Sample Environment Joint Research Activity

FP7 NMI3 Project

NMI3 - Neutron & Muons Integrated Infrastructure Initiative

Scientific Advisory Board

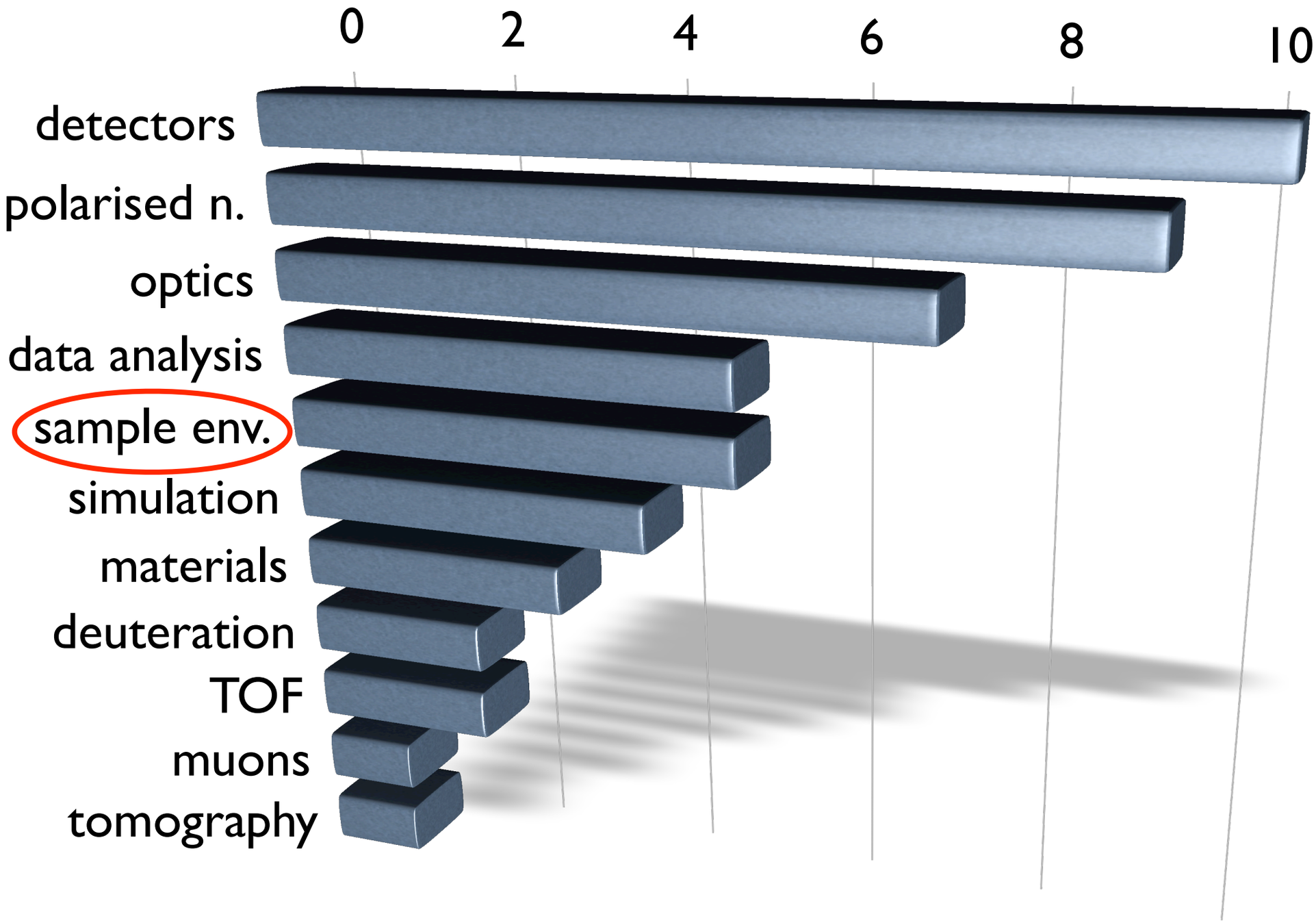
NMI3 Members

- Co-ordination @ ISIS
  - Administration
  - Finance
  - Information
- Networking Activities
  - Schools
  - Workshops
  - Exchanges
- Access Contracts
  - ISIS
    - PSI
      - NPI
  - HMI
    - BNC
      - …
- Joint Research Activities
  - ??
    - ??
      - ??
  - SE?
    - ??
      - …

Timetable

- January 26, 2006 : NMI3 Meeting at FRM2
- May 1, 2006: List of topics sent to RMG
- October 9-11, 2006: Presentations of the projects at the NMI3 meeting
- January 2007: NMI3 proposal written
- June 2008: End of FP6 NMI3 project
- 2008: Beginning of the FP7 project

Number of propositions sent to R. McGreevy



Propositions sent by MM and ELB on April 12:

- **Adsorption Sample Environment**

  designed in a modular fashion to be used on different types of neutron scattering instruments (<200 bar, 3-1000K)

  - precision gas handling system
  - controlled sample changer with preparation option
  - humidity controlled bio-sample chamber with mass monitoring option
  - application to hydrogen, deuterium, oxygen including safety aspects

- **Gas Pressure Systems**
  - up to 10kbar pressure cells with in-situ pressure control
  - application to hydrogen, deuterium, oxygen including CE certification and safety aspects

- **Very high temperature furnaces**
  - sample levitation system using electric levitation or gas-flow techniques
  - maximum temperatures above 2000°C

- Proposed by FRM-II:
  - In-situ gas loading sample chamber, especially for hydrogen
  - Optimisation of sample throughput under varying conditions (temperature, preparation stage with controlled atmosphere)
  - Sample environment of bio-samples with humidity and temperature control
  - High temperature furnace for spin-echo instruments

  - Development of a self-shielded asymmetric, liquid cooling free high field magnet (10T)
  - Development of asymmetrical split-pair coil cryogen-free magnet optimised for ^{3}He polarisation (for avoiding spin filter depolarisation)

- Also proposed by HMI:
  - Components for use in high field magnets
  - Time-pulsed sample environment, e.g. laser pulses for periodically creating excited states in light-sensitive biological or other systems correlated with neutron scattering experiments at the excited and ground states.

- Proposed by PSI:
  - Shear cells for SANS and reflectometry applications such as the rheological investigation of nanofluids

  - There exist a vast and largely unexplored potential for extending neutron investigations with the <u>combination of auxiliary methods</u>. Two general types are:
    (a) simultaneous measurements of microscopic (neutron diffraction or spectroscopy) and thermodynamic (susceptibility, calorimetric etc.) properties.
    (b) "Pump-probe" methods (AC, RF), where the physics of the sample is controlled by an auxiliary method, and the response is recorded with neutron techniques.

- Also proposed by ILL:
  - Very high magnetic field project

    To define and to characterise a design of a split-coil large continuous field magnet design. Matching of the coil and neutron beam geometry, identification of suitable material choices, etc.

Priorities ?

Very high temperature furnaces	BNC, FRM-II, HMI, ILL, ISIS, NPI, …
Gas pressure systems	BNC, FRM-II, HMI, ISIS, ILL, …
Adsorption sample environment	BNC, HMI, ISIS, ILL, …
Pump-probe methods	BNC, HMI, PSI, …
Shear cells for SANS and reflectometry	BNC, PSI, …
Combination of auxiliary methods	PSI, …
Components for use in high field magnets	HMI, …
Self-shielded cryogen-free magnets	FRM-II, …
…?	…?

… FZJ ? LLB ?

General comments

- from ISIS (R. McGreevy):

  A wide range of ideas on sample environment development. The high magnetic field would be appropriate for a design study proposal outside of NMI3.

  For other ideas priorities would have to be made, but it isn't obvious how a SE JRA, unless extremely focussed, would be a real collaboration. Is a development + technology transfer model appropriate? (Also since some of the things suggested already exist in some places).

- from FRM-II:

  JRA makes sense if only one system going to be developed and groups can really share tasks.

- from ILL:

  ILL "Very high field" project will follow a different route. Self-shielded magnets are already developed by a few companies. ILL agrees with R. McGreevy comments.

- from HMI:

  HMI agrees with R. McGreevy comments.

SE-JRA proposal

- Tasks (Gantt chart)
  - milestones
  - deliverables
- Implementation plan
- Partners ? Observers ?
- Co-ordinator ?

SE-JRA Proposal

Dissemination of knowledge, Tech. transfer	BNC, FRM-II, HMI, ILL, ISIS, NPI, …
Very high temp. furnaces - levitation (+3000°C)	BNC, FRM-II, HMI, ILL, ISIS, NPI, …
Gas pressure systems (10 kbar) • high-precision in-situ control (ILL) • application to H_2, D_2, O_2 (HMI + ISIS)	BNC, FRM-II, HMI, ISIS, ILL, …
Adsorption sample environment • precision gas handling system (HMI+ ISIS) • humidity controlled bio-sample chamber with mass monitoring option (ILL)	BNC, HMI, ISIS, ILL, …
Pump-probe methods	BNC, HMI, PSI, …
Shear cells for SANS and reflectometry	BNC, PSI, …
Combination of auxiliary methods	PSI, …
Components for use in high field magnets	HMI, …
Self-shielded cryogen-free magnets	FRM-II, …

… FRM-II ? FZJ ? LLB ? PSI ?