Larmor Progress

Robert Dalgliesh

2nd October 2012

Utrecht

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Thanks

- Thank you to NWO, TU Delft and the Scientific community of the Netherlands for their support in this project.
- TU Delft are acknowledged world experts in the development of novel Larmor precession techniques and it is a privilege to be able to work with them again

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- Building Layout and services
- Progress Review
- Day One?
- Prospective ISIS science themes
  - SANS
  - SESANS
  - Larmor Diffraction
- Sample environment equipment
- Some discussion points

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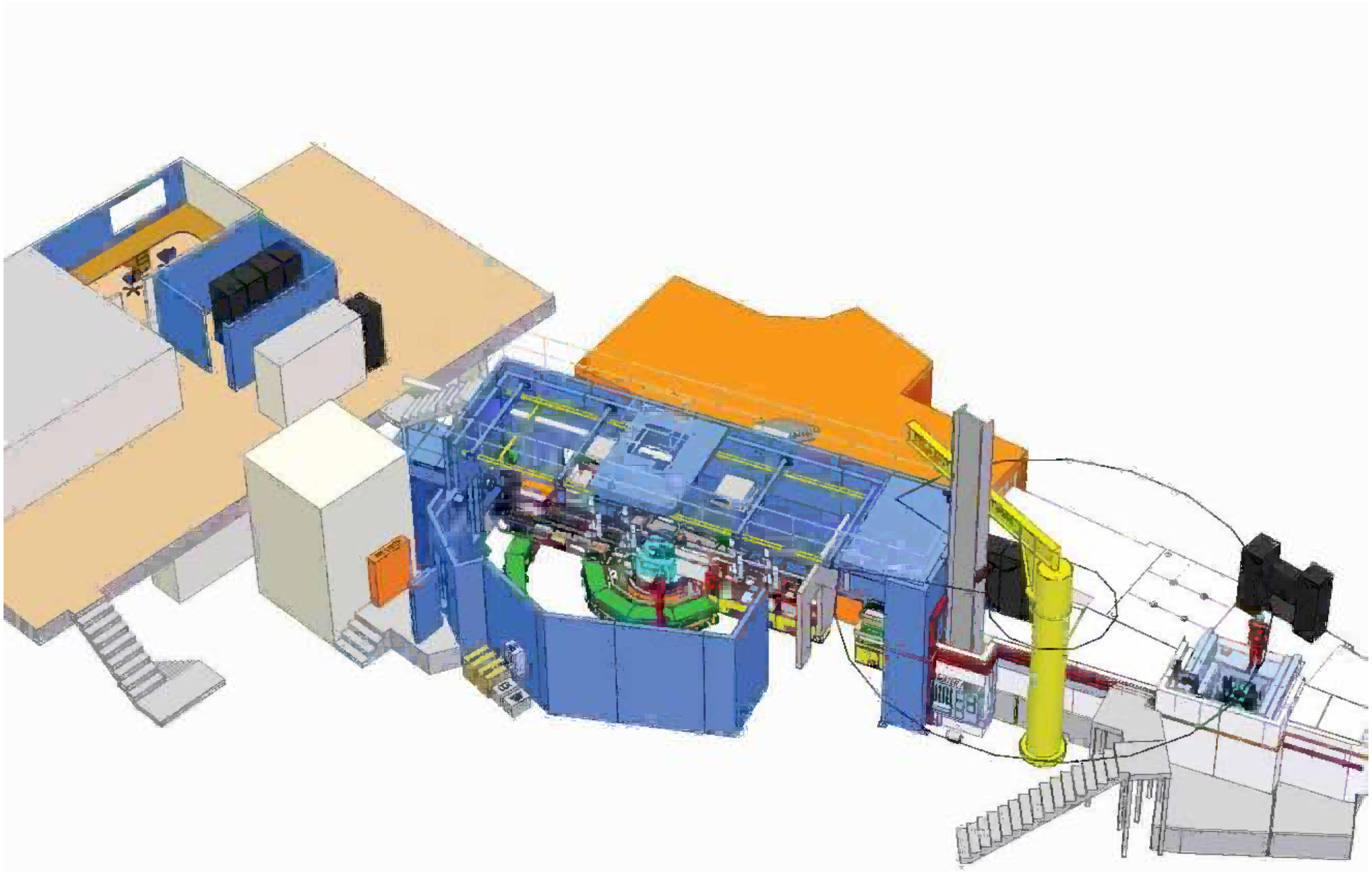

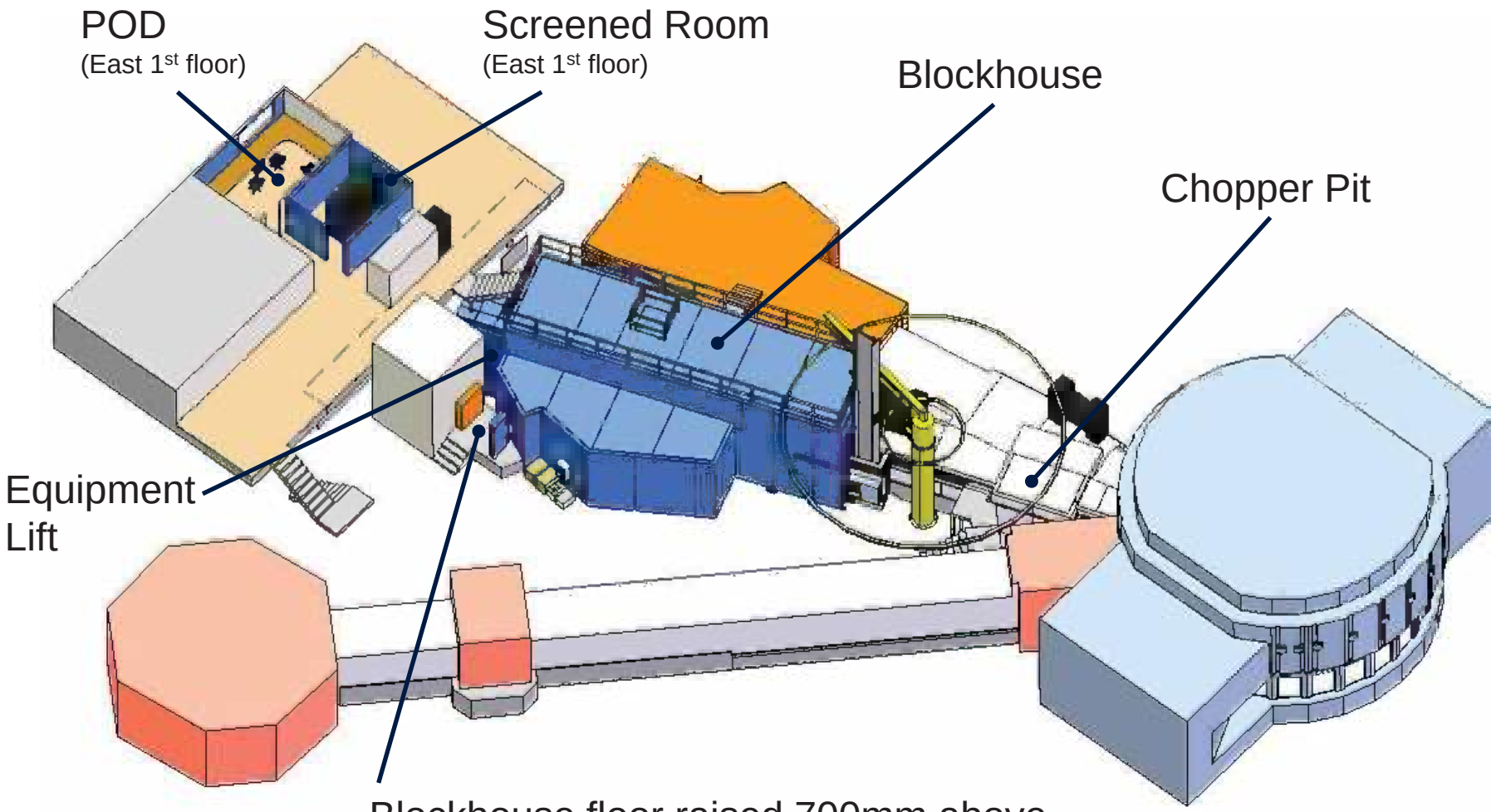

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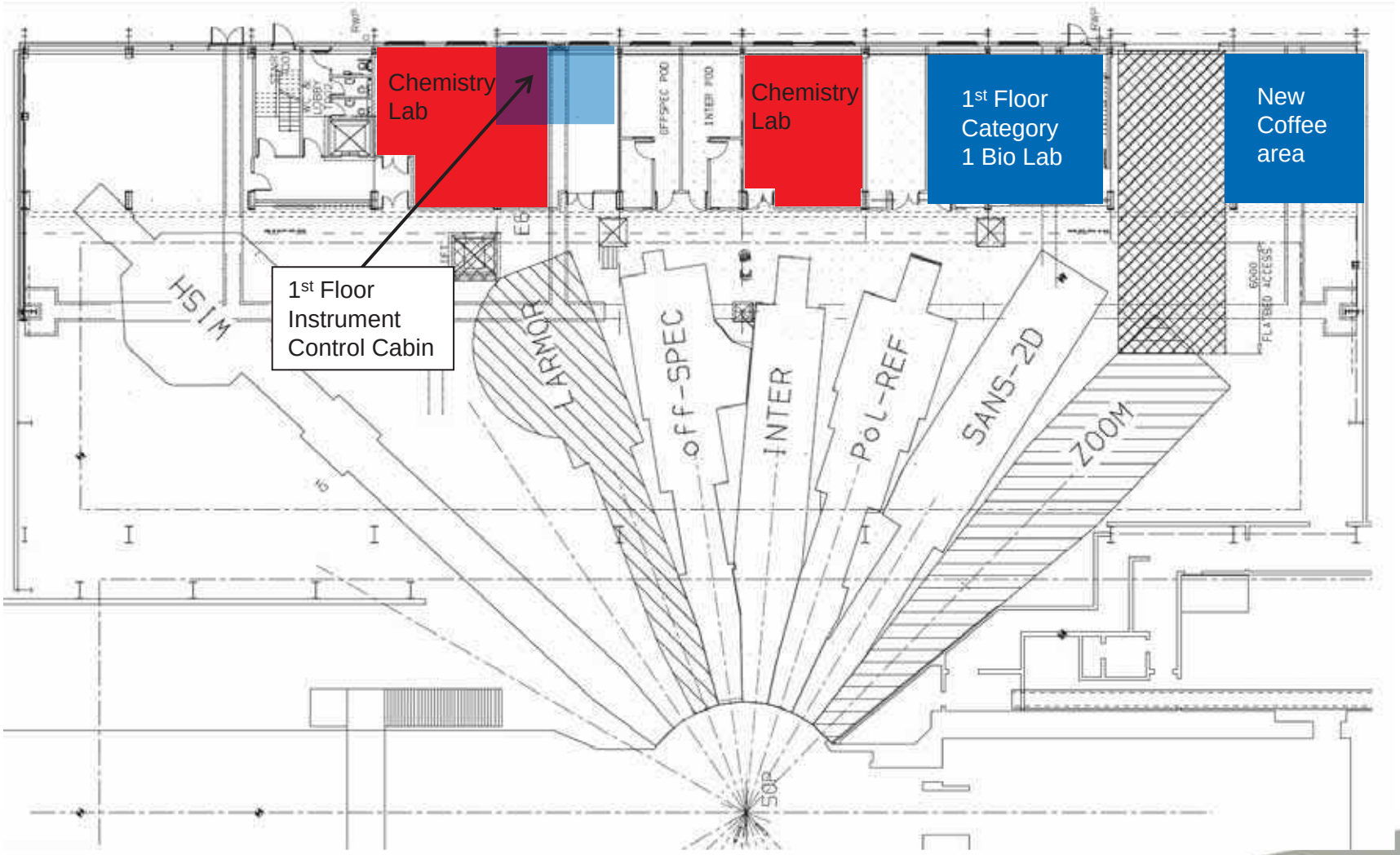
Building Layout and Labs



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Progress Update
September 2012

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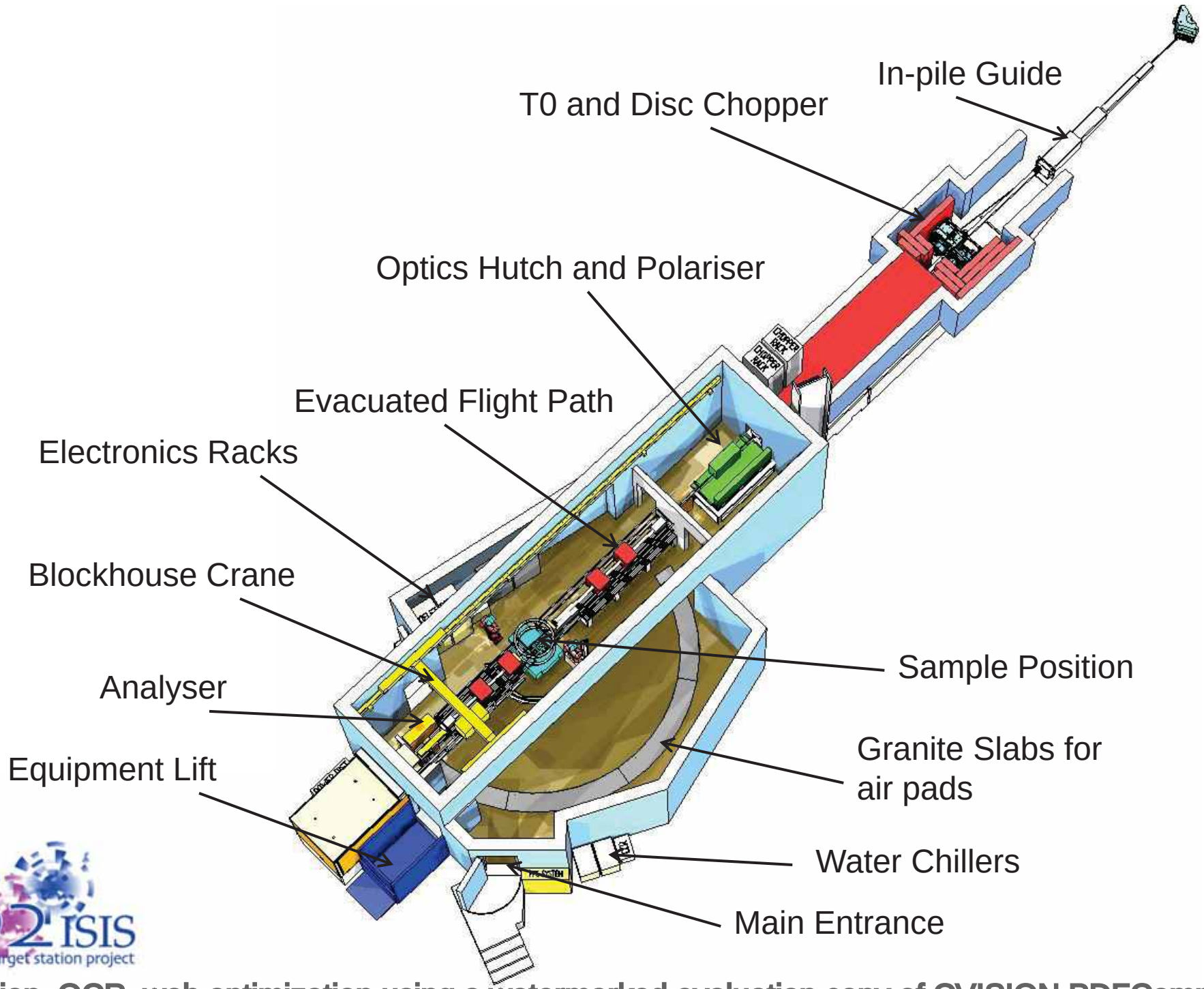
Larmor Current Status – Sept 2012

Task	Specification	Concept Design	Detailed Design	Procurement	Installation
Reflector Modification					
Shutter and Insert height					
Shutter insert					
Insert and glass guide					
Chopper					
Polarisers (Glass)					
Spin echo system					
Misc bench components....					
Sample stack					
Analysers (Glass)					
Detector					
Rotating detector bench					
Raised blockhouse floor					
Beamstop					
Beamline shielding					
Blockhouse					
Services					
Electrical + Motion control					



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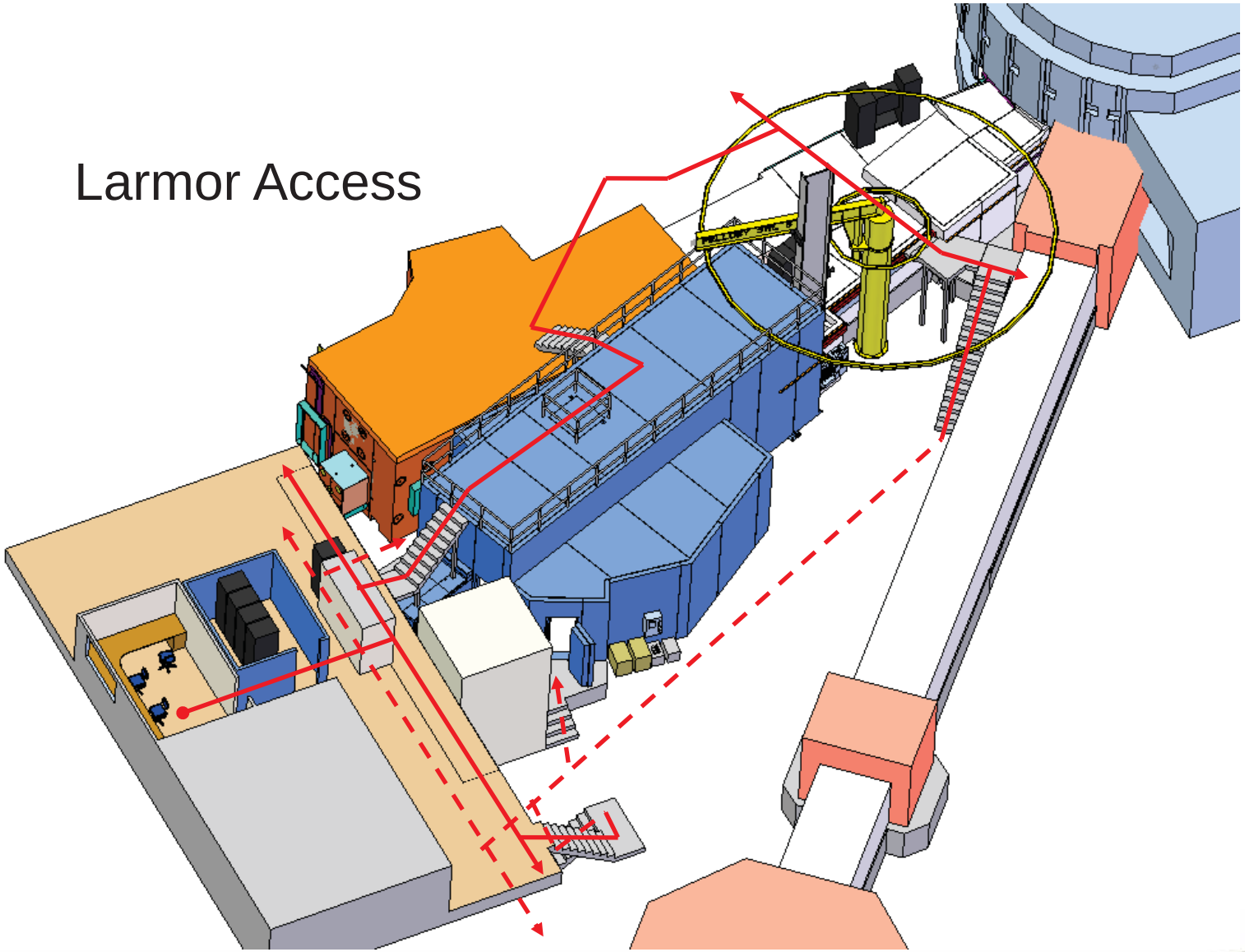
Larmor Access



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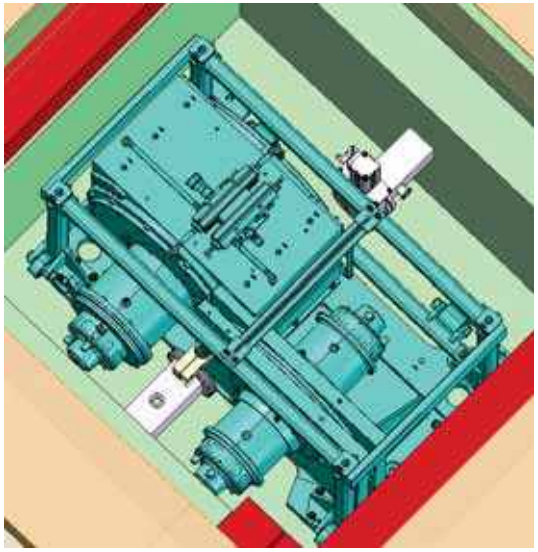
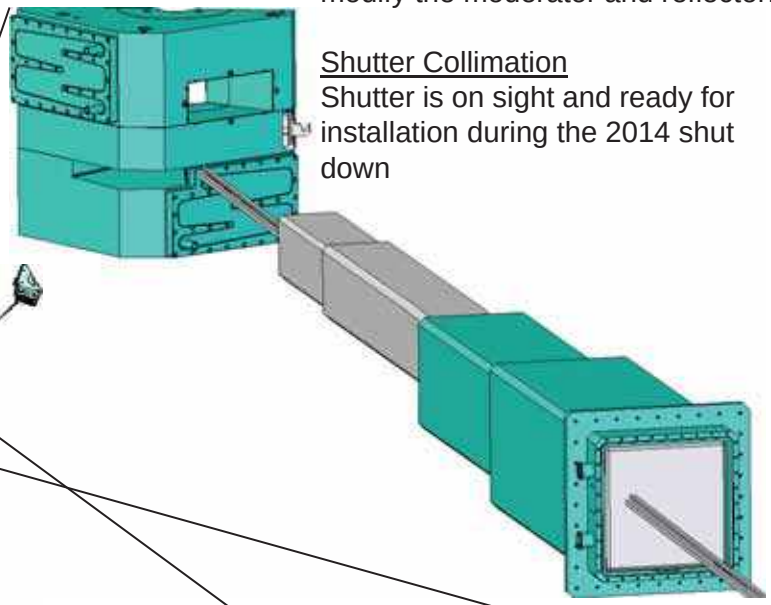
Larmor Beamline Front End

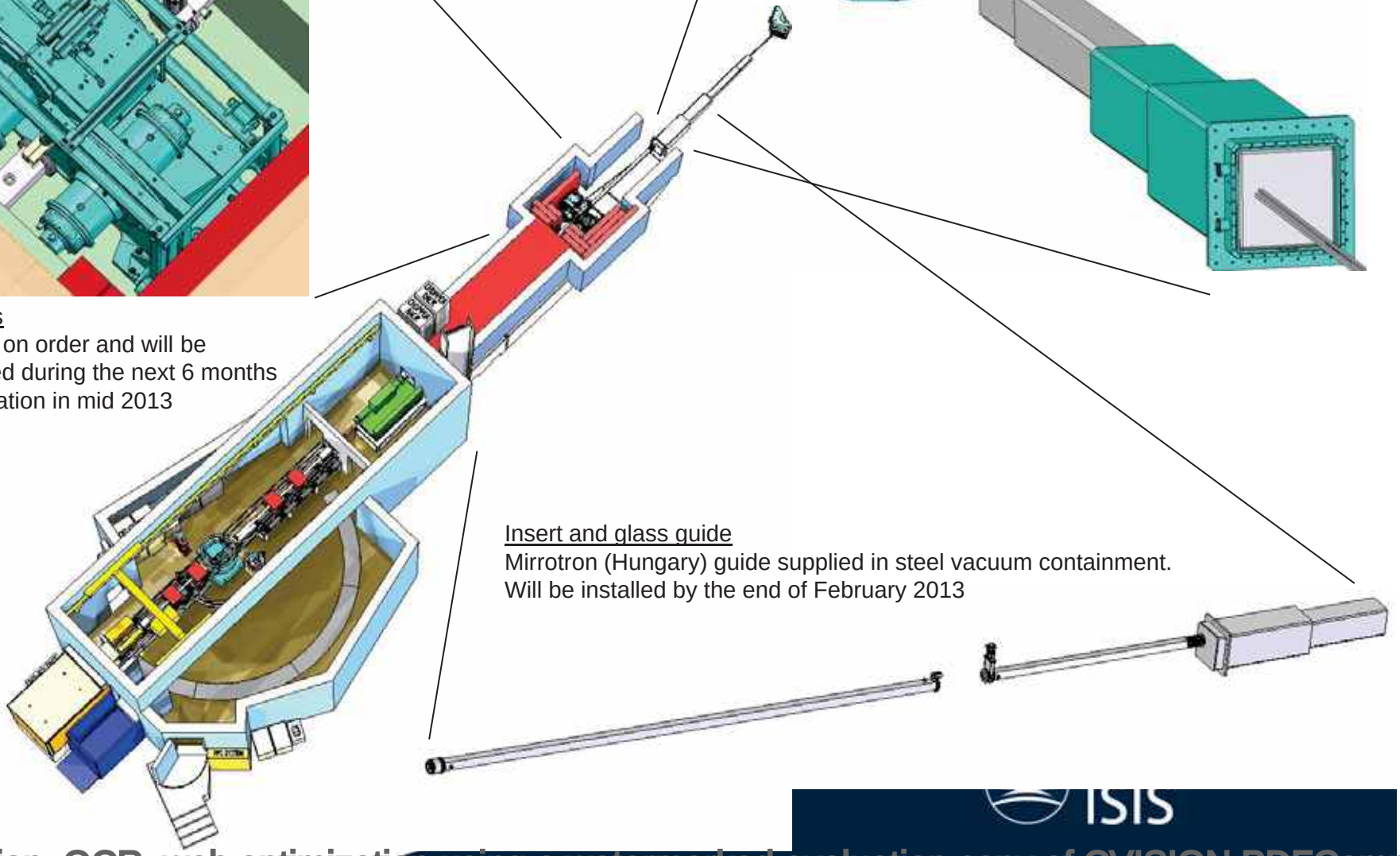


Choppers
Parts are on order and will be assembled during the next 6 months for installation in mid 2013

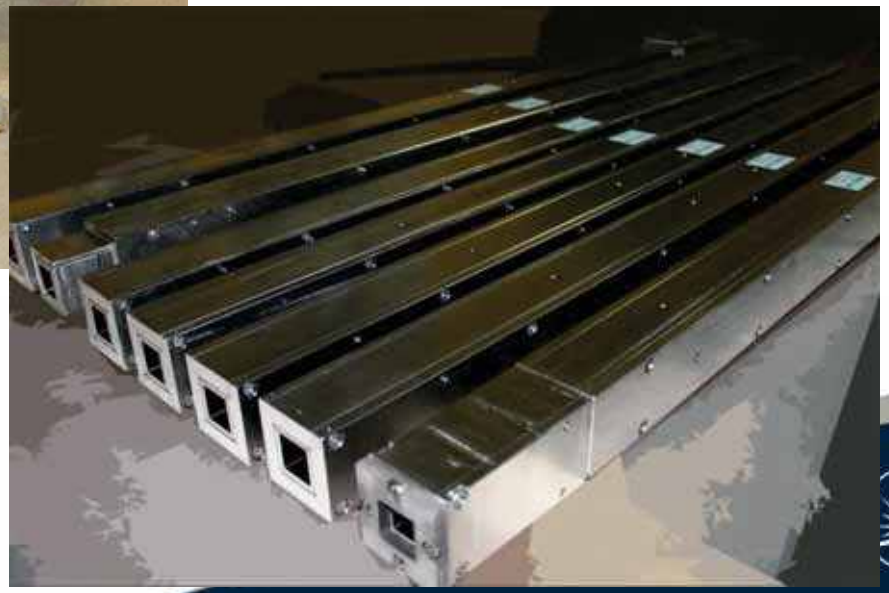
Reflector Modification
6 month shutdown in 2014 to modify the moderator and reflector.

Shutter Collimation
Shutter is on sight and ready for installation during the 2014 shut down





Insert and glass guide
Mirrotron (Hungary) guide supplied in steel vacuum containment.
Will be installed by the end of February 2013



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Guide Support Installation

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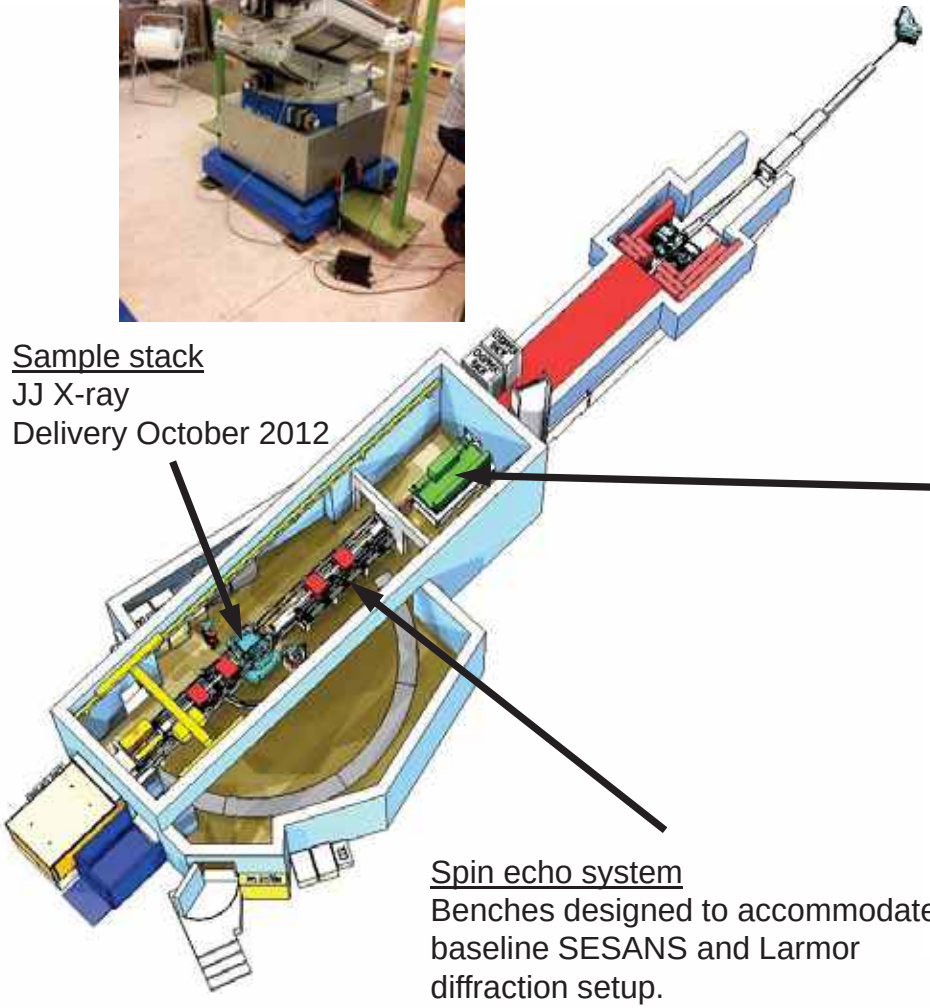
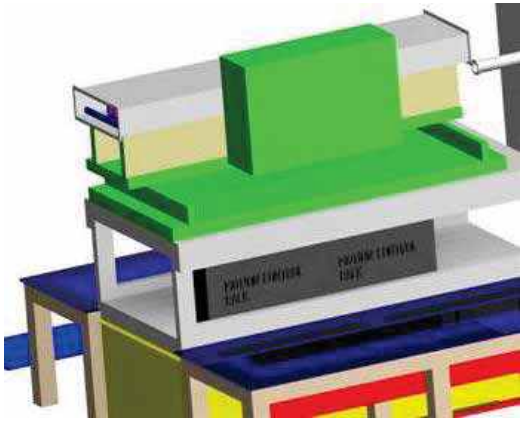
Blockhouse Internal Components



Sample stack
JJ X-ray
Delivery October 2012



Polarisers
Swiss Neutronics design detailed design near completion.
Delivery in early 2013
Vacuum containment awaiting final design

Spin echo system
Benches designed to accommodate baseline SESANS and Larmor diffraction setup.
Based on initial specifications developed with TU-Delft

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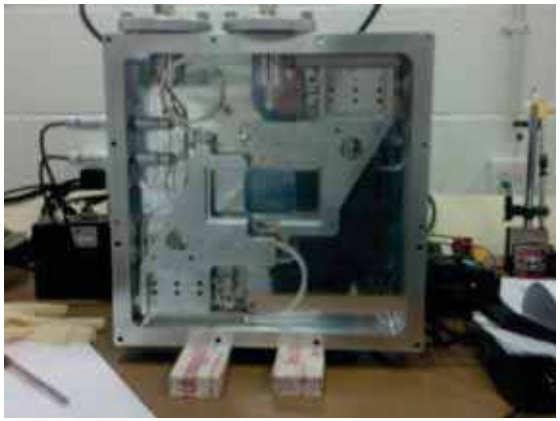
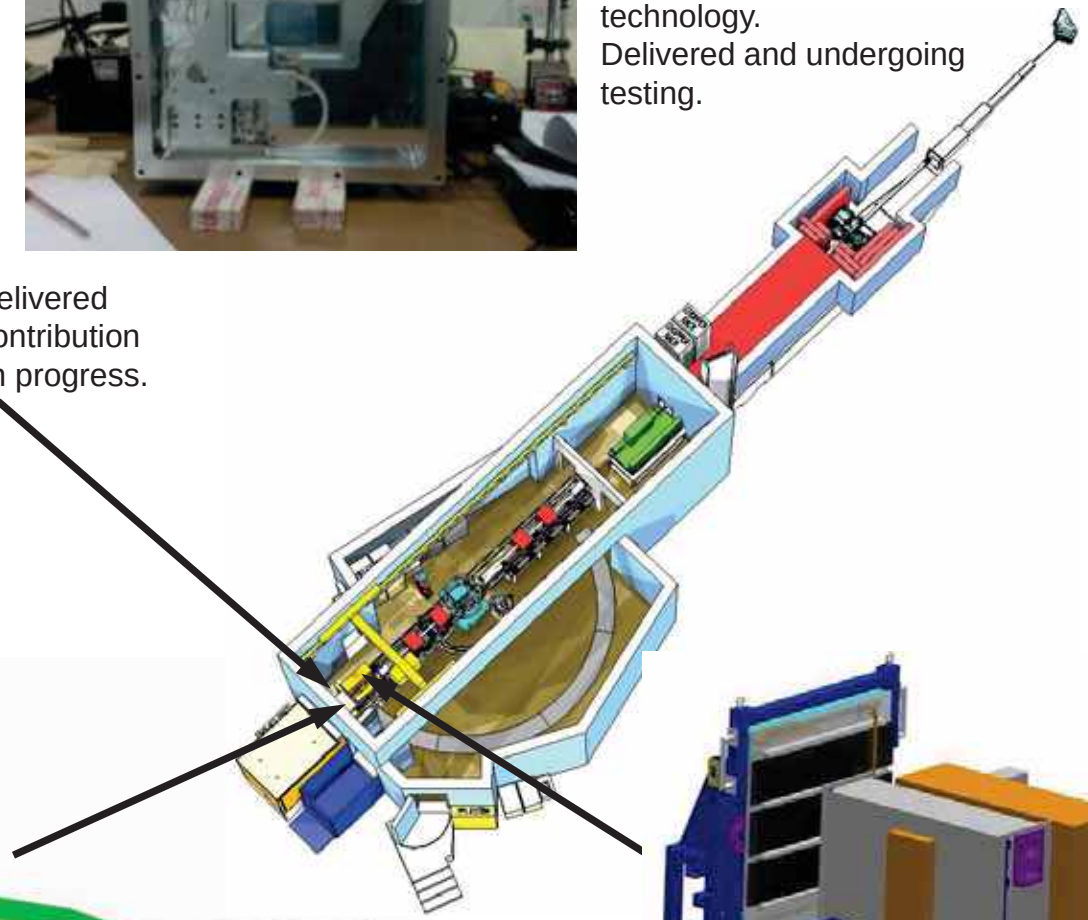
Blockhouse Internal Components

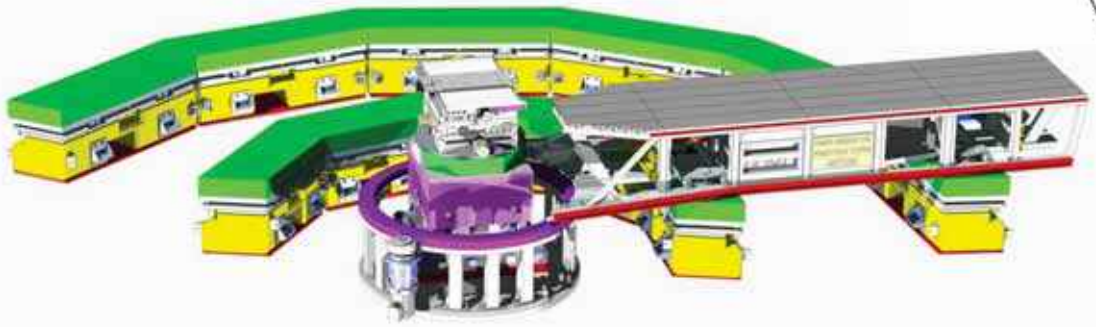


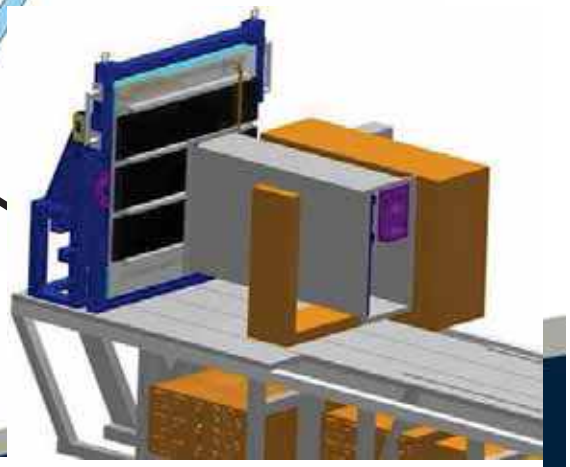
Slit Packages (Diaphragms)
Custom manufactured piezo electric design developed in collaboration with Heason technology.
Delivered and undergoing testing.

Detector
Detector Tubes delivered
Frame – Italian contribution
Detailed design in progress.



Rotating detector bench
Final design review is imminent.





Day One Analyser
Detailed design nearly complete by SNAG.
Delivery in early 2013
Vacuum containment and positioning specified.

Data Aquisition

- Larmor will be the first instrument to start up with the new ISIS DAE 3.
- Tests will begin on OffSpec in late 2012.

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Event Mode

- No more histograms! (If you want)
- Count every neutron, record its arrival time and reconstruct data afterwards using additional data from external equipment or time.

DAE2 (90s technology)

DAE3

- Data acquisition capacity increased to accommodate >15GB/hr
- Ethernet streaming to disk.
- Significantly increased on board processing capabilities.
- More flexible external inputs.

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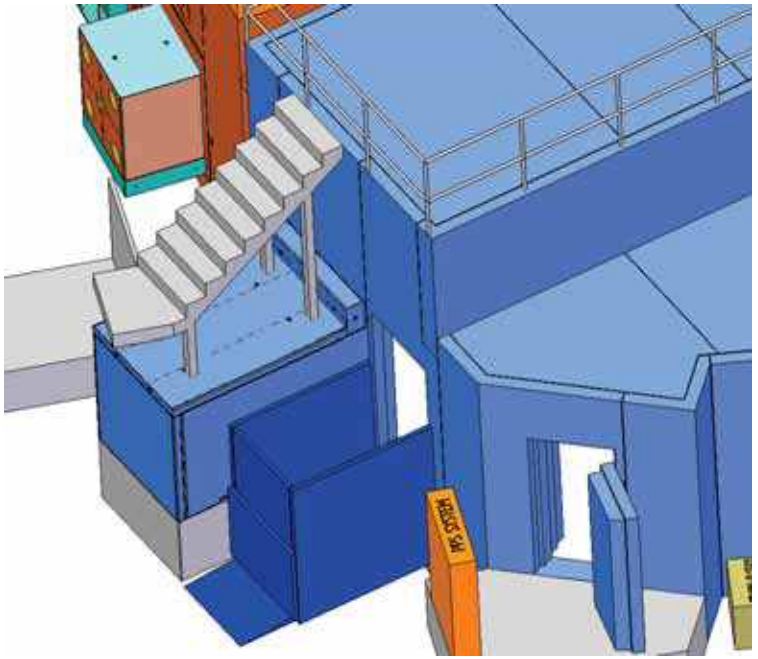
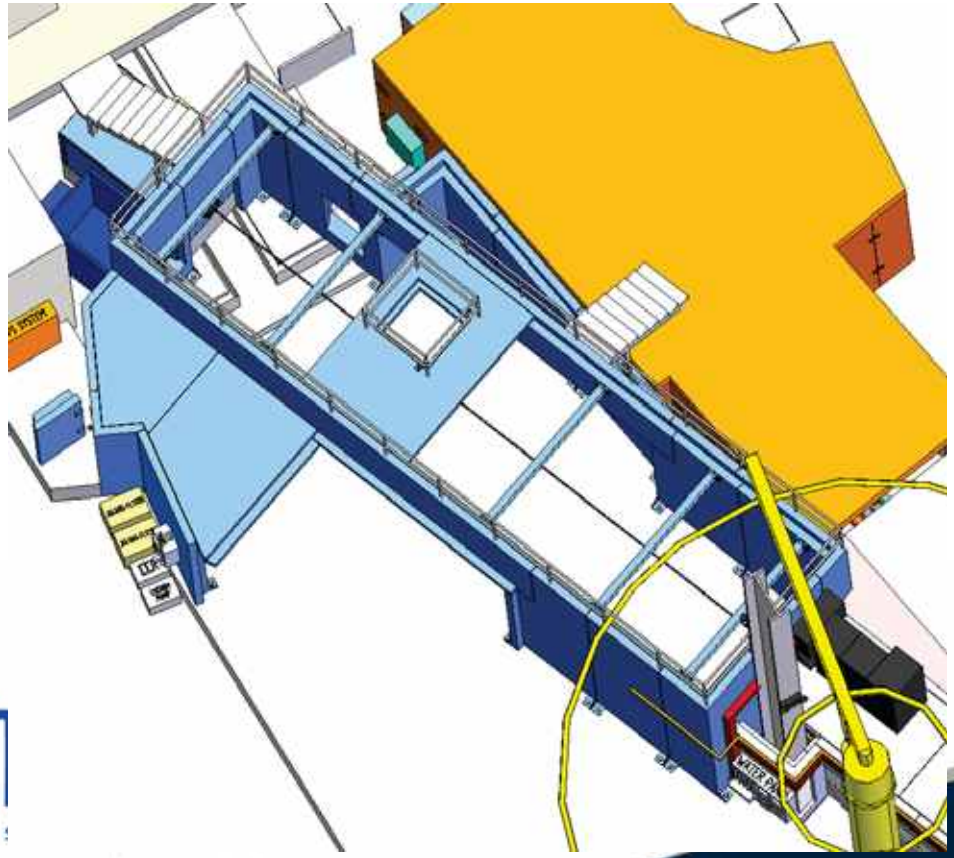
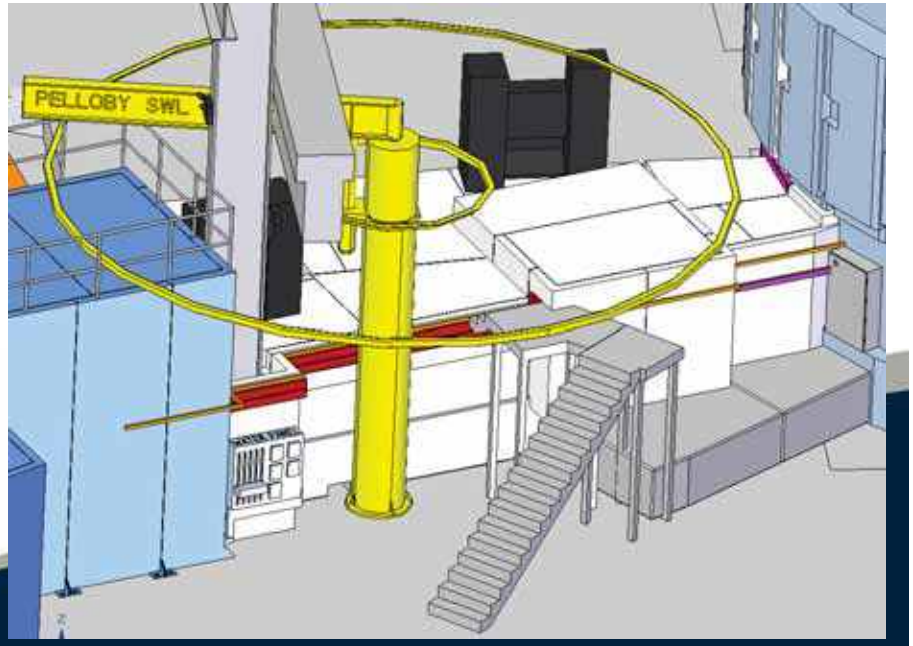
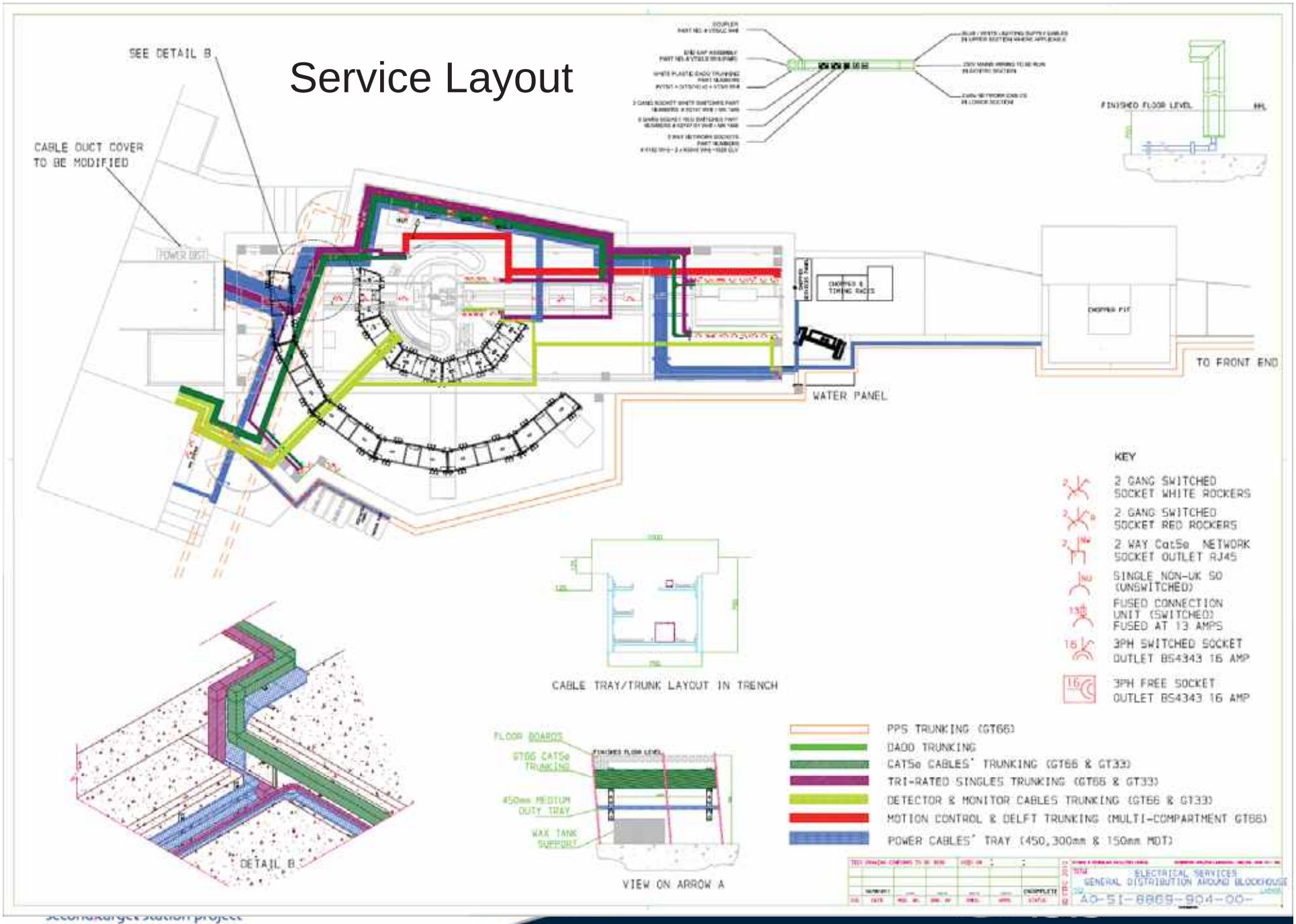
Beamstop	- Installed
Beamline shielding	- Concrete installed
Steel	– delivered to site
Wax	– delivered to site
Blockhouse	- Currently being assembled
Services	- Gas, water and electrical requirements have been defined and supply routes planned.

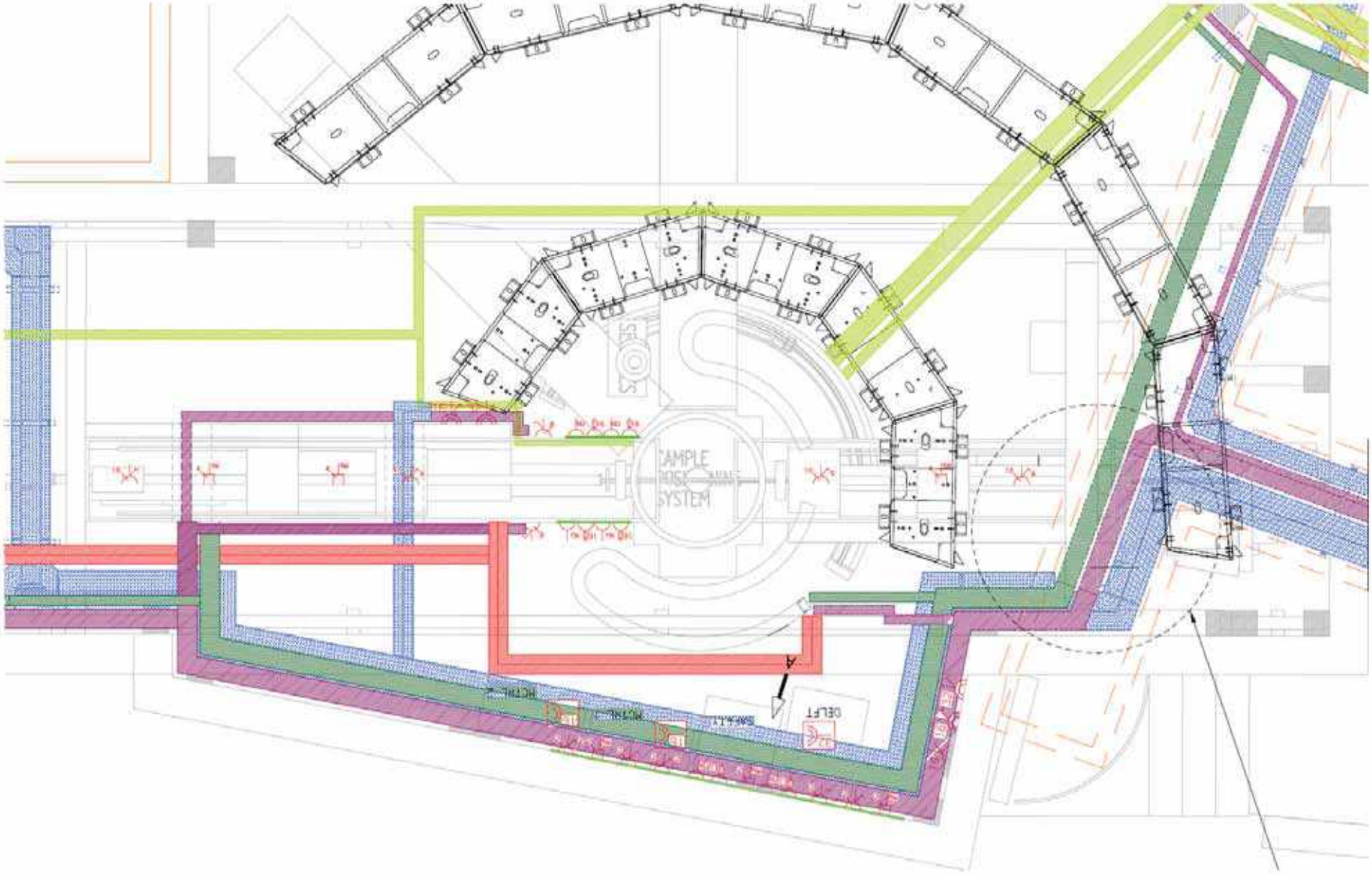






Service Layout





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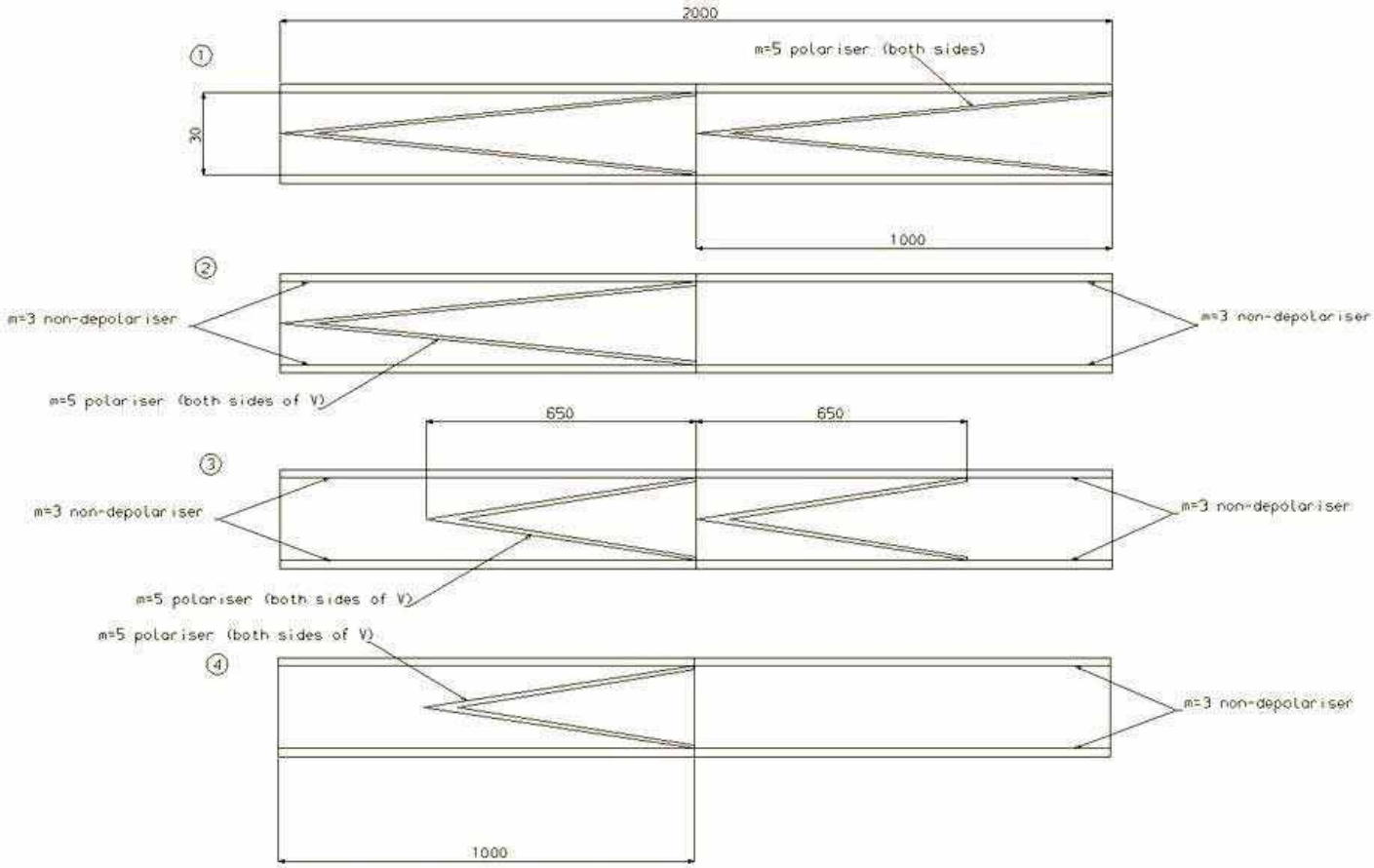
Polariser Design

- Very Flexible
  - Intended to allow optimisation for flux or polarisation
  - Potentially provides spare devices suitable for trials of MIEZE, TOFLAR and modulated SESANS

5 Potential Configurations to optimise



Day One?

- What do we at ISIS mean?
  - Aiming to open shutter for the first time in autumn 2013.
  - No direct moderator view so ~60 days of preliminary commissioning.
  - 6 month shutdown after which full commissioning will start.
  - At this point SANS, polarised SANS and SESANS will be commissioned.
  - Larmor Diffraction to follow shortly afterwards
  - MIEZE spectroscopy and NRSE will be delivered at a later date as the NWO-TU Delft project progresses.

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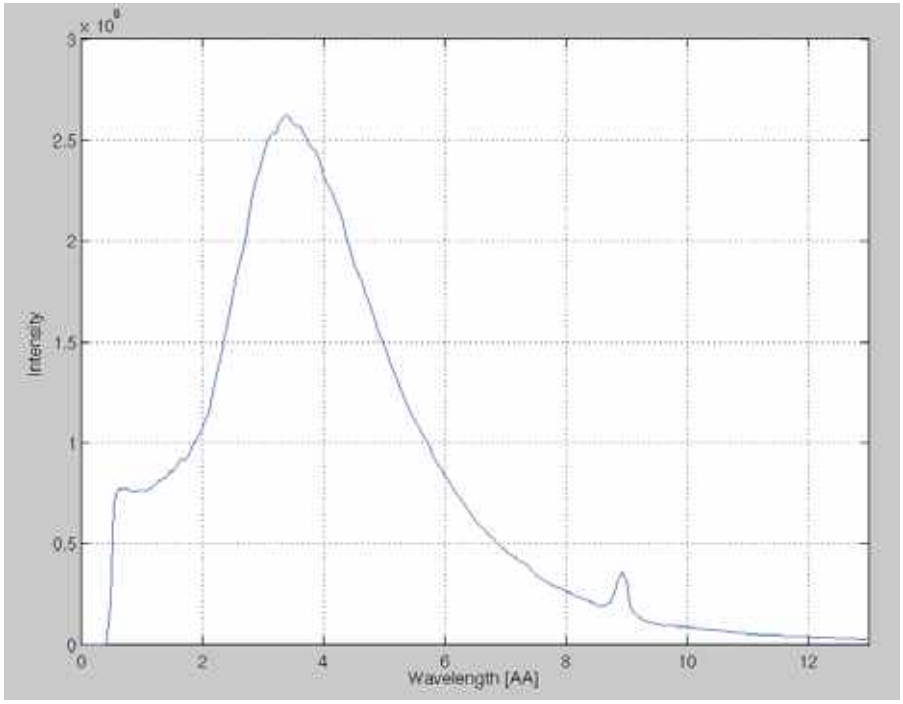
SANS Performance

- Incident Spectrum similar to PolRef
- 0.5–13.2Å peak at 3Å
- Q Range
  - Beam in detector centre with a 50x50mm beamstop
    - ~0.005–1.2Å^{-1}
- Flux
  - Comparable to SANS2D and therefore D22 at 4m
  - World leading performance



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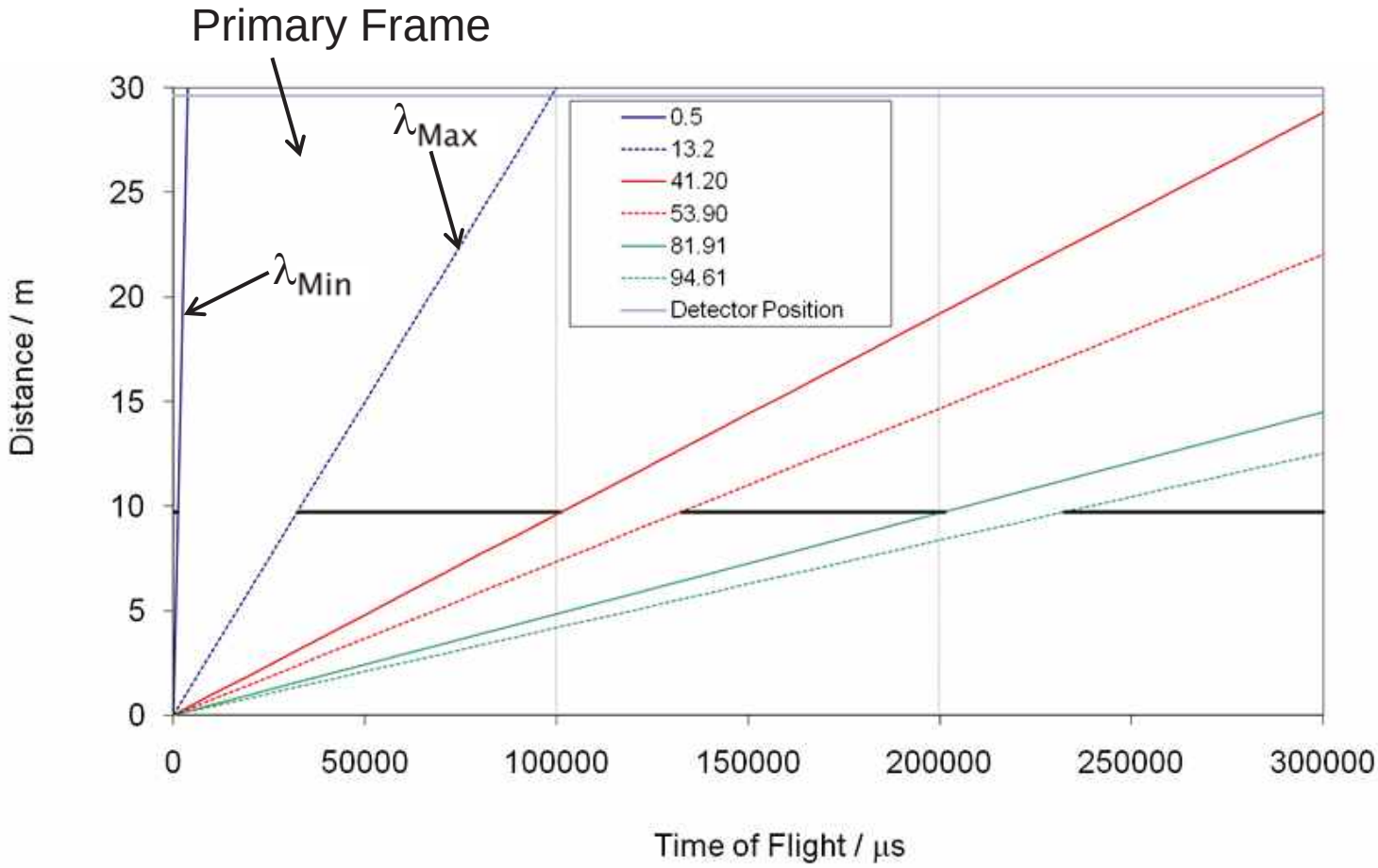
Chopper Diagram

- Wavelength band could be shifted, if necessary, to improve the low Q limit.
  - E.g 4–17Å if data is collected after 100ms.
  - This would require the removal of a spike from high energy neutrons at the start of the frame



Science Program

- Balance will need to be determined by demand.
  - SESANS
  - Larmor Diffraction
  - Technique Development.
  - SANS

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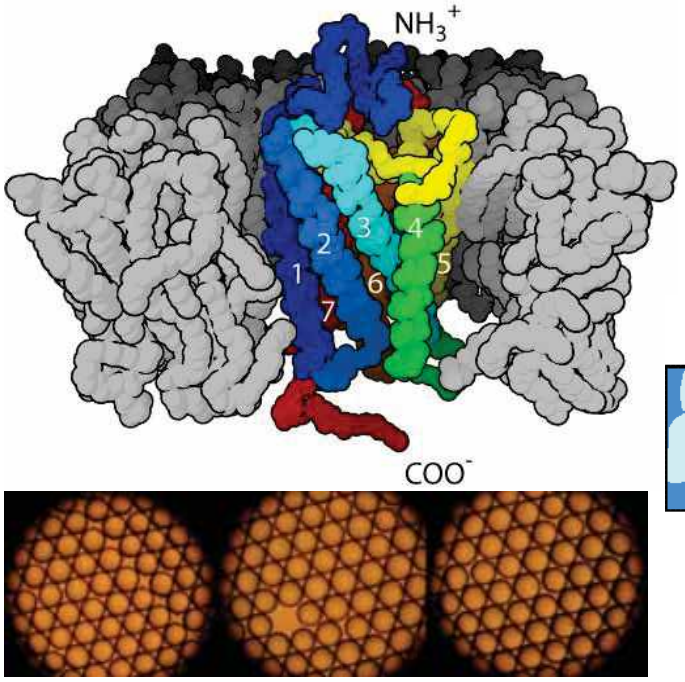
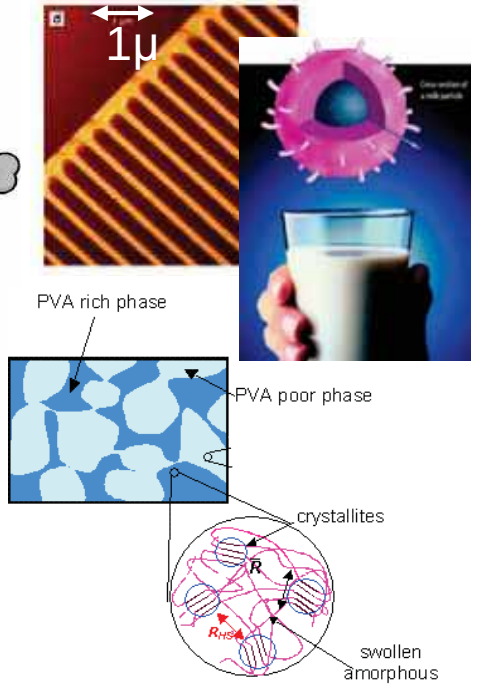
SESANS Science

- Length scales from ~20nm to 20μm
- Significant overlap with SANS option
- Science themes
  - Aggregation
  - Colloids
  - Food Science
  - Advanced Materials
  - Bio-Materials
  - Granular Materials
- At least 10 times more flux than OffSpec





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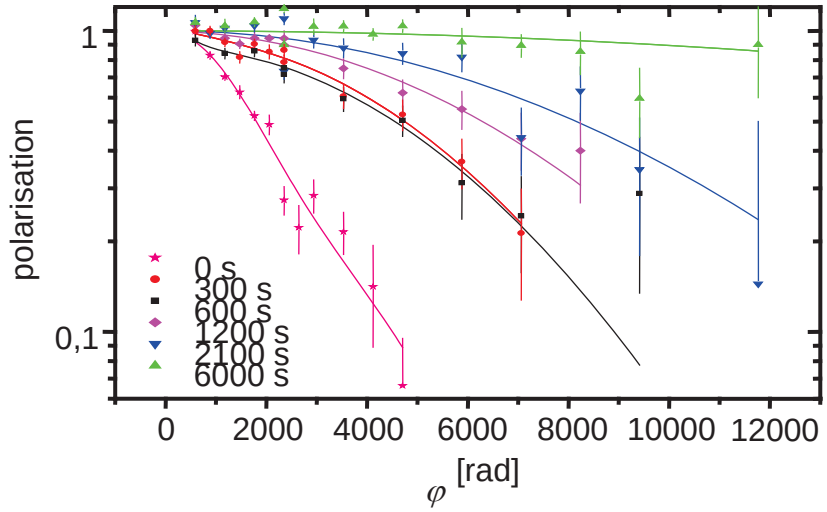
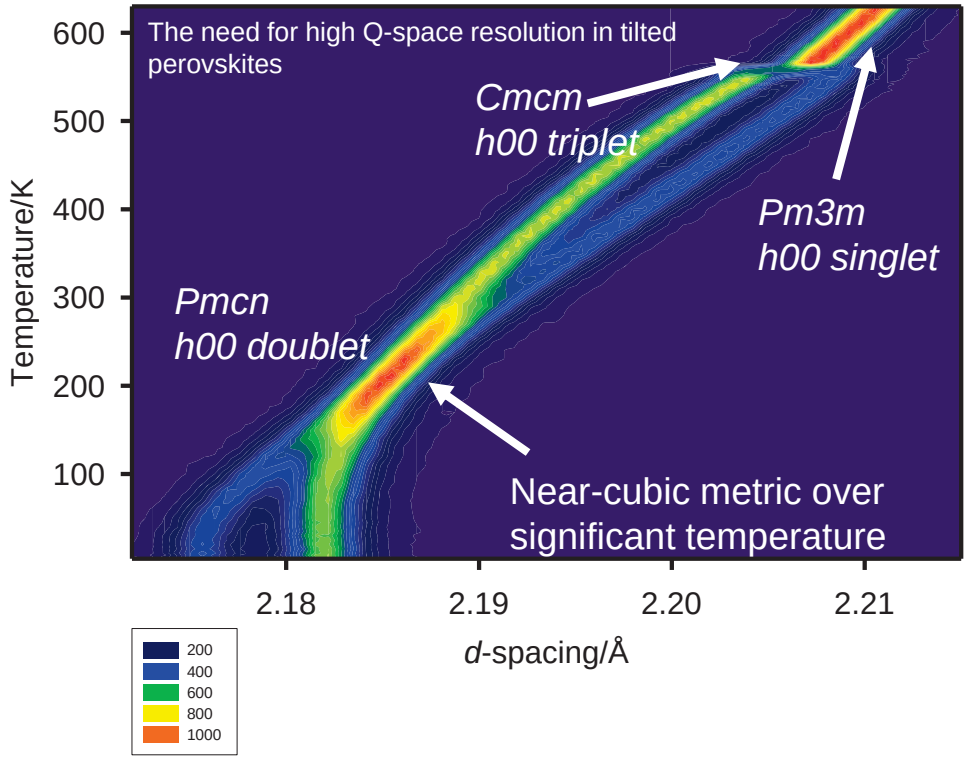
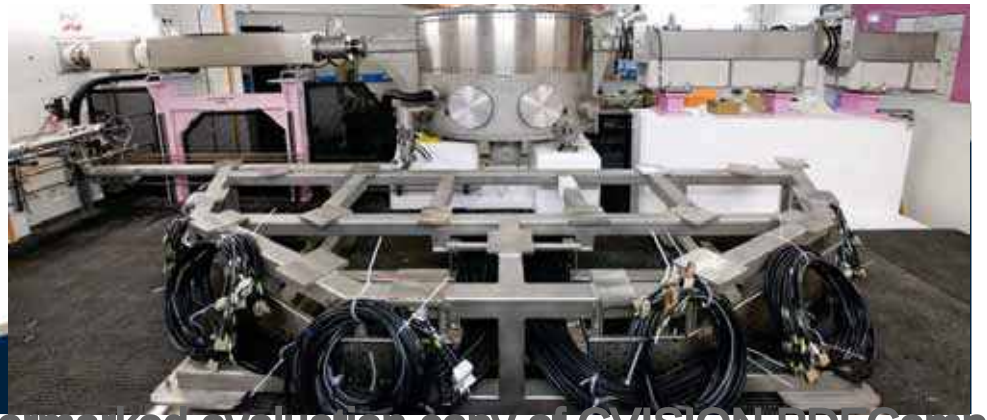
Larmor Diffraction





- Main interest from engineering and complex magnetism communities.
- Those from WISH and EngineX



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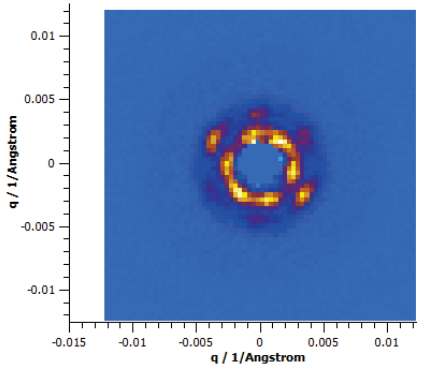
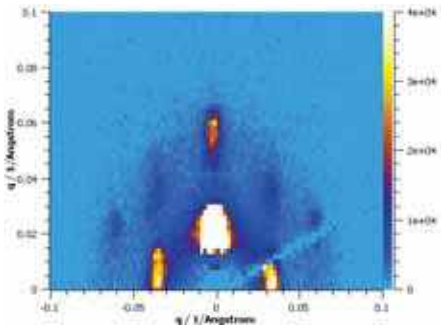
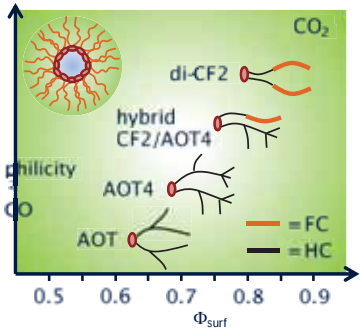
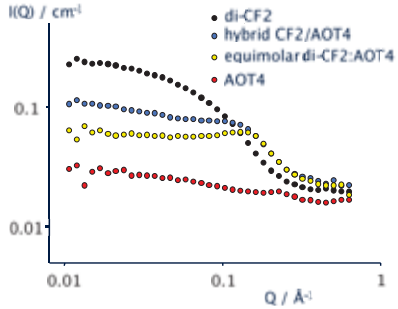
SANS Science

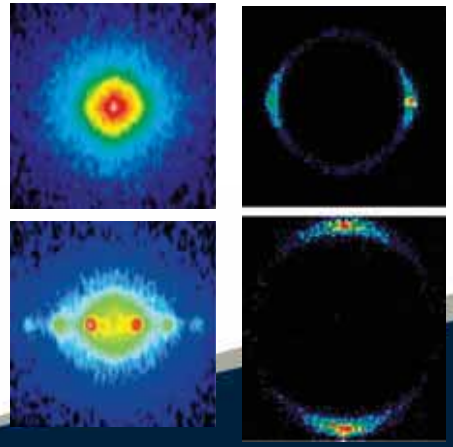
- Current Program
  - Huge array of soft matter science
  - Colloids
  - Proteins in Solution
  - Polymers and surfactants under shear
- Developing program
  - GISANS
  - Polarised SANS
  - Hard condensed matter, magnetism and super conductivity











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Sample Environment

- Key to successful exploitation
- Routinely available ISIS sample environment equipment.
  - Simple Sample Changer
  - Stopped Flow
  - Rheometry
  - Cryogenics
  - Pressure
  - Stress-Strain
  - Magnets

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Discussion Points

- What specific sample environment equipment should be available from day one?
- What should the characteristics of the day one SESANS system be?
  - Are very large length scales (50 microns) needed?
  - Should it be possible to measure SANS and SESANS simultaneously?
- What science would be investigated if SESANS and diffraction were available simultaneously?
- Fitting and simulation software.

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Thank you for your attention.

- Thanks for material to
  - David Turner
  - Nick Webb

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