS  
Lead scientist: M Strobl, ESS  
Lead engineer: not in place  
Lead institution: ESS (preparing to transfer to TUM)  
TUM representative: B. Schillinger (tbc, formalisation in preparation)  
PSI representative: E. Lehmann (tbc, formalisation in preparation)

Project budget: proposed 14 Mio / CC A 9 Mio communicated / realistic 12 Mio discussed (TBC)

Budget status: to be reviewed, TBC

Staging plan budget: 2 Mio, to be reviewed, TBC

Staging plan funding: in preparation

Current status: Phase 1 app. 10% complete

STC approval: July 2013 Tranche 1

Phase 1 - Preliminary Design

Start date: Jan 2014

Budget: 489 kEuro

status: TBC

TG2 date: Oct 2016

outcome: TBD

Phase 2 - Detailed Design

Start date: Feb 2017 (TBD)

Phase 3 - Procurement, Construction, Installation

Start date: Jan 2018 (TBD)

Phase 4 - Cold Commissioning

Start date: TBD

Phase 5 - Hot commissioning

Start date: Dec 2020

Phase 6 - User operations

Start date: Mar 2023

Major in-kind components

Component	Provider	Value	Status
Project lead, shielding, shutter, disc chopper system	TUM	7 Mio	In preparation with TUM, TBC
Neutron optics, detectors (partly), cave interior	PSI	4.5 Mio	In preparation with PSI, TBC
Total value of in-kind contributions		85-95%	Budget TBD (see above)



Current status of instrument (27/4/2016):

- Project basically on hold waiting for TUM to be ready to continue
- exception: PSI active implementing changes to baseline design wrt to new moderator and extraction baseline and preparing for required change to 3cm moderator as well as background simulations;
- New instrument scientist to start working at TUM 1.6.2016
- New Instrument engineer expected to be available at TUM on same time scale

Instrument: SKADI  
High resolution polarized SANS

03/05/2015

Instrument Consortium Executive Board members

Proposer: Henrich Frielinghaus, FZJ  
Lead scientist: Sebastian Jaksch, FZJ  
Lead engineer: Romuald Hanslik, FZJ  
Lead institution: Forschungszentrum Jülich  
FZJ representative: Sebastian Jaksch  
LLB representative: Jacques Jestin  
LLB engineer: Sylvain Désert

Project budget: 14.2 M€  
Budget status: Proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: approved for Phase 1 / need to wait for official BMBF decision

STC approval: October 2014

Tranche 1

Phase 1 - Preliminary Design

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Start date: September 2015  
Budget: 492.2 k€                      status: TBD  
TG2 date: July 2016                outcome:

Phase 2 - Detailed Design

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Start date:

Phase 3 - Procurement, Construction, Installation

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Start date:

Phase 4 - Cold Commissioning

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Start date:

Phase 5 - Hot commissioning

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Start date:

Phase 6 - User operations

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Start date:

Major in-kind components  
Not yet defined

Current status of instrument (date): 2015-09-09

The SKADI team are preparing to enter Phase 1 in September this year. The team has started regular preparatory meetings involving all partners and ESS. The level of effort and division of work between FZJ and LLB has been agreed.

Current status of instrument (date): 2016-05-03

The SKADI team are preparing for TG2 in September this year. STAP meeting is scheduled for 10<sup>th</sup> of May, scope setting meeting is scheduled for 20<sup>th</sup> of June.

Instrument: T-REX  
Bispectral Chopper spectrometer

27/04/2016

Instrument Consortium Executive Board members

Proposer: Thomas Brückel,  
JCNS, Forschungszentrum Jülich GmbH  
Lead scientist: Nicolò Violini, JCNS, Forschungszentrum Jülich GmbH  
Lead engineer: Hans Kämmerling,  
ZEA-1, Forschungszentrum Jülich GmbH  
Lead institution: JCNS, Forschungszentrum Jülich GmbH  
Other representatives: Jörg Voigt, JCNS  
Andrea Orecchini,  
Uni Perugia & Centro Nazionale delle Ricerche (CNR)

Project budget: 19,932 MEu  
Budget status: from proposal  
Staging plan budget: TBD  
Staging plan funding: TBD

Current status: preparing to enter phase 1

STC approval: Oct 2015                      Tranche 2

Phase 1 - Preliminary Design

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Start date: May 2016  
Budget: 397,65 k€                      status: in discussion  
TG2 date: January 2017

Phase 2 - Detailed Design

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Start date:

Phase 3 - Procurement, Construction, Installation

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Start date:

Phase 4 - Cold Commissioning

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Start date:

Phase 5 - Hot commissioning

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Start date:

Phase 6 - User operations

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Start date:

Major in-kind components

Component	Provider	Value	Status
Total value of in-kind contributions			

Current status of T-REX project (updated 27/4/2016):

T-REX has been endorsed by the SAC in May 2015 and approved by the ESS Steering Committee in October 2015.

A proposal including the construction phase costs of T-REX has been submitted to the German national funding agency.

The MoU between JCNS and CNR is in preparation and under discussion. The instrument consortium for construction will be led by JCNS. CNR is anticipated to contribute to construction as a minor partner for T-REX.

A bilateral research contract between ESS and Forschungszentrum Jülich about phase 1 is under discussion. The document describes the terms of the agreement concerning the funding mechanism of phase 1, for the level of participation to the T-REX project, from the Jülich Centre for Neutron Science – JCNS.

The partners are preparing the "Scope of Work and Schedule", which describes the scope of work and the schedule for phase 1 of T-REX and the terms of the agreement concerning the funding mechanism of phase 1 for the contribution to the T-REX project, from the CNR.

The Phase 1 work on key components is in preparation with anticipated involvement of the ESS technology groups.

Various detector concepts are under consideration. In particular with the aim to make use of current ESS developments on B-10 solid converter Multi-GRID, as proposed, the concept will be studied during Phase 1 in further detail. The work-package will provide the parties involved with enough information about specifications, degree of achievements of the scientific requirements, cost, schedule for procurement and installation. The comparative analysis of alternative concepts will ensure that sufficient information will be obtained to make an informed decision on the adopted solution.

The conceptual design of the shielding shall be investigated during phase 1, by making use of ESS human resources, according to the agreement on the funding mechanism above. For this purpose a work order is under discussion between IK partners and ESS. As the shielding concept has an impact on the level of high energy radiation along the beamline, its design will affect the design and characteristics of other key components, like for instance neutron guide and T0-chopper. Therefore the work package on shielding is expected to start as early as possible, to ensure that sufficient time is left to adapt to any changes needed to the other work packages involved.

The neutron optics will be eventually updated and optimized after the decision is made about the baseline of the moderators and the design of the inserts. The optional collimation system to enable small detection angles and improved Q resolution, has not yet been specified in the proposal and is planned to be defined during Phase 1.



*Major in-kind components*

Component	Provider	Value	Status
Total value of in-kind contributions			

**Current status of instrument (date: 29/04/2016)**

The Italian CNR has presented a MoU to ESS that has been signed on February the 3<sup>rd</sup> 2016. CNR could provide about 75% of the funds needed for the VESPA project with a spending time-line still to be defined. The remaining 25% will have to be provided by another partner. Negotiations with ISIS (STFC, UK) are currently going on. The appointment of a lead engineer is also related to these negotiations.

The original VESPA proposal (April 2015) was based on Monte Carlo simulations making use of the so-called thermal “pancake” moderator, which has been recently superseded by the “butterfly” one. The “butterfly” moderator components for McStas are now fully available, so the parameters of elliptic guides and choppers for VESPA have to be updated, even though preliminary simulations show that they should be all right as they are.

The instrument concept has been recently submitted for publication on *Review of Scientific Instruments* (March 2016):

*VESPA: the vibrational spectrometer for ESS*

by A. Fedrigo, D. Colognesi, M. Bertelsen, M. Hartl, K. Lefmann, P. P. Deen, M. Strobl, F. Grazzi, and M. Zoppi