



ISIS – Science and Technology Facilities Council

ACCESS Activity presentation
by Uschi Steigenberger, Philip King, Adrian Hillier
General Assembly in Villigen, CH
March 31, 2009



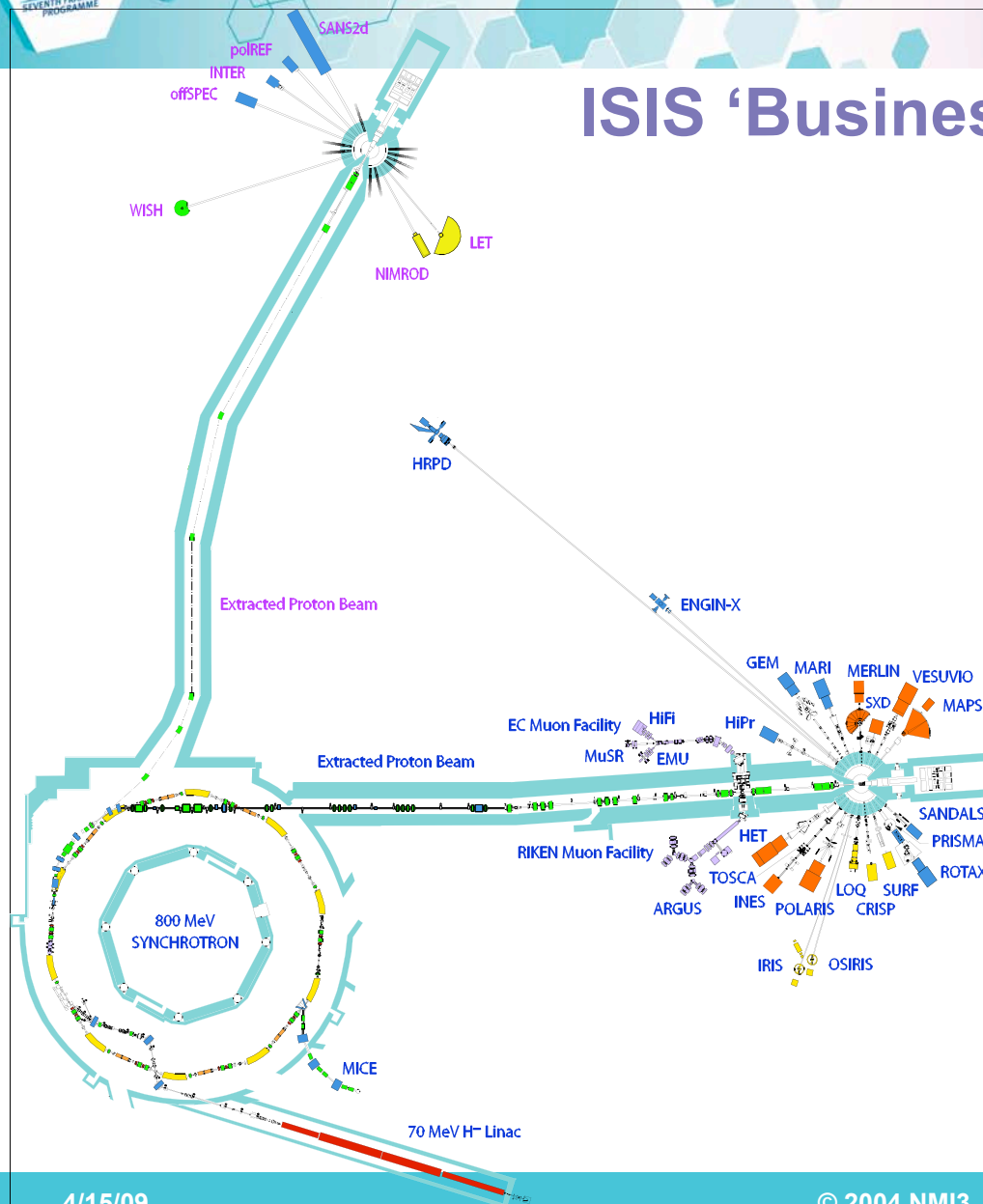
NMR

lasers

X-rays

Neutrons and muons

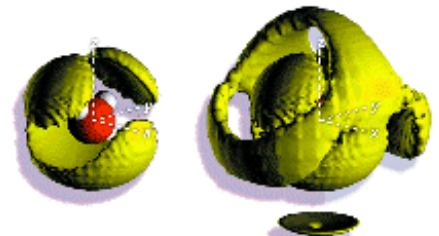
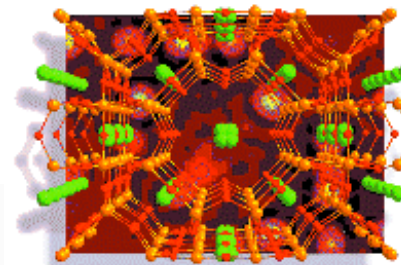
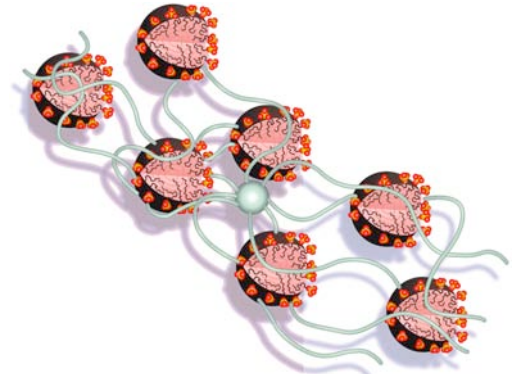
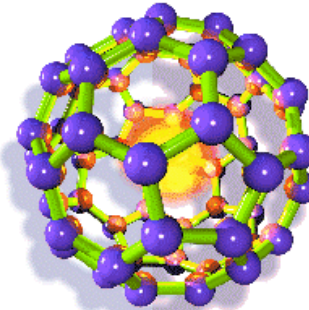
ISIS 'Business'



- World-leading Pulsed Neutron and Muon Facility
- Broad Academic Base
~1500 users/yr
- 650+ Experiments/ yr
- 18 Neutron + 5 Muon Instruments
- 400+ Publications/ yr
- From 2009: + 7 Neutron Instruments on TS2

Science at ISIS

- Materials & processing
- Energy for the future
- Environment & clean technology
- Nanotechnology
- Sensors & smart materials
- IT & quantum devices
- Drug design & pharmaceuticals
- Bio-technology & materials
- Cultural heritage
- Fundamental physics & chemistry



ISIS users at work

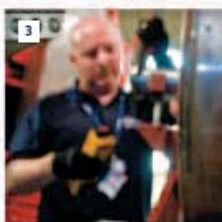


1. Shalev Serial (Hebrew University and Weizmann Institute, Israel) and Shaleim Sana (Weizmann Institute, Israel) using Rotax to study phase and element variations in Middle Bronze Age copper-based axes. ORE C2873

2. François Fillard (CNRS, France) seeking macroscopic quantum entanglement in the isotopic mixture $KH_{0.9}D_{0.1}CO$ on SXD. ORE C2853



3. Enrico Perelli Cippo (Milan-Bicocca University, Italy) using Engin-X for comparative analysis of new and end-of-life wheel rims from a high speed train for the identification of rolling contact fatigue effects. Dave Marwell (ISIS) can be seen loading the wheel rim on to the instrument in the background. ORE C2887



4. Tom Headen (University College London) at ISIS during his investigations of the structure of liquid toluene and coronene solutions in toluene on SANDALS. ORE C2857

Emma Barney (ISIS), Xuegen Zhai (Salford University), Richard Haynes (ISIS), Nigel Mellors and Christopher Quinn (Salford University) using CEM for characterization of phases and short-range ordering of Ca in Fe-Ca alloys. ORE C2840



Jan Silverwood and Neil Hamilton (Glasgow University) preparing for inelastic neutron scattering studies of catalysis on MAPS. ORE C3084



5. Stuart Huntun and Natalie Sorbie (Glasgow University) using Polaris to study the interplay of structure, stoichiometry and anion mobility in new nitride catalysts. ORE C2830

6. Heloisa Bordallo (HMI, Berlin, Germany) using Osiris to study the behaviour of the 2D molecular magnet $Fe(NCS)_2$ (pyrazine), under applied magnetic fields. ORE C2899



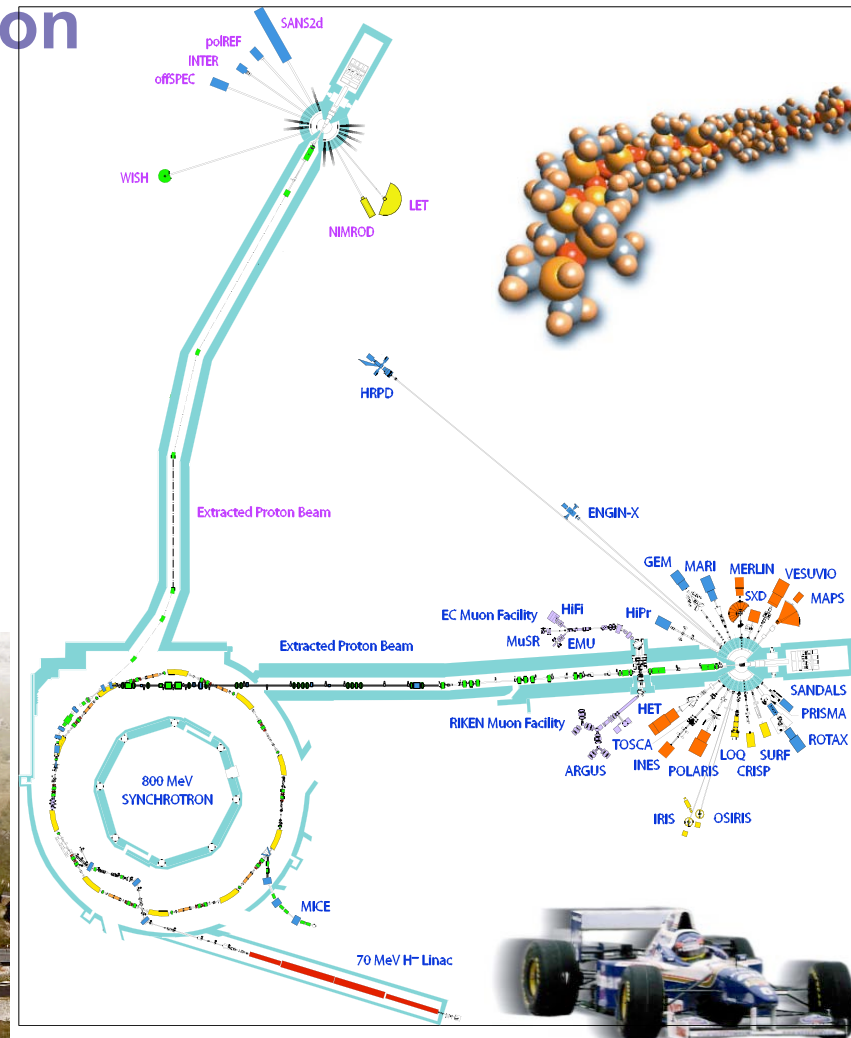
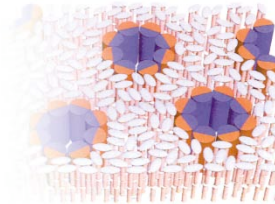
7. Craig Bull and Katsuki Komatsu (Edinburgh University) using SXD to investigate molecular materials under pressure. ORE C2802

Renata Nilmini (Cardiff University) and Lorella Izzo (Salerno University, Italy) preparing samples for studying the effect of polymer surfactant interactions. ORE C2861



ISIS Second Target Station

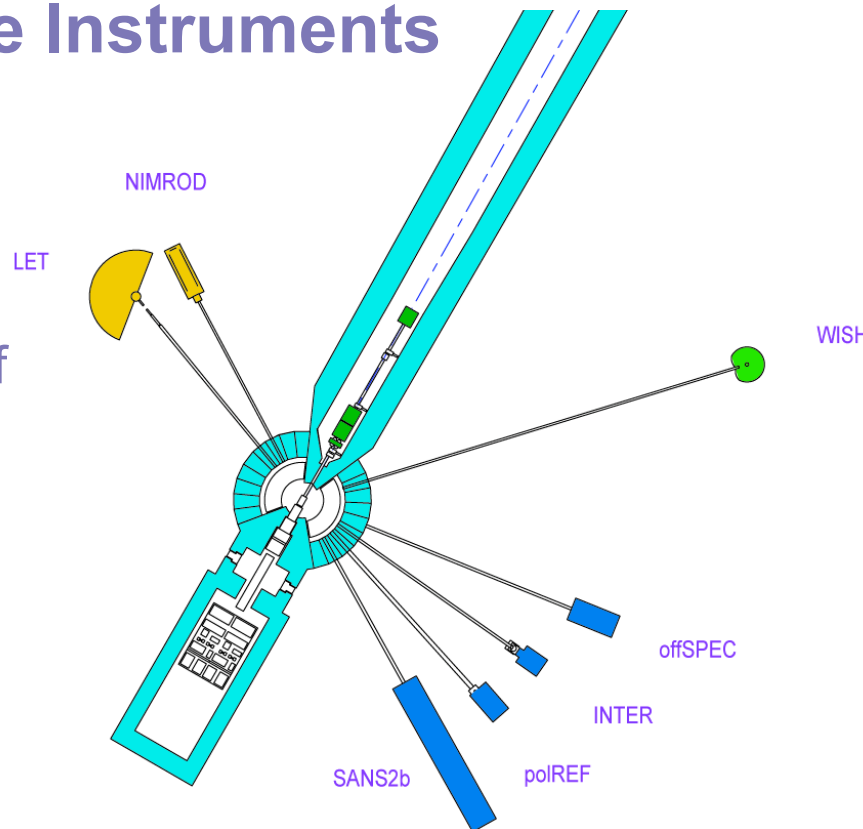
- £150M project
- Key science areas:
 - Soft Matter
 - Advanced Materials
 - Bio-molecular Science
 - **Nanoscience**



Phase One Instruments

Dynamics

LET High-resolution measurement of material energy scales



Structures

NIMROD Intermediate range order in liquids

WISH High-resolution magnetic structure

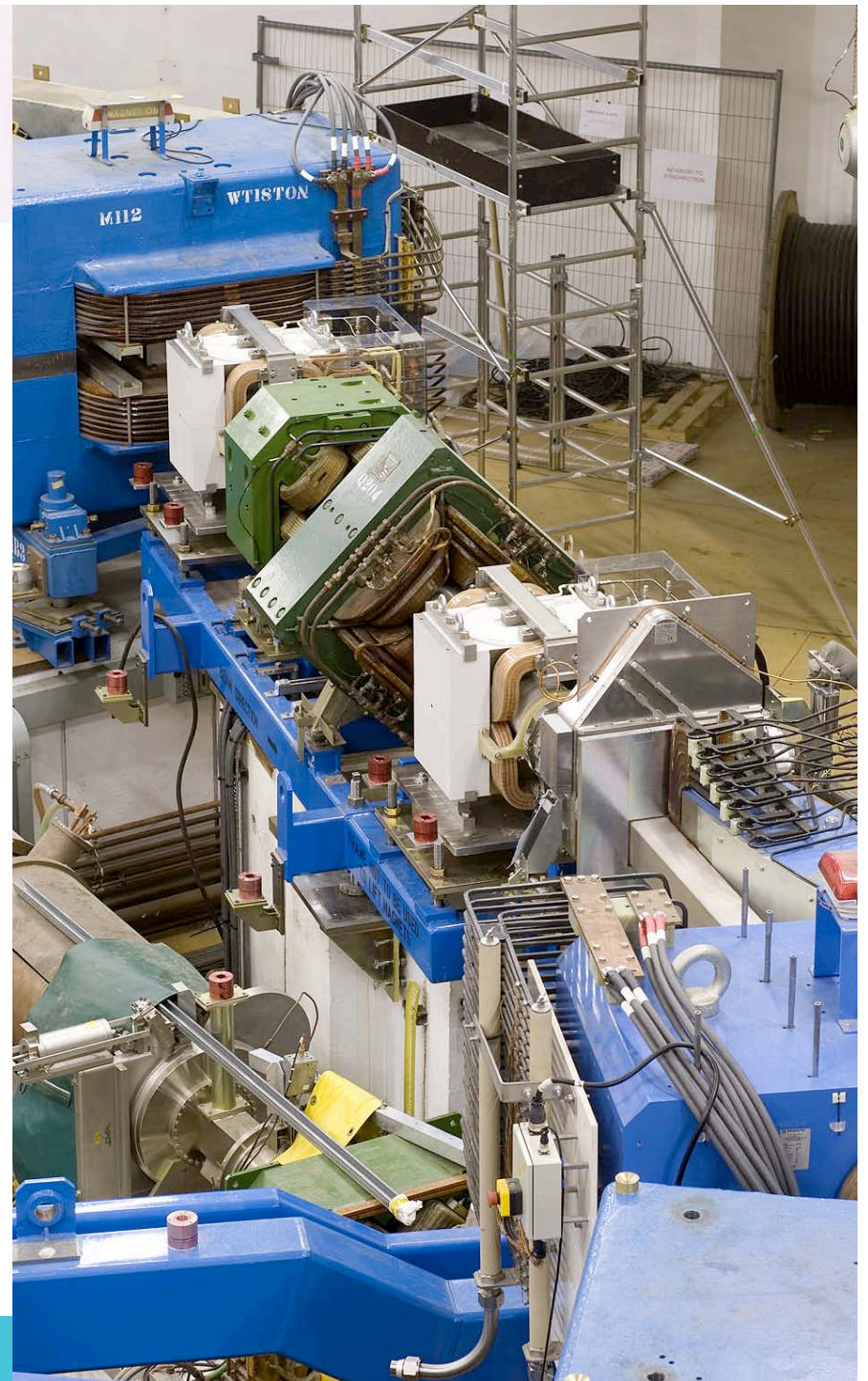
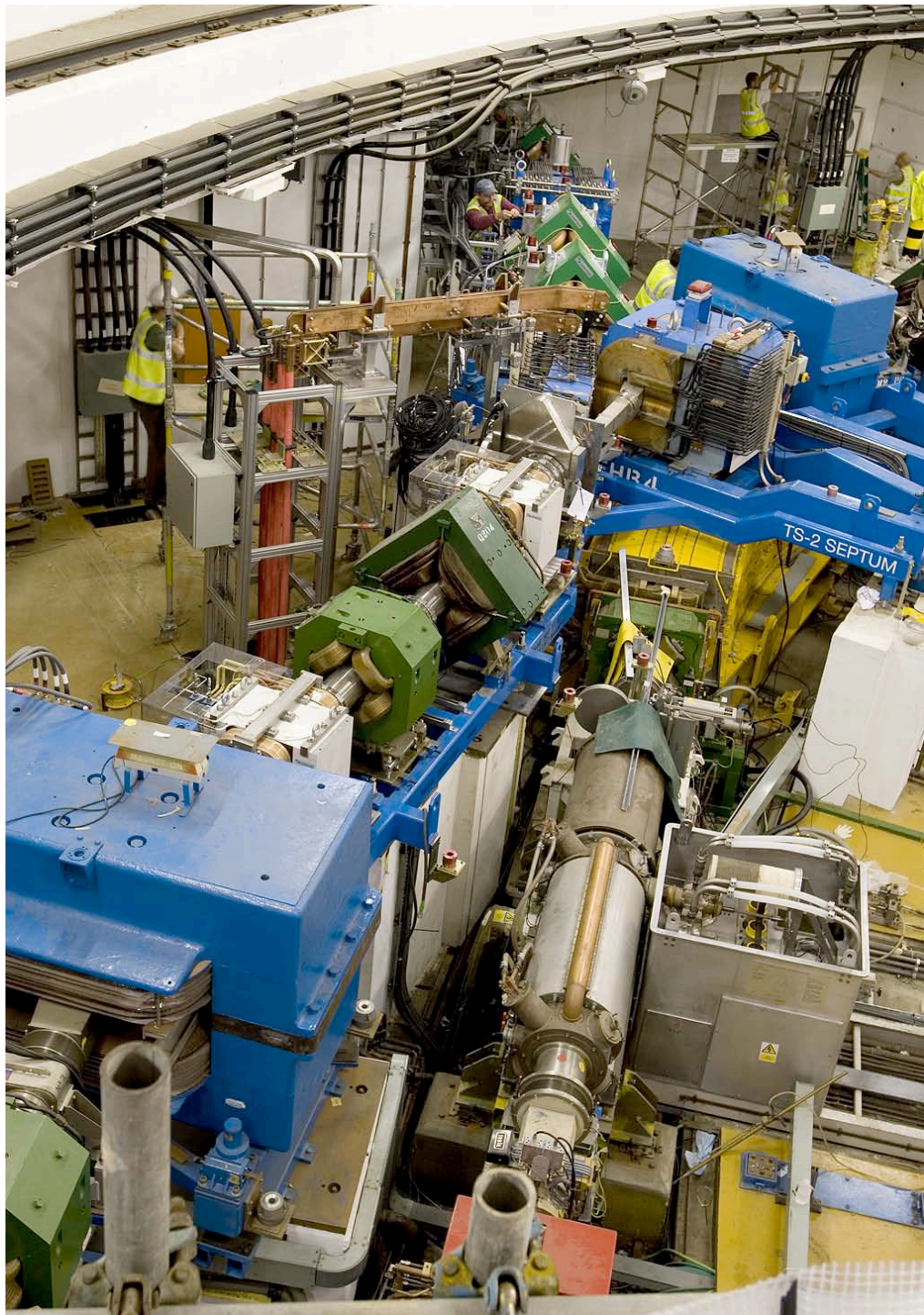
SANS2D Large molecule structure in multi-component systems

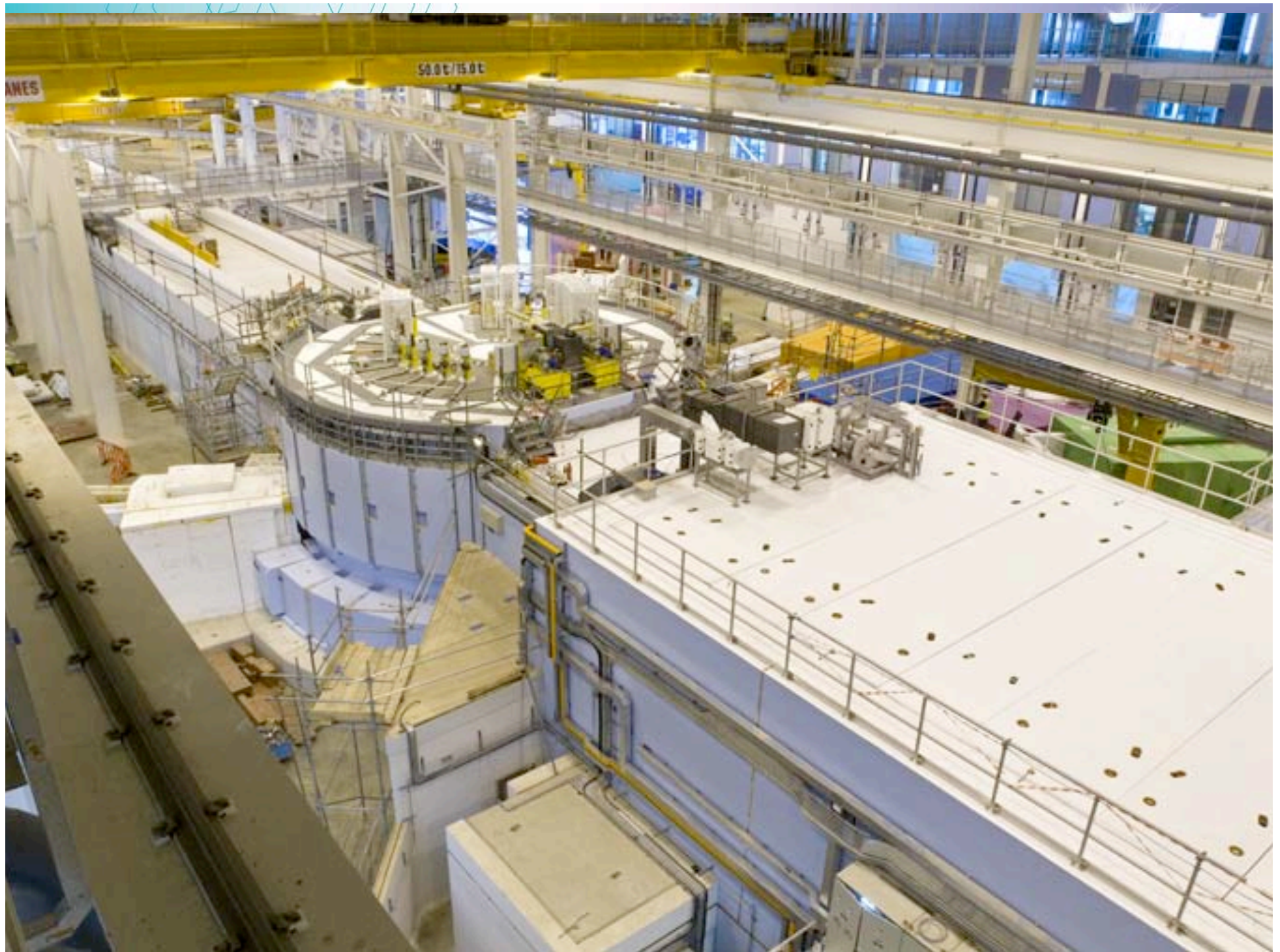
Reflectometry

INTER Air/ liquid/ solid interface interactions

OFFSPEC Structures of membrane, protein and liquid interfaces

POLREF Interface measurements in magnetic sensor devices

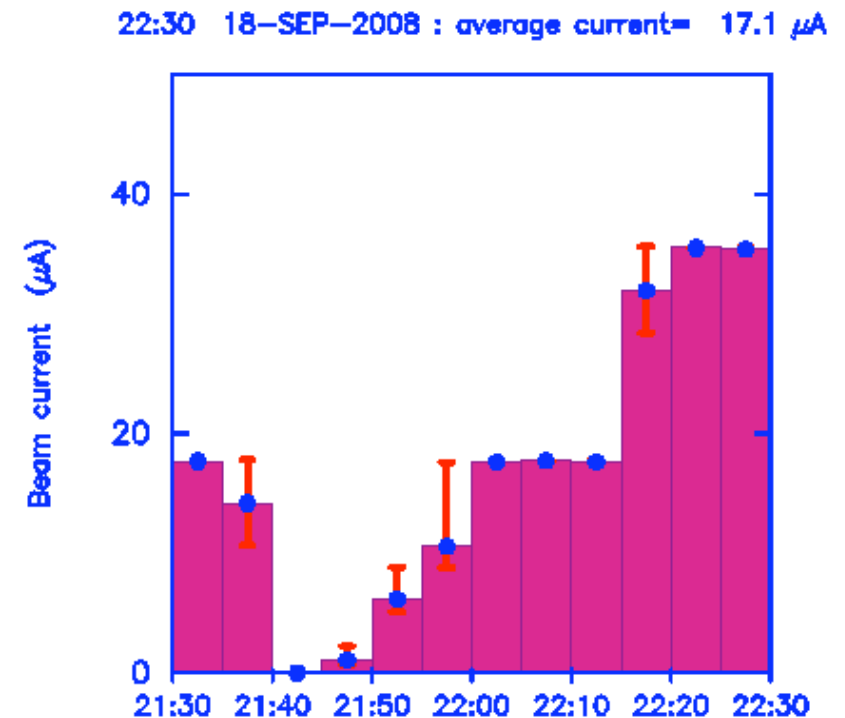




ISIS Second Target Station

■ Milestones

- First protons: 14 December 2007
- First neutrons: 3 August 2008
- 10 pps running: 18 September 2008
- INTER, POLREFF, OFFSPEC & NIMROD: in scientific / technical commissioning
- WISH & SANS2D: start in March 2009
- LET: in late spring



ISIS Second Target Station First Neutrons!

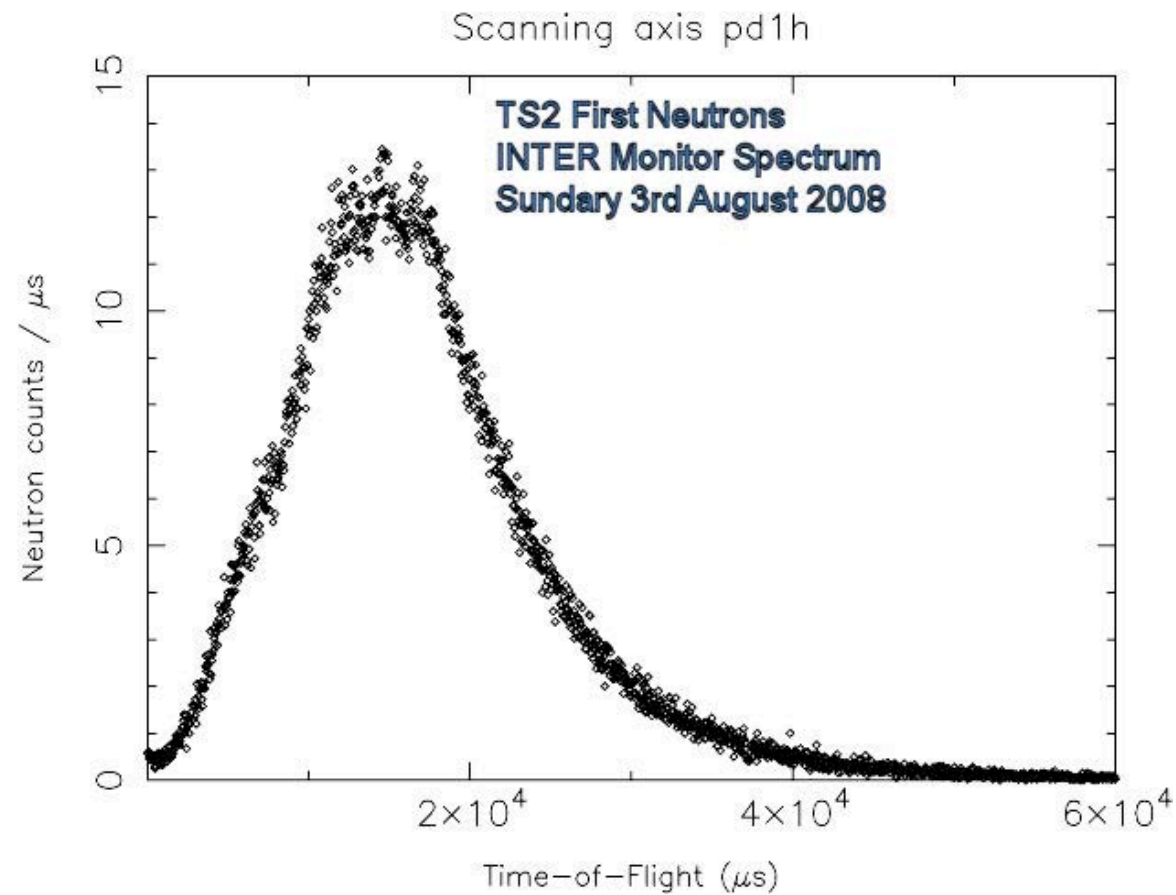


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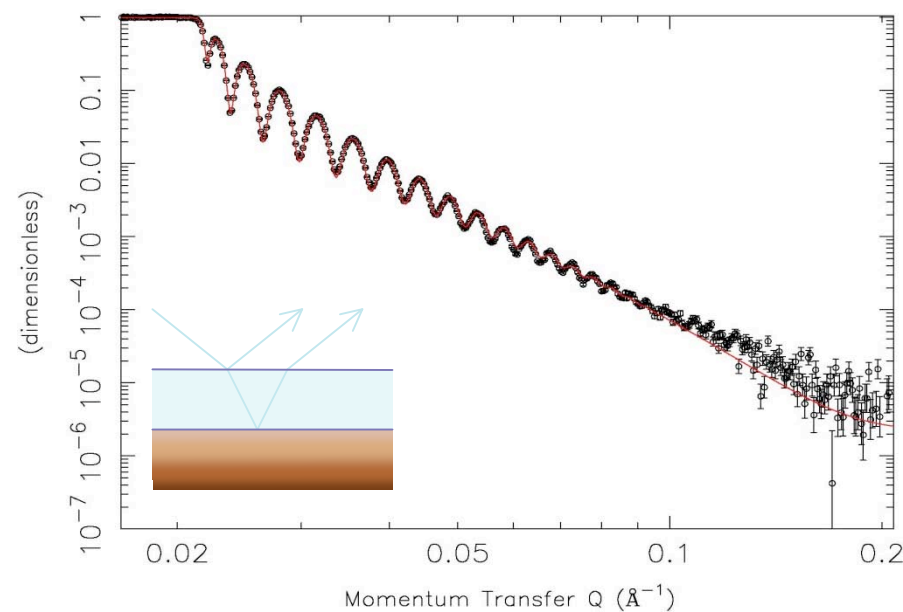
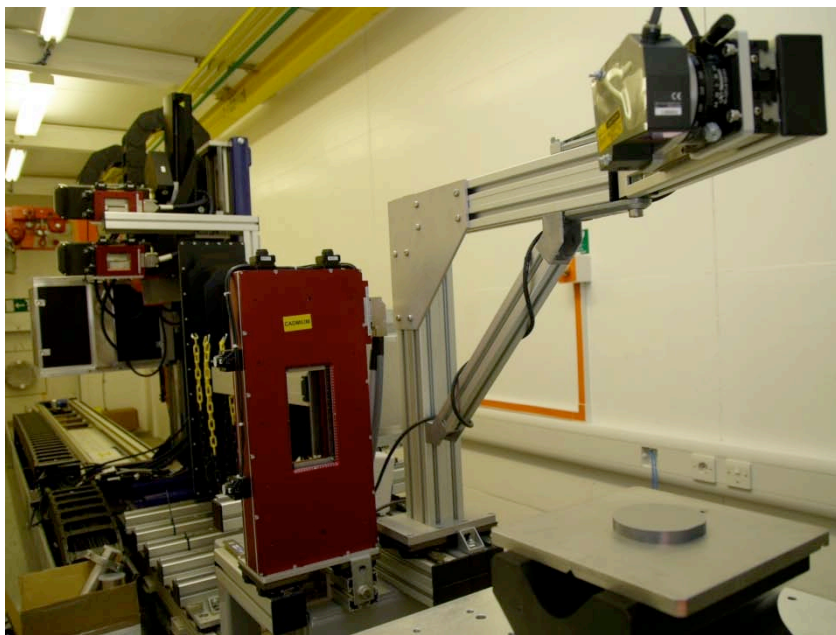
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ISIS Second Target Station First Neutrons!



INTER: Chemical interfaces

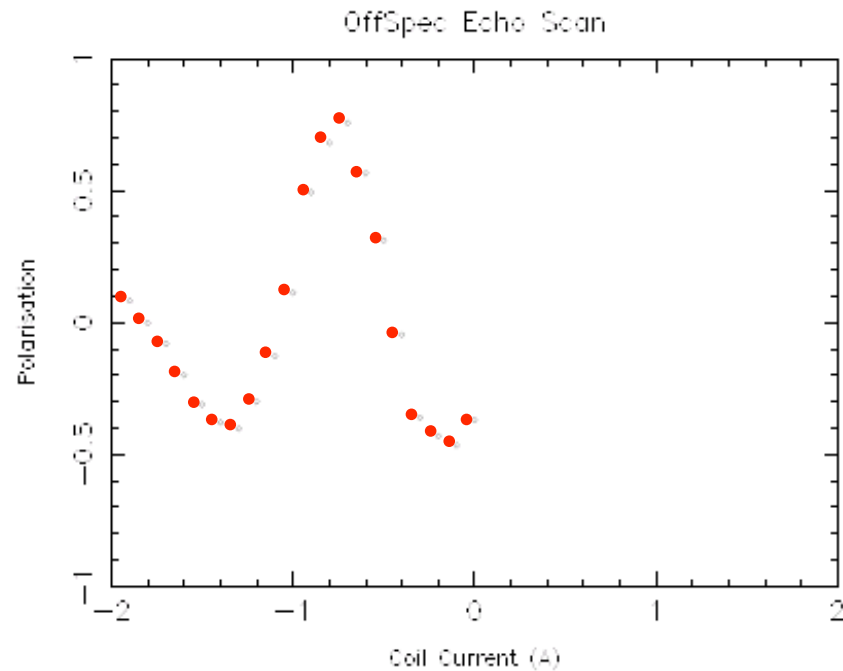
- First neutrons: 3 Aug 2008
- First data: 29 Sept 2008



First reflectivity measured on INTER.
Nickel/Carbon film (1216 Å) on glass

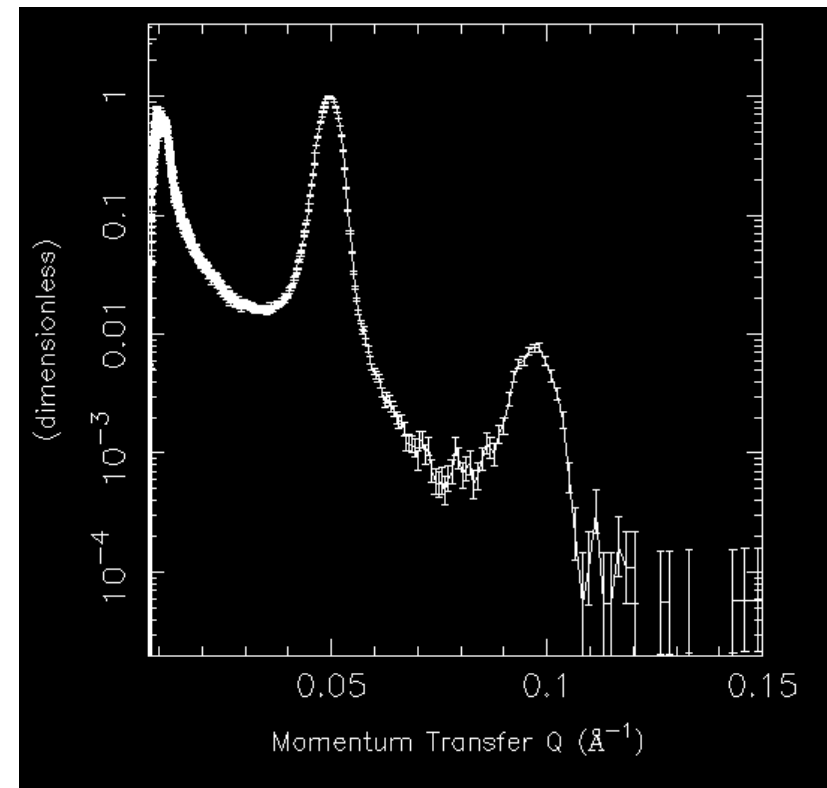
OffSpec: Spin-echo reflectometer

- First neutrons: 3 Dec 2008
- First spin-echo measurement: 20 March 2009
- Instrumentation in collaboration with Delft



PolRef: Polarised reflectometer

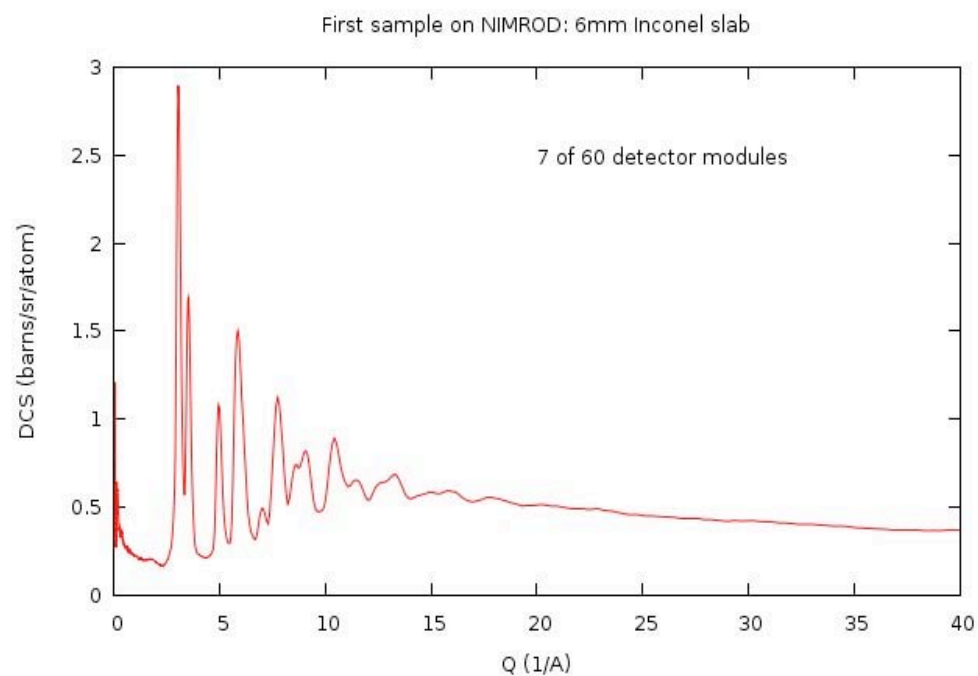
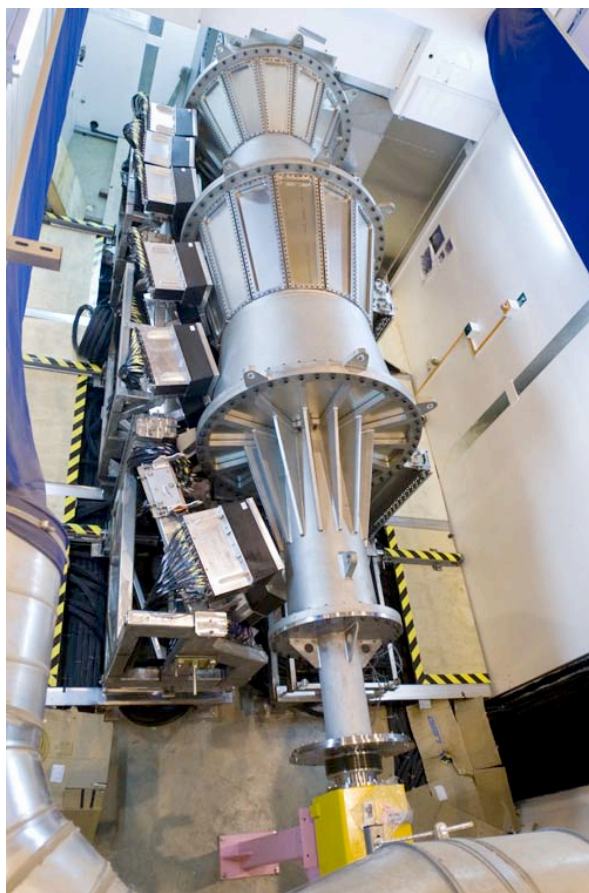
■ First neutrons: 3 Dec 2008



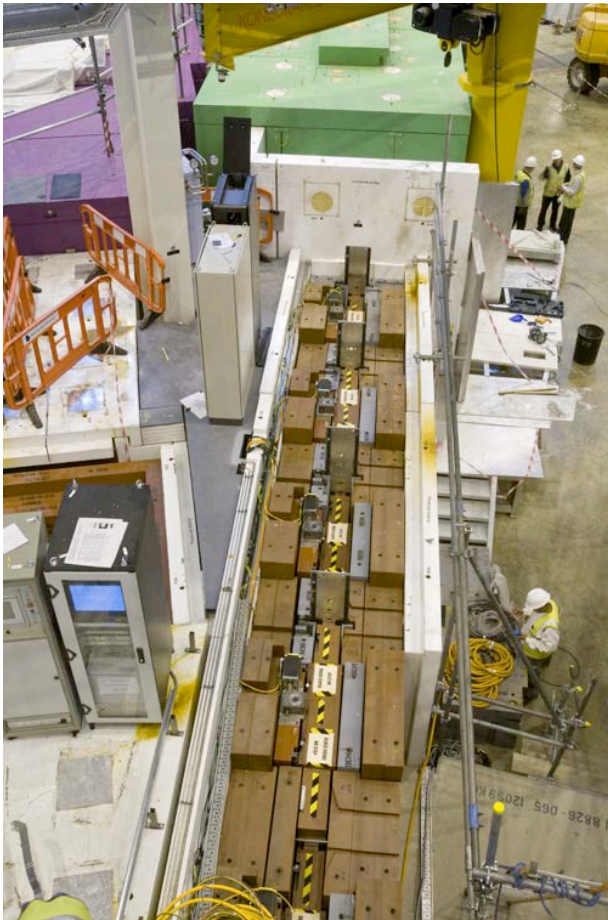
Early measurement: [Fe/Si]_x22
Superlattice, unpolarized Beam

NIMROD: Near and intermediate range order diffractometer

- First neutrons: 10 Dec 2008

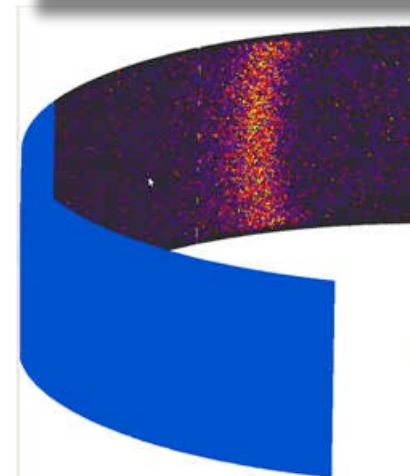
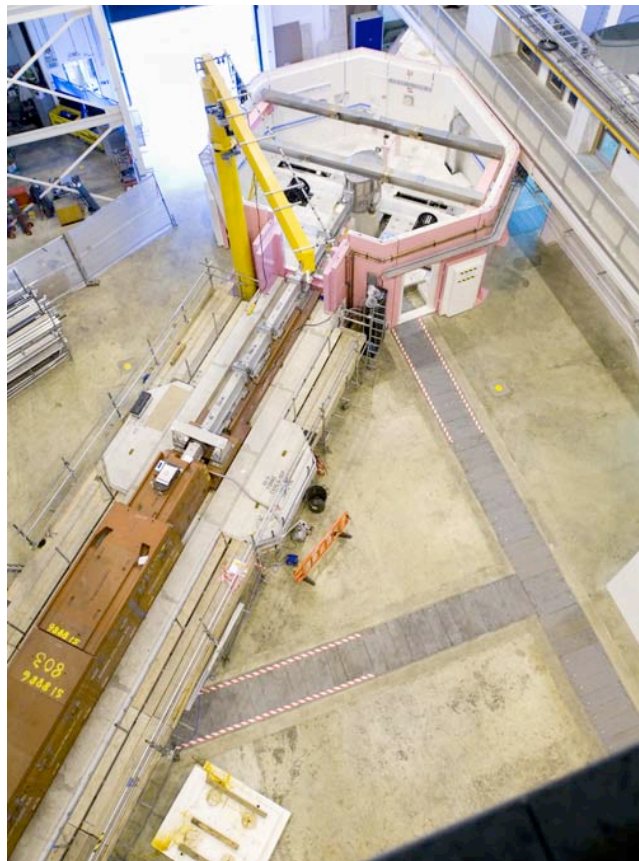


SANS2d: Small angle neutron scattering



WISH: Powder and single-crystal magnetic diffractometer

- First neutrons: 23 March 2009



Software as well as hardware!

LET: cold neutron multi-chopper spectrometer



TS-2 Instruments: the next steps

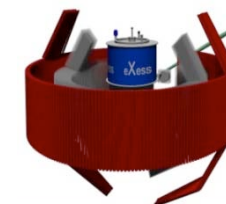
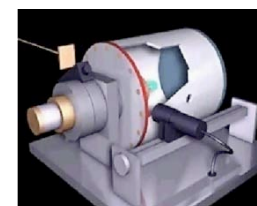
- Phase 1 (£24M+) – 7 instruments
 - INTER, POLREF, OFFSPEC, SANS2D, WISH, LET

- Phase 2 (£21M+) – 5 instruments
 - Gateway 1& 2 Oct 2008
 - Design and development 2009 -10
 - Construction 2009 -12

- Phase 3 (£25M+) – 6 instruments (TS2 + TS1 ?)
 - Earmarked in Large Facilities Capital Fund 16 July 2008
 - Design and development 2011-13
 - Construction 2012-15

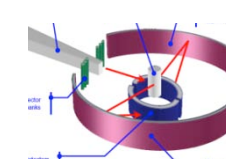
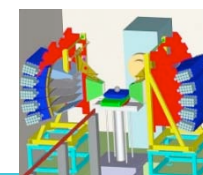
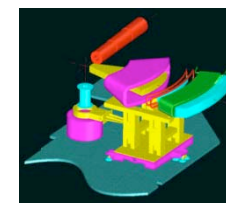
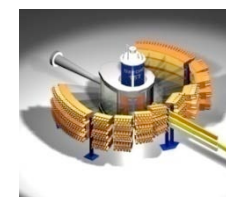
TS-2: Phase 2 / 3 Instruments

LMX	Macromolecular Crystallography
CHIPR	Chip irradiation
LARMOR	SANS, diffraction and spectroscopy using Larmor precession of polarised neutrons
Spiral	Real space structure correlations
Zoom	Small-angle scattering from kinetic processes
eXess	Extreme sample environments spectrometer
eXeed	High-pressure crystallography
Nessie	Ultra-slow dynamics spin-echo spectrometer
IMAT	Neutron tomography and cultural heritage



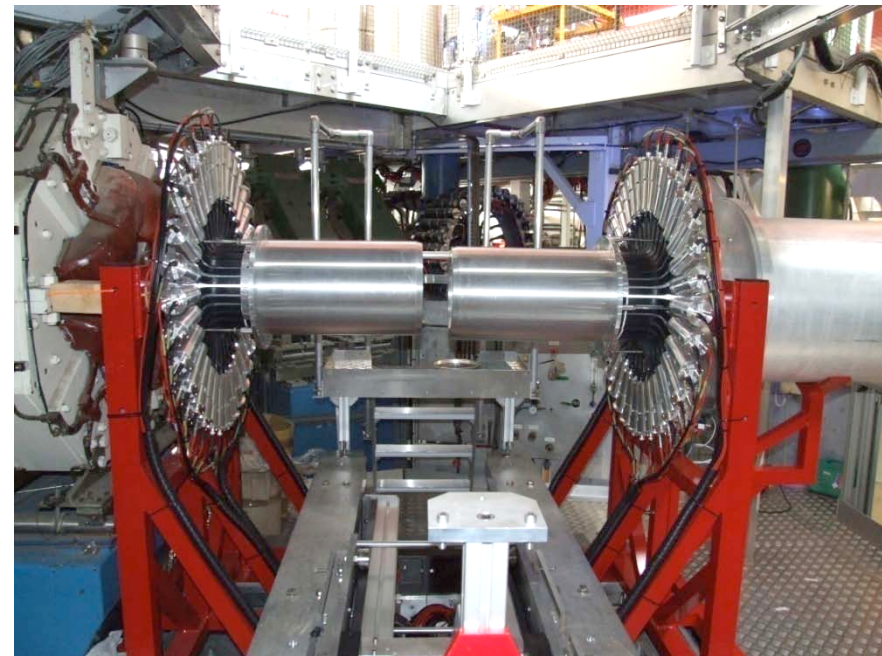
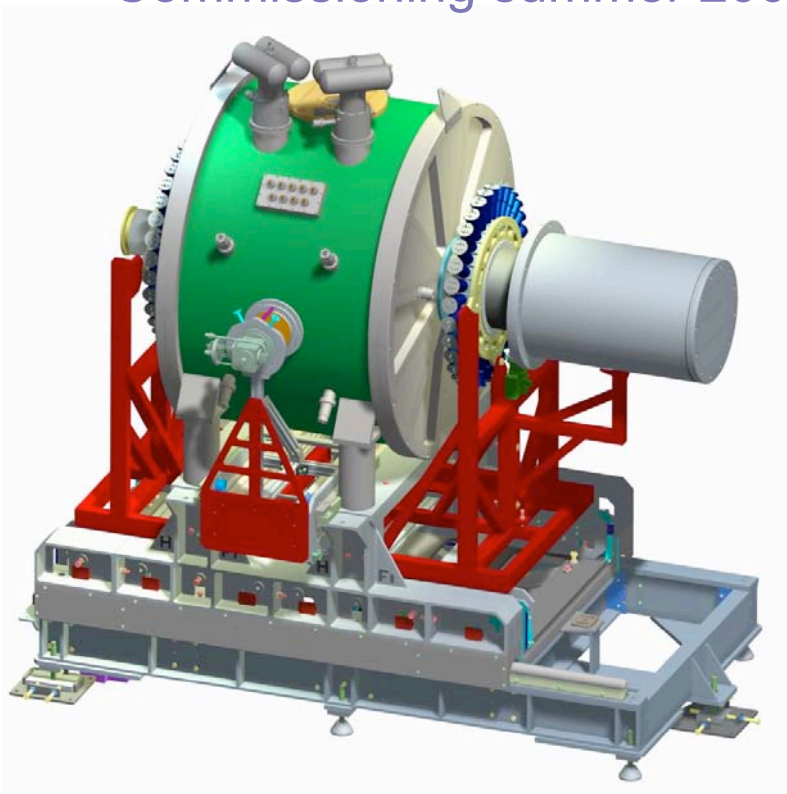
Strategic Development Programme:

- Detectors
- Optics
- Spin Manipulation
- Software



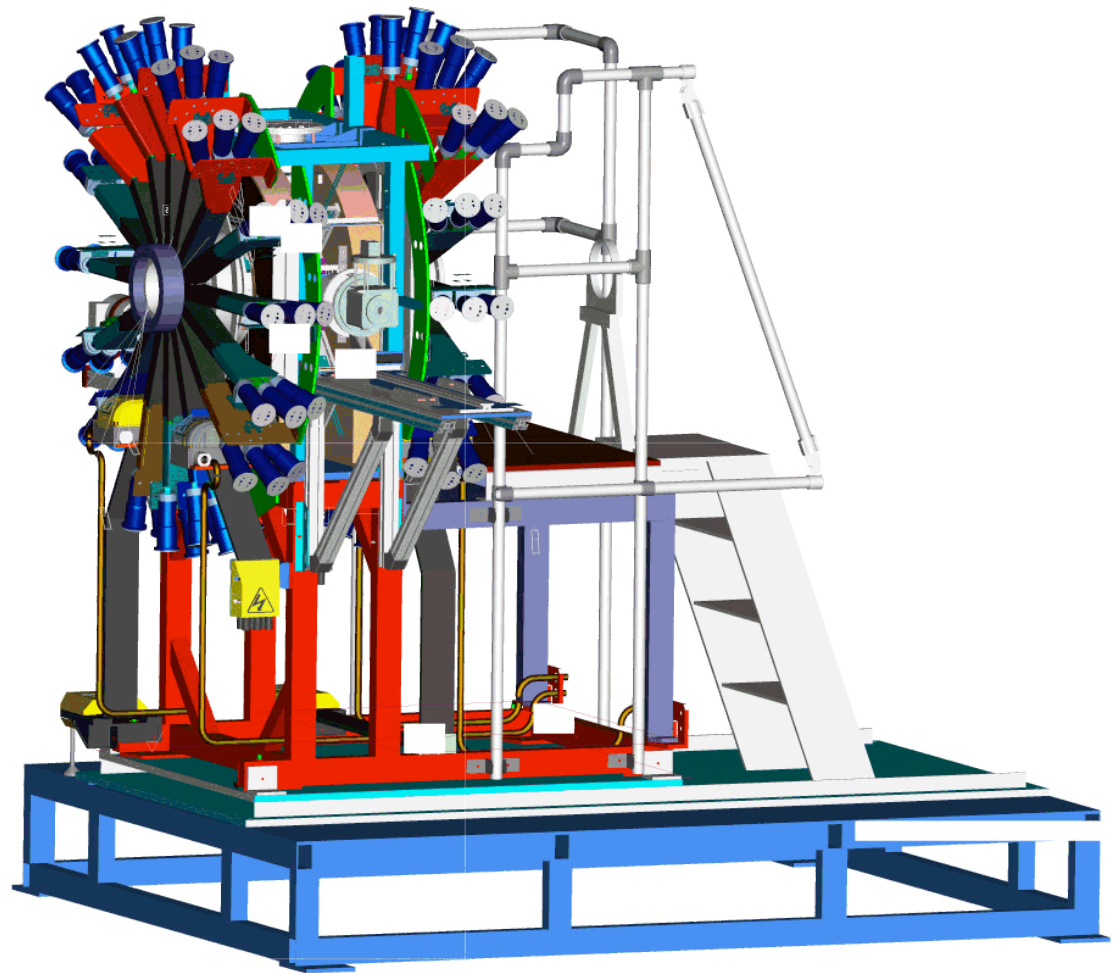
TS1 Developments: HiFi muon spectrometer

- High-field muon spectrometer
- 0-5 T, 30mK-1500K – unique muon instrument
- Commissioning summer 2009



TS-1 Developments: EMU muon spectrometer

- Significant upgrade
- 3x data rates
- Better sample environment access
- Improved measurement background
- Installation late 2009

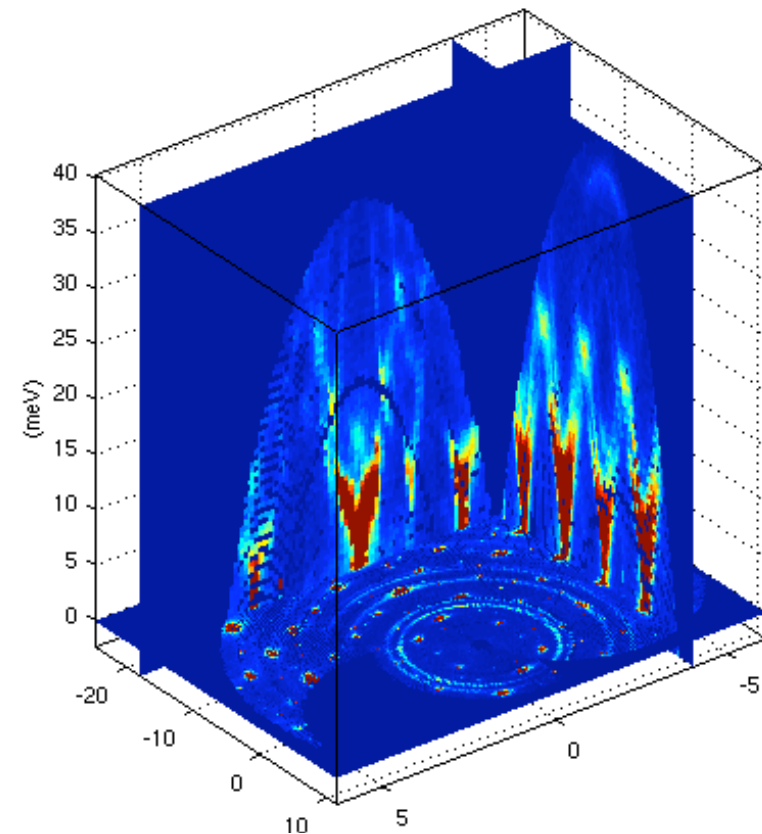
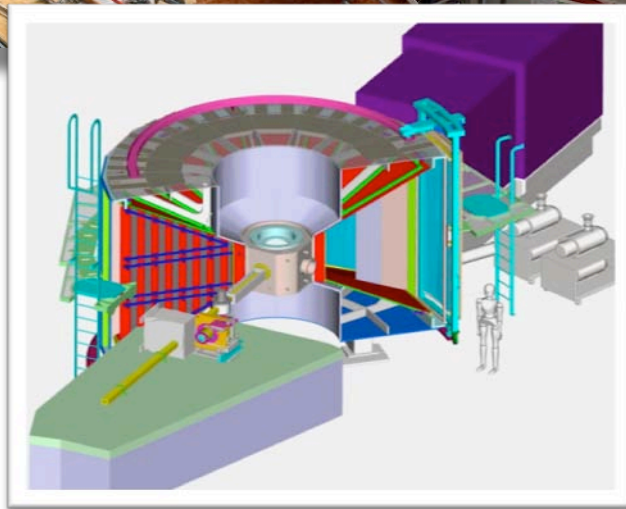


TS-1 Developments: RIKEN-RAL Muon Facility

- New, ultra-high data rate spectrometer being installed
- Pressures up to 6 kbar now available
- Laser stimulation of samples possible



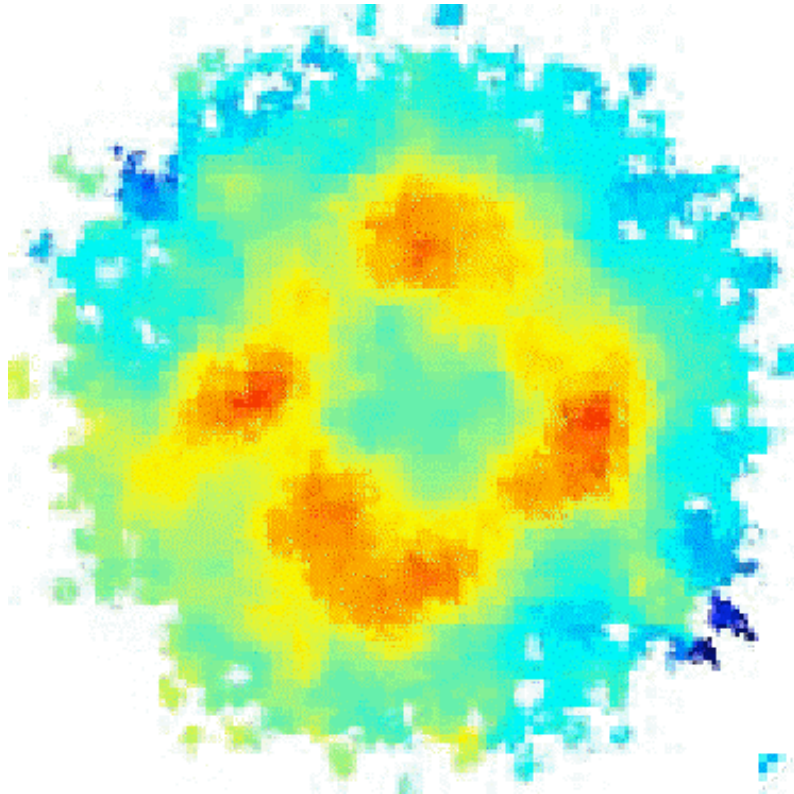
TS-1 Developments: MERLIN



Phonons in Calcite
Martin Dove and Beth Cope

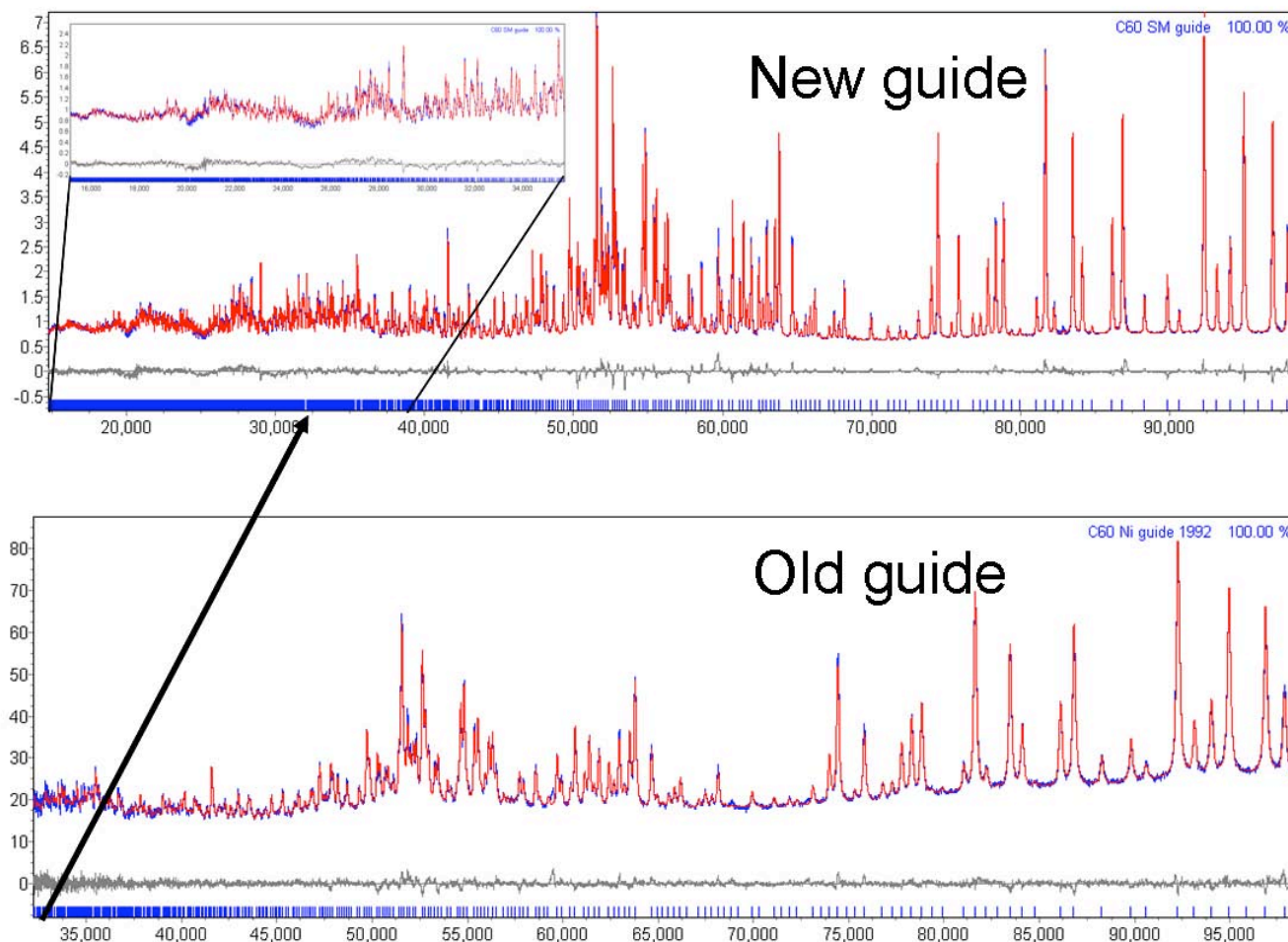
TS-1 Developments: The end of an era for HET

■ Dec 1984 – Dec 2008



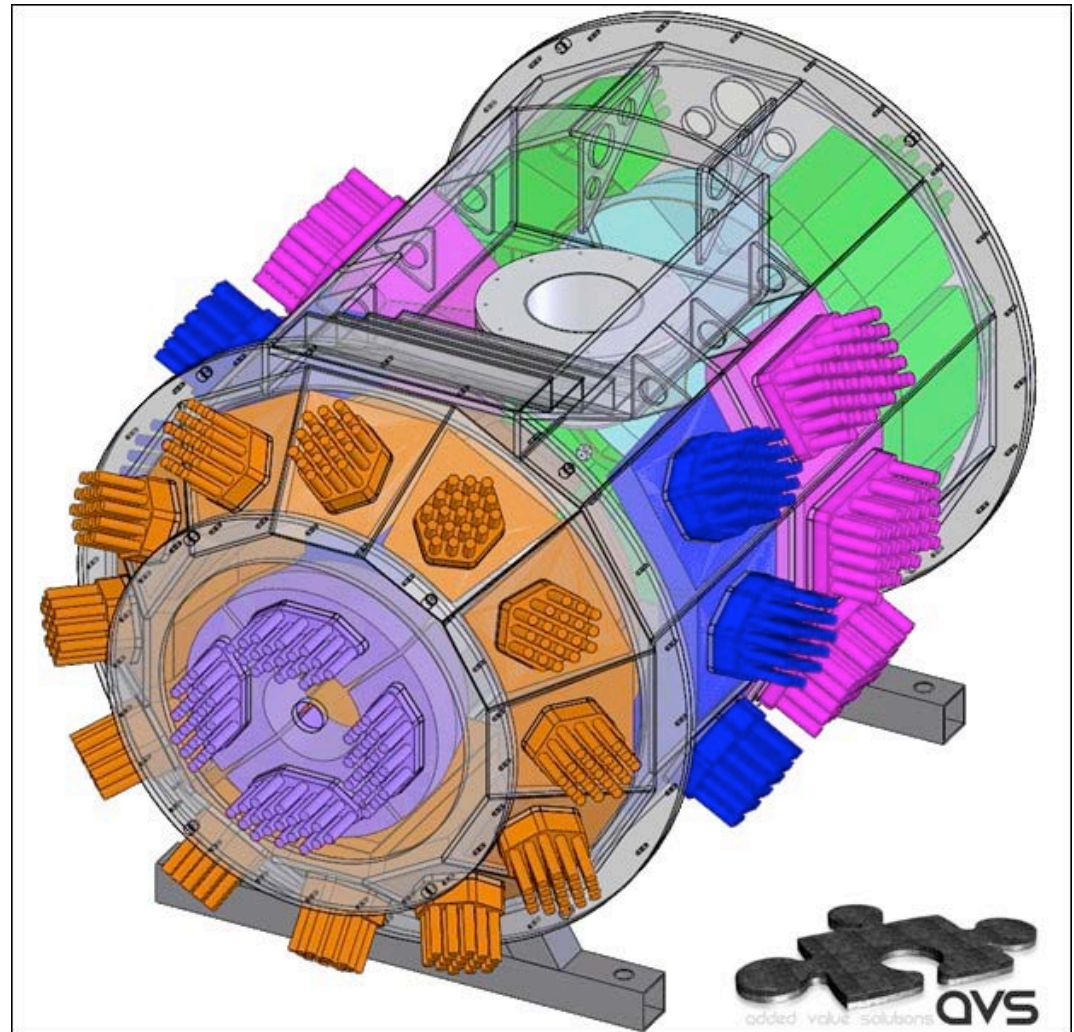
TS-1 Developments: HRPD

- Installation of new super-mirror guide complete
- Large flux gains have revolutionised instrument performance



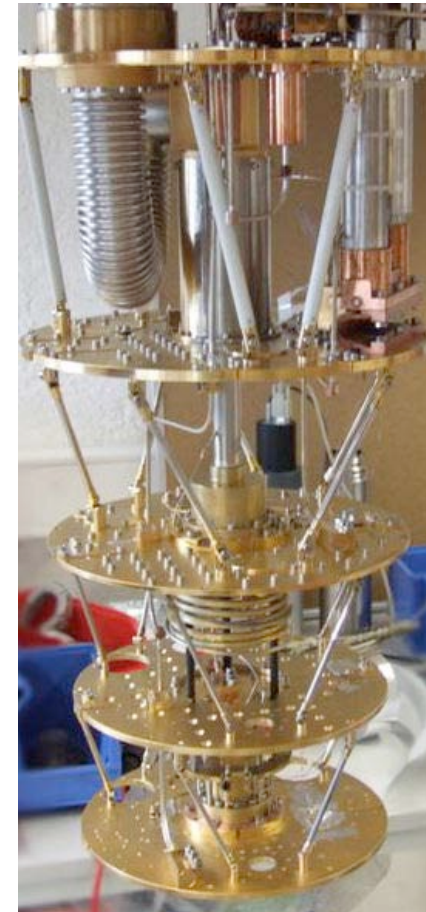
TS-1 Developments: Polaris

- Major detector upgrade
- Big count rate improvements
- Improved resolution
- Design and layout complete
- Installation early 2010



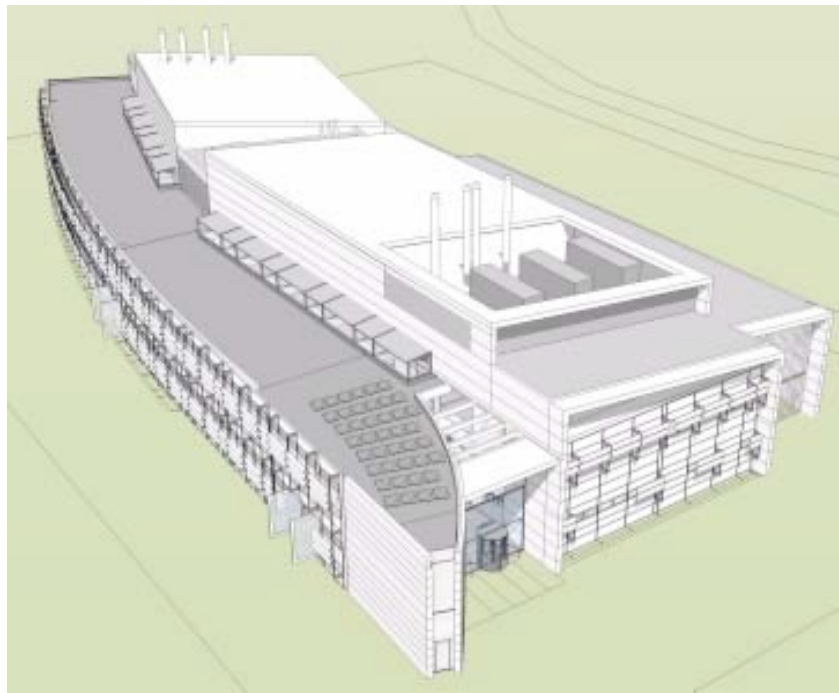
New experimental capabilities

- Vericod OI cryogen-free dilution system



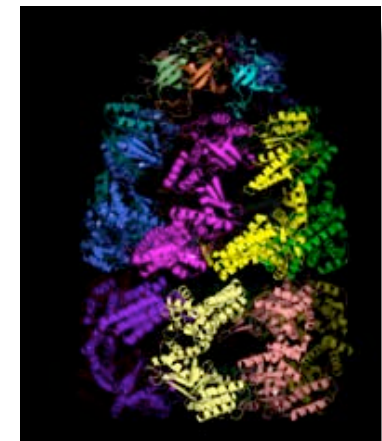
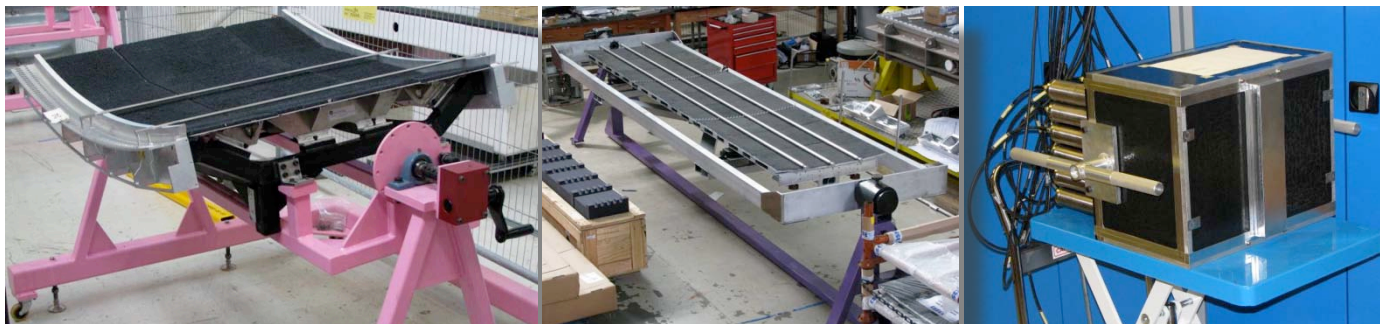
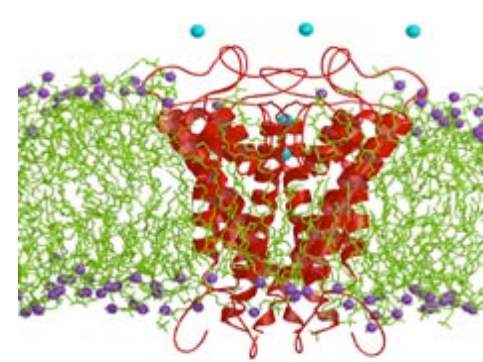
RAL Research Complex

- Research facilities for users of ISIS and DIAMOND
- Ready Autumn 2009



Science and Technology Gateway Centres

- Hartree Centre - modelling
 - Imaging Solution Centre
 - Detector Centre
- Science and Business Case under preparation
 - Discussion with Academic Partners – in progress



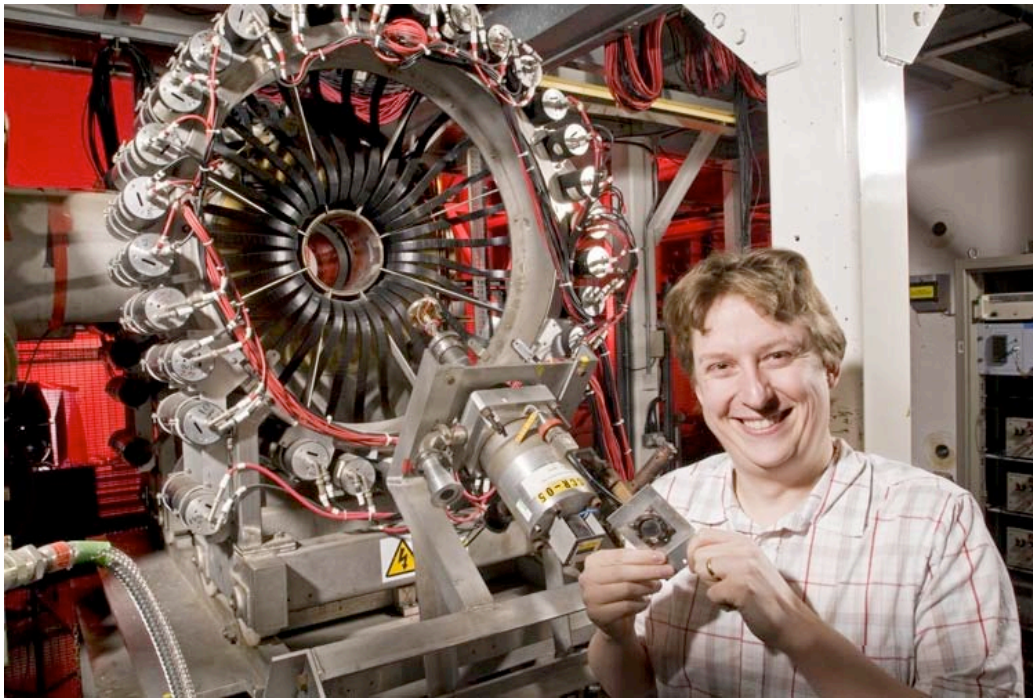


ISIS Uniqueness

- Unique pulsed spallation source in Europe
- Neutrons and muon for complementary information
- State of the art instrument suite – including 7 new TS-2 instruments
- Very diverse range of science, spanning many disciplines
- Very well-developed user community
- Excellent experimental support – new users actively encouraged
- Technical groups for SE, detectors, electronics, choppers, etc, etc.
- Training for less experienced users – including annual hands-on courses
- 50+ scientists with expertise across a very broad range of science areas who can assist with experiments
- Situated alongside DIAMOND, lasers, research complex
- Long history of very successful Access contracts

Changing faces

- Adrian Hillier: now Muon Access Manager
- Philip King: moving to Networking Activities





And now . . .
LUNCH!



Your place in Europe

- Statistics on user frequentation / outcome in terms of publications?
 - Previous Access contracts (n+ μ): 184 experiments, 351 unique users, 481 user-visits
 - ISIS as a whole: 650 expts / yr, 400+ publications / yr