IMAT Design Evolution

Jim Nightingale
ISIS

Science & Technology Facilities Council
Rutherford Appleton Laboratory

From $299

iMat

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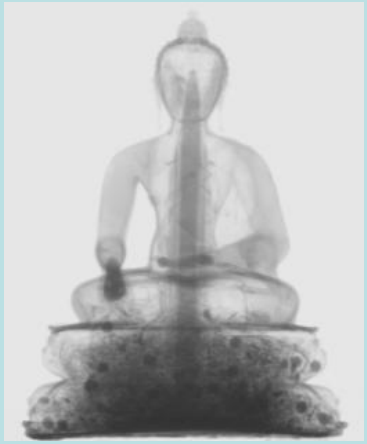
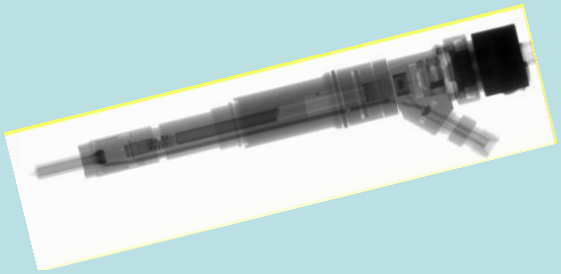
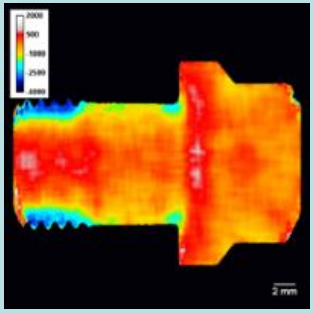
IMAT Science

TOF Imaging

Radiography Tomography
Energy Selective Imaging





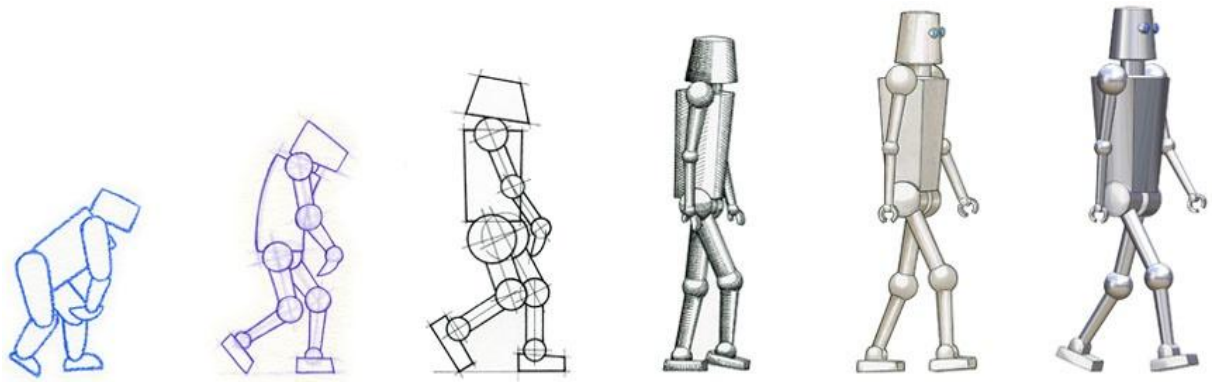


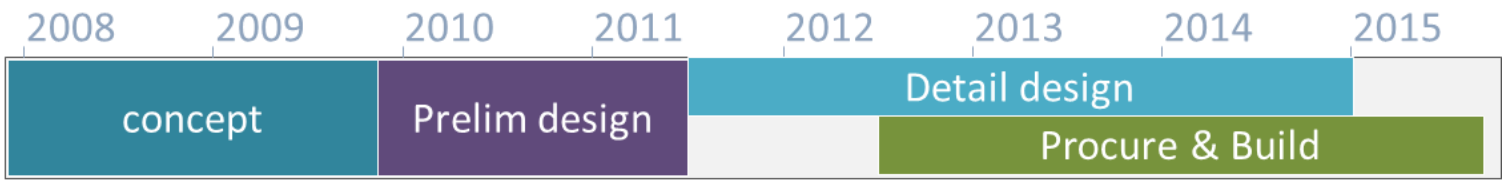
Neutron Diffraction

Phase analysis
Strain scanning

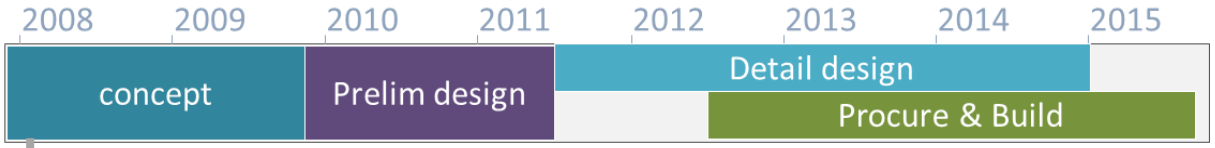
IMAT is an engineering instrument

IMAT Design Evolution

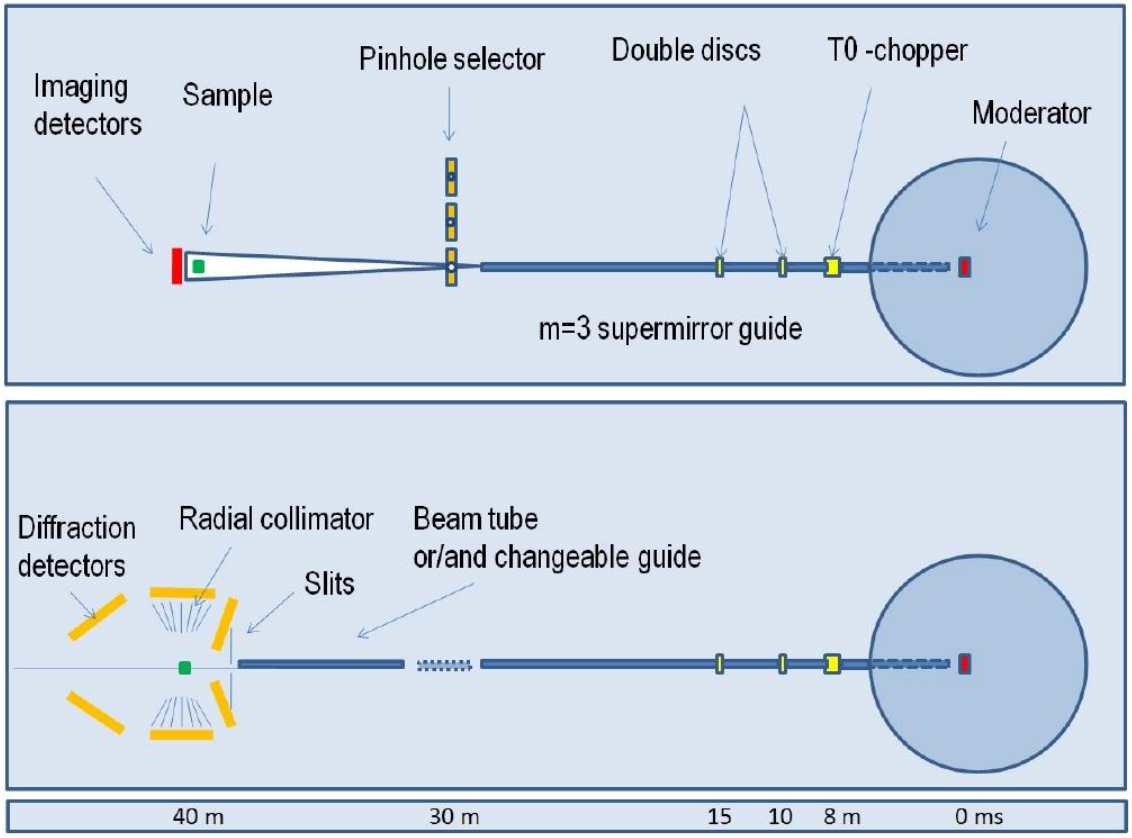




Instrument Concept & Layout



2008 Draft Proposal



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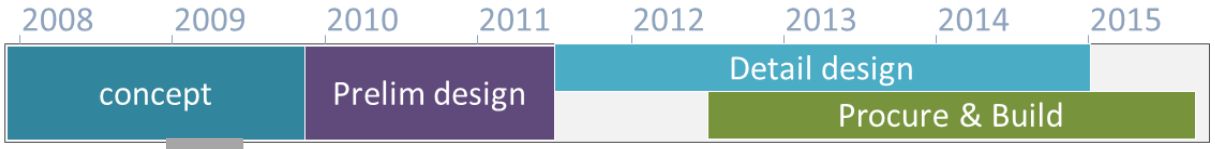
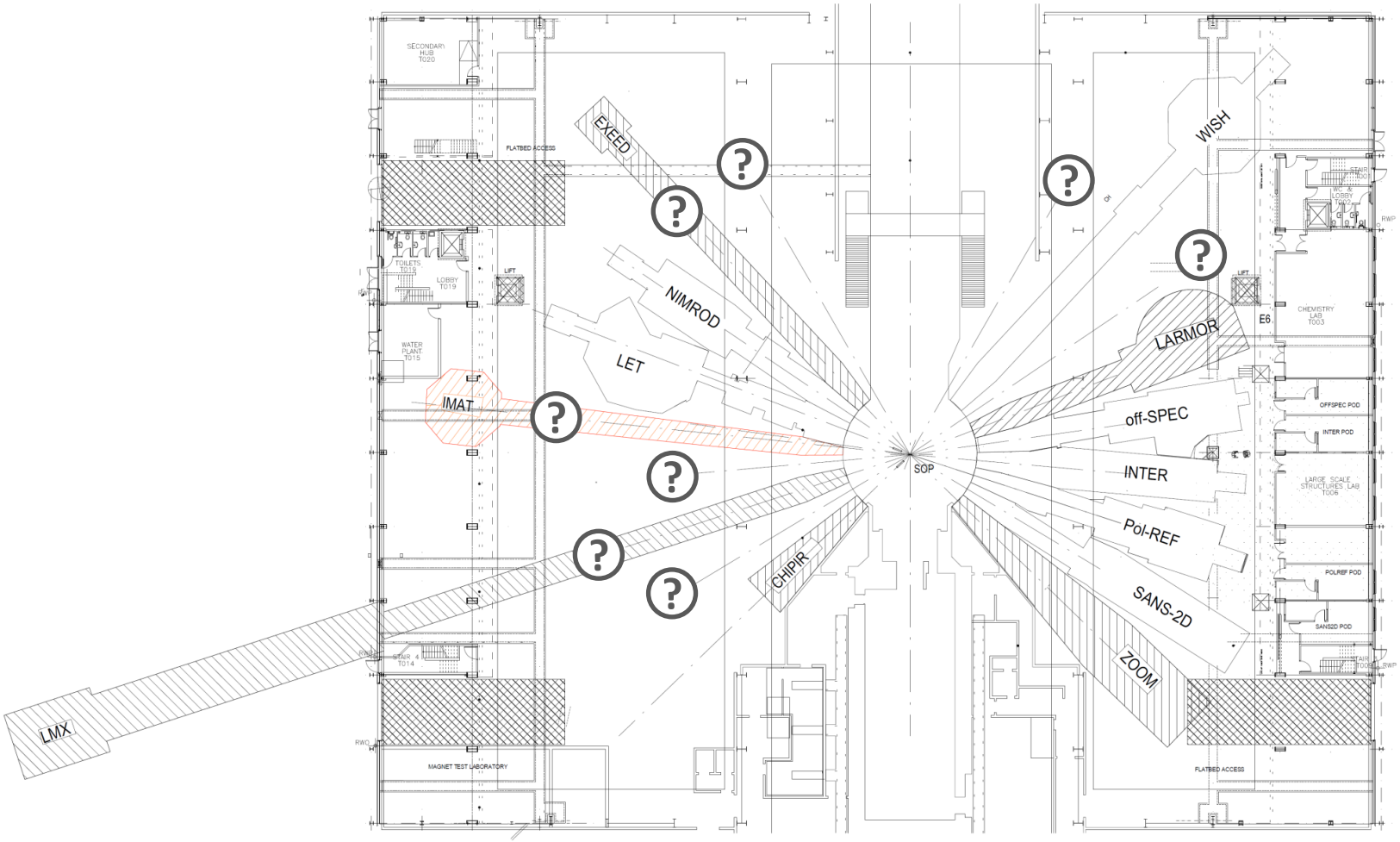


IMAT position proposal



Nov 2009 – Feb 2010
Decision on position and length

40m

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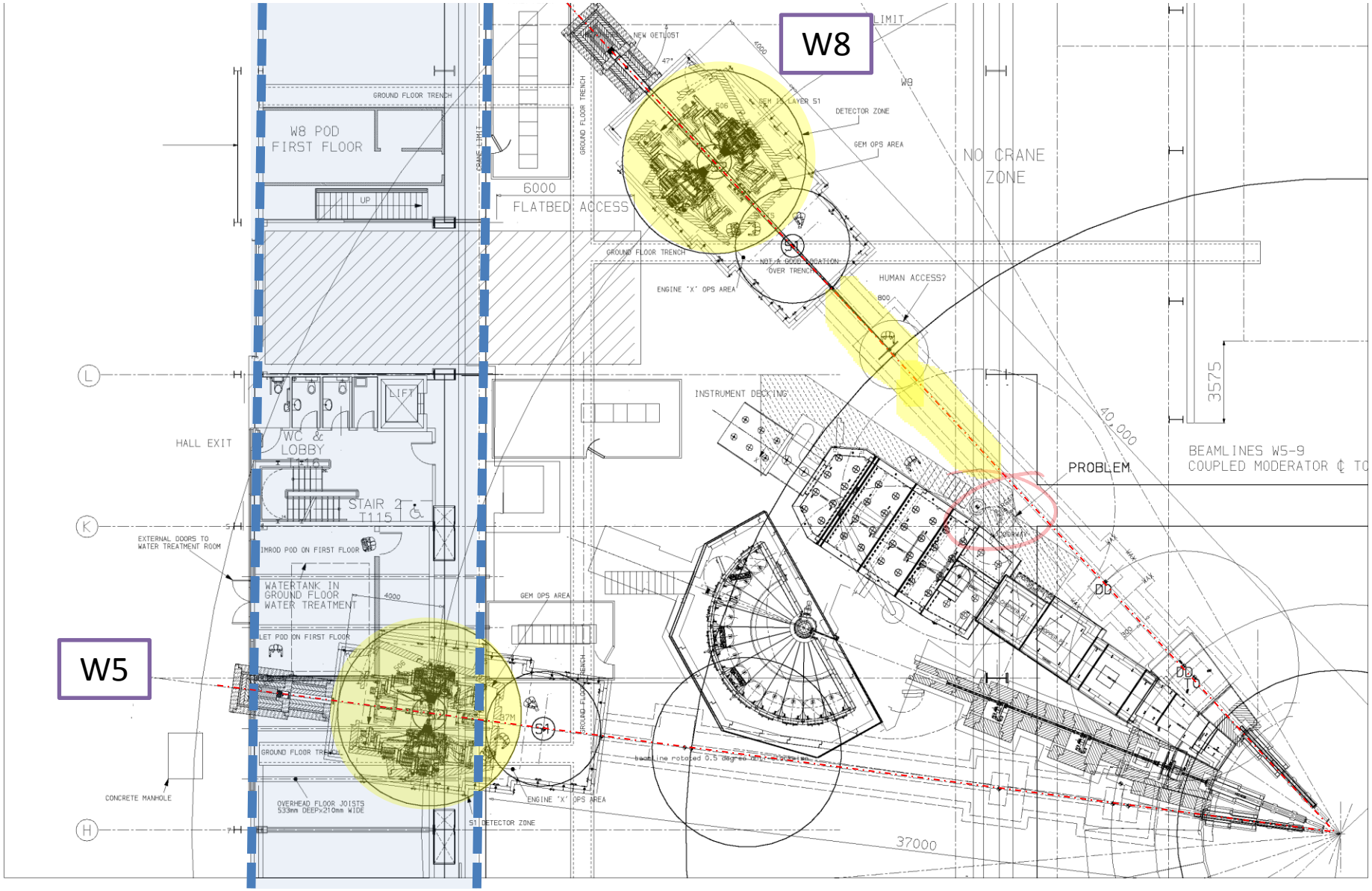
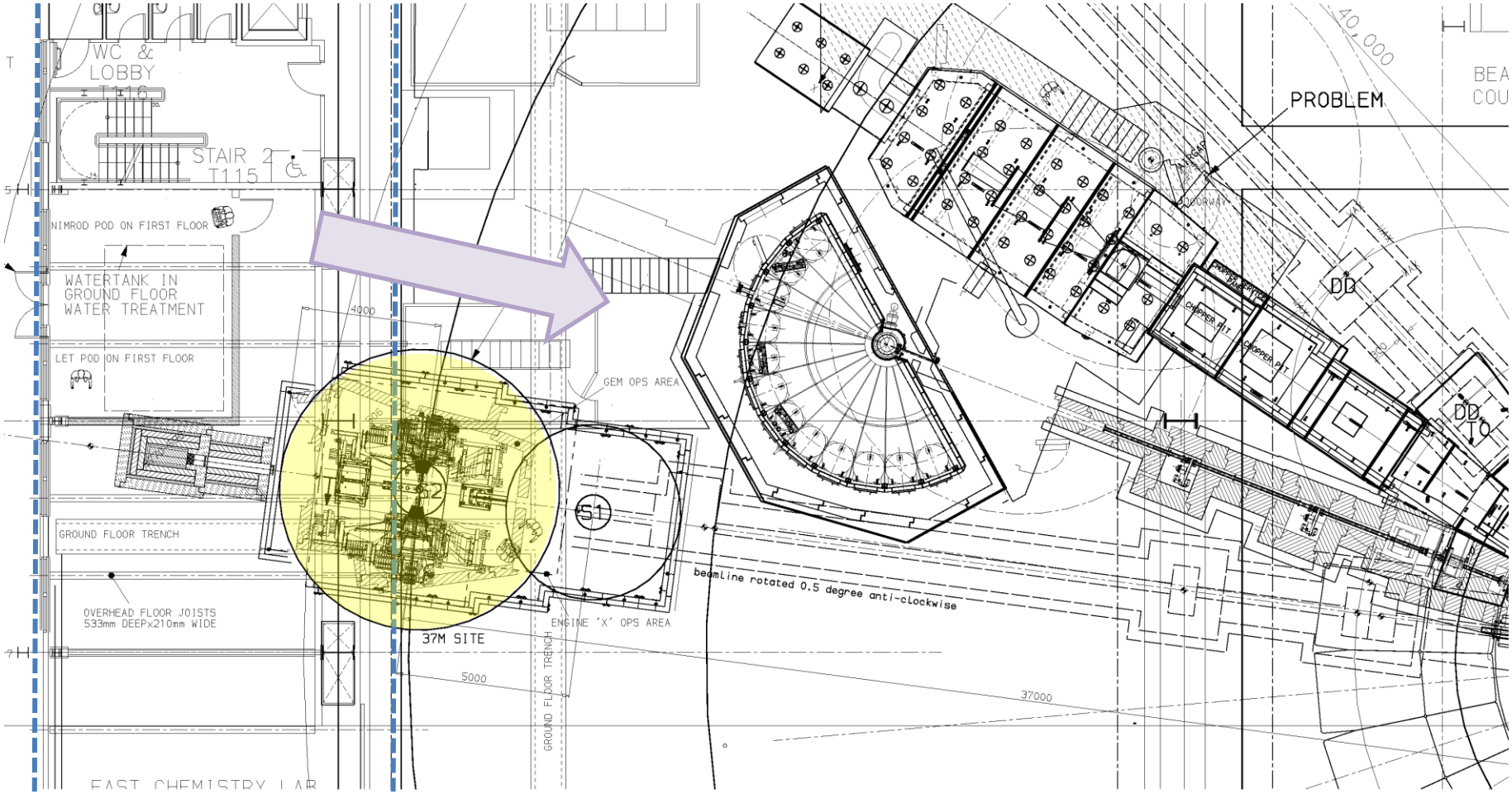


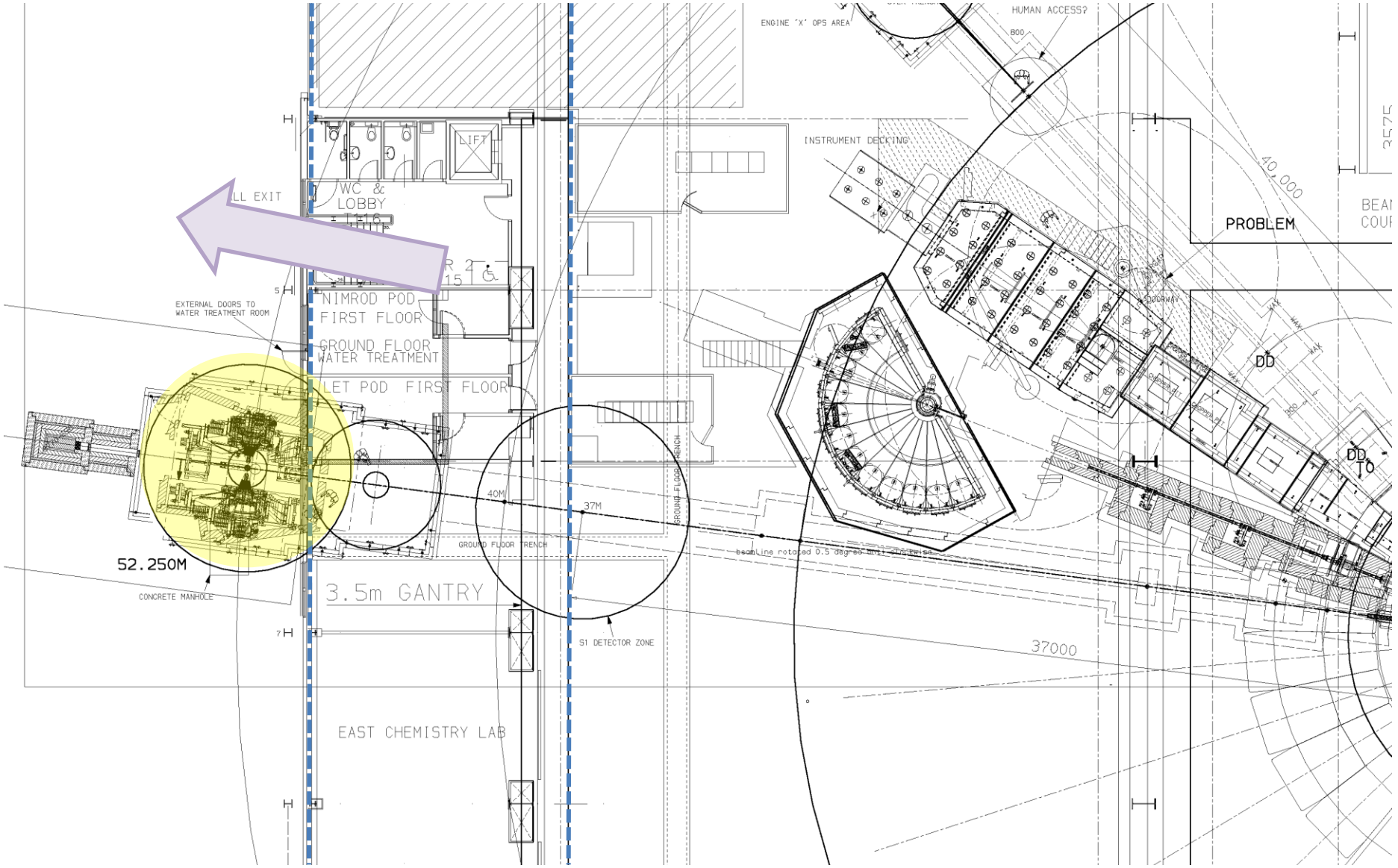
Nov 2009 – Feb 2010
Decision on position and length

37m

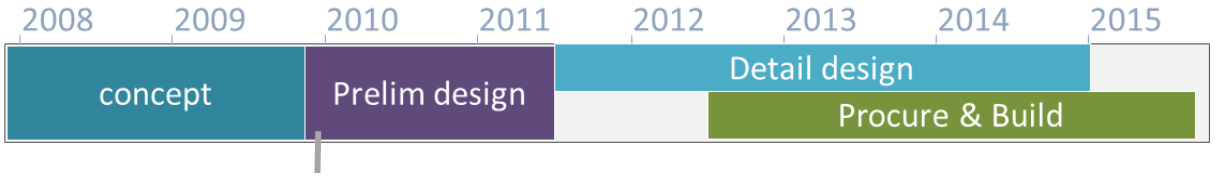


Nov 2009 – Feb 2010
Decision on position and length

52m



Instrument Concept & Layout



Jan 2010 - IMAT position decision

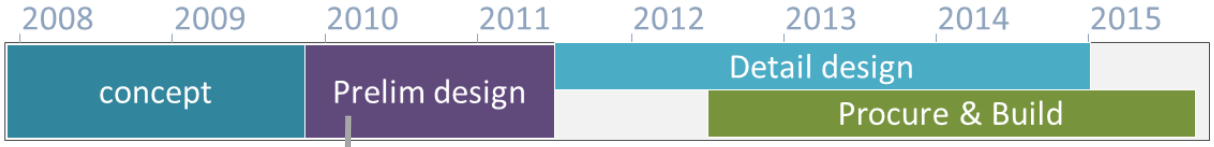
	Imaging/ Radiography	Strain analysis	Texture analysis	Access/ease of user operation	Overall rating
W5/L37	8.4	3	5.2	5	5.4
W5/L56	8.1	9	9.8	10	9.2
W8/L40	9.5	5	9.8	8	8.1

Kockelmann, W., Zhang, S. Y., Chapon, L. C. (2010) IMAT: performance evaluation report

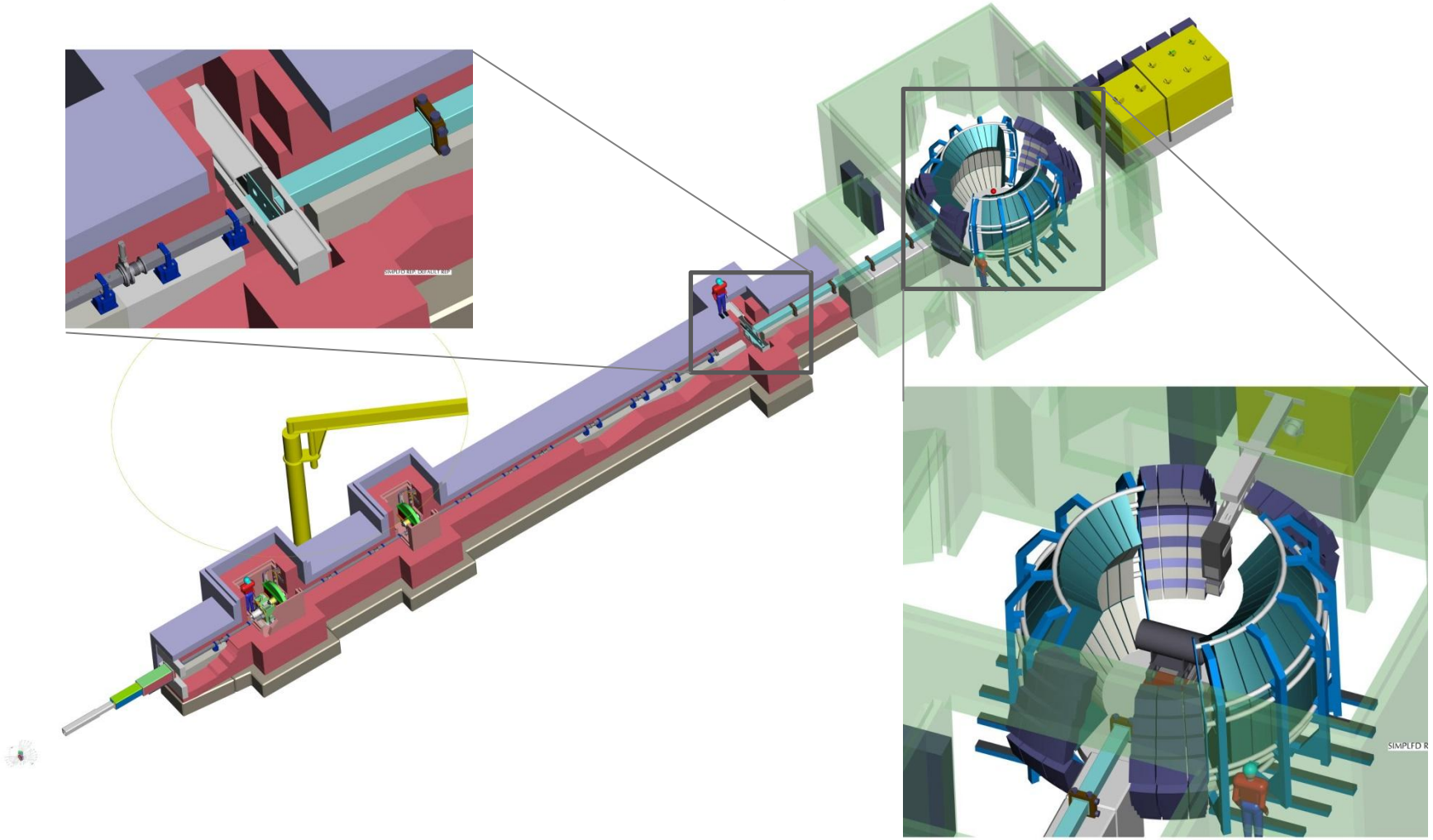
Impact:

- Increase of instrument cost = £2m
- Increased complexity of design & build
- Increased timescale for evaluation and sign-off

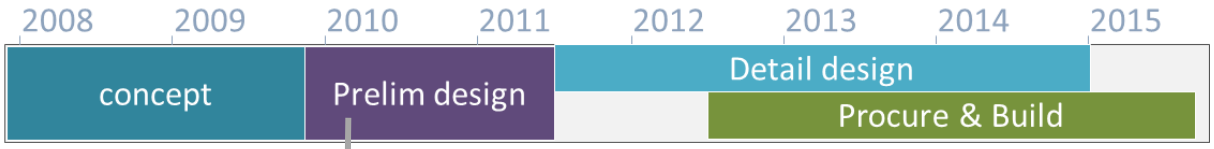
Instrument Preliminary Design



Feb 2010 – First outline design



Instrument Preliminary Design



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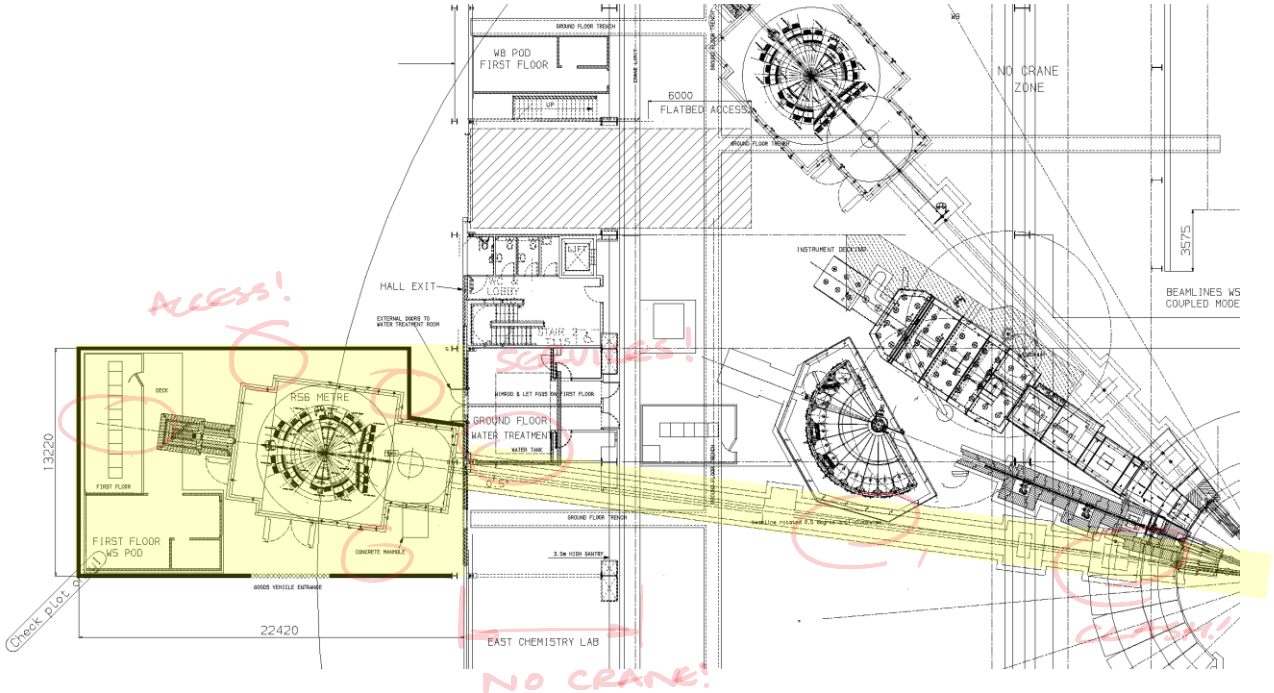
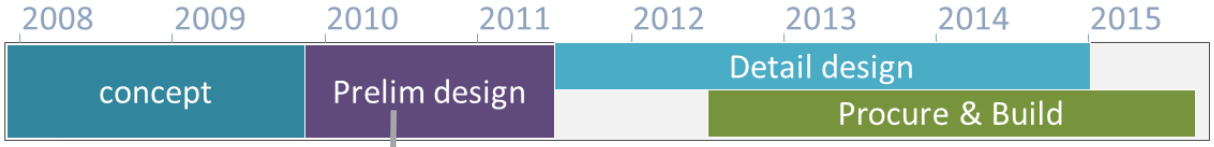
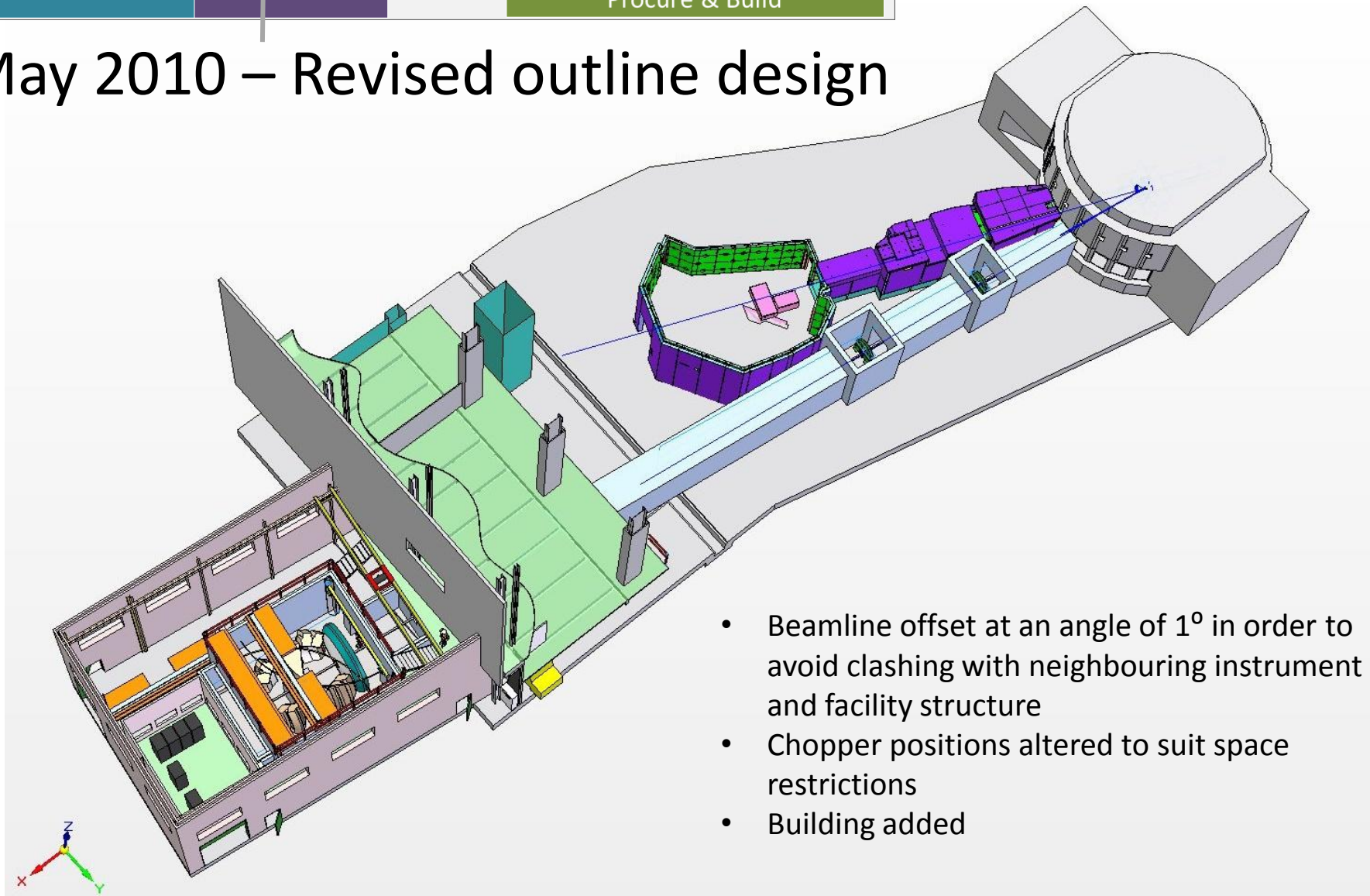


Instrument Preliminary Design

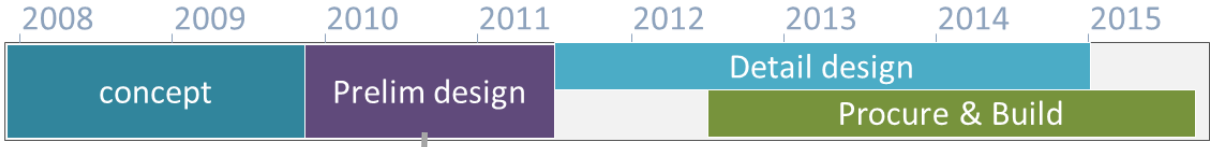


May 2010 – Revised outline design

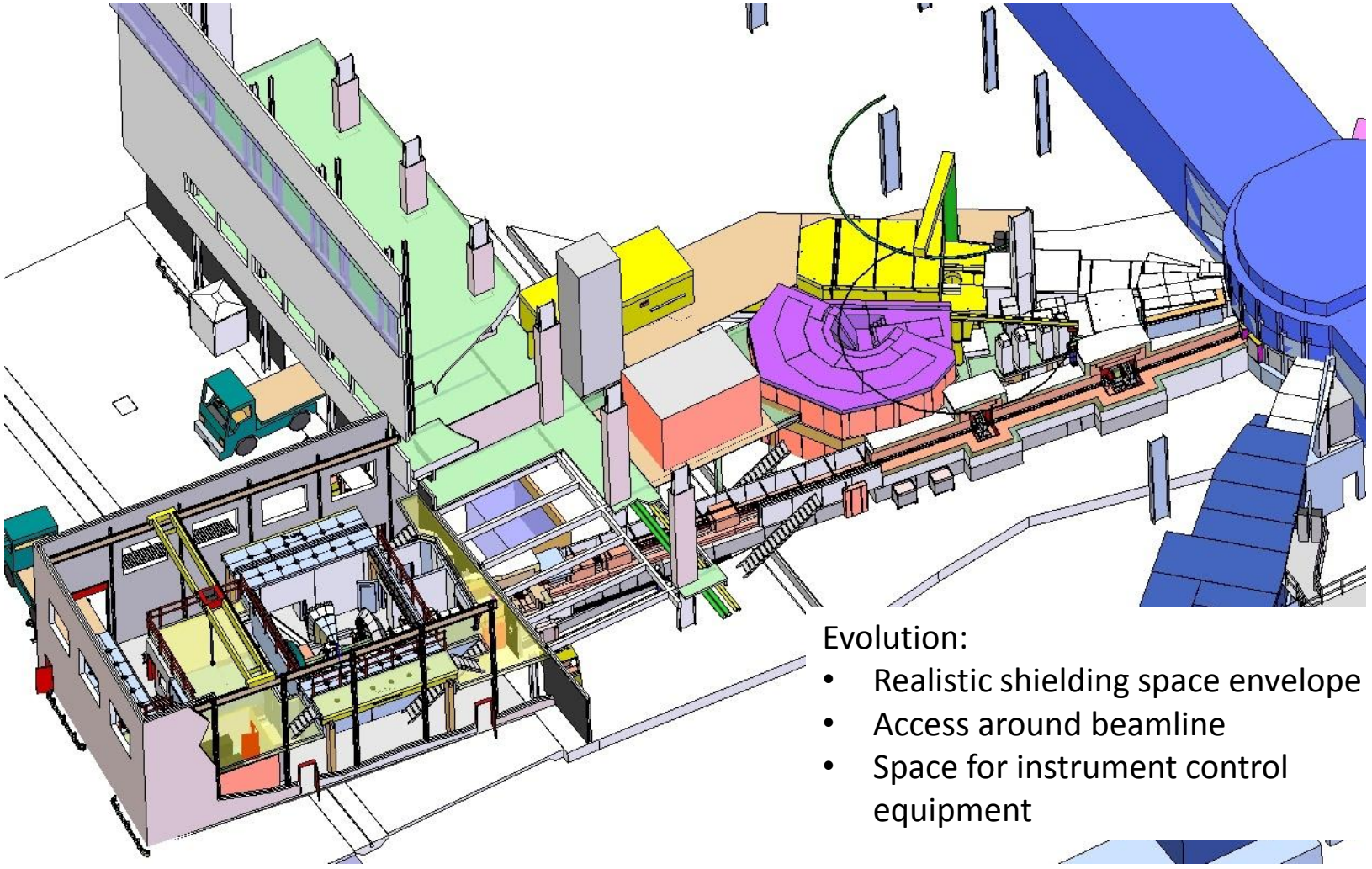


- Beamline offset at an angle of 1º in order to avoid clashing with neighbouring instrument and facility structure
- Chopper positions altered to suit space restrictions
- Building added

Instrument Preliminary Design



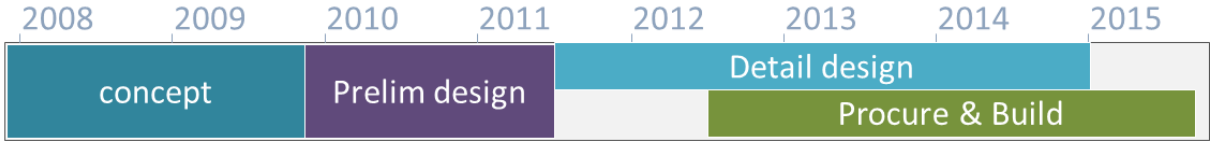
July 2010 – Developed outline design

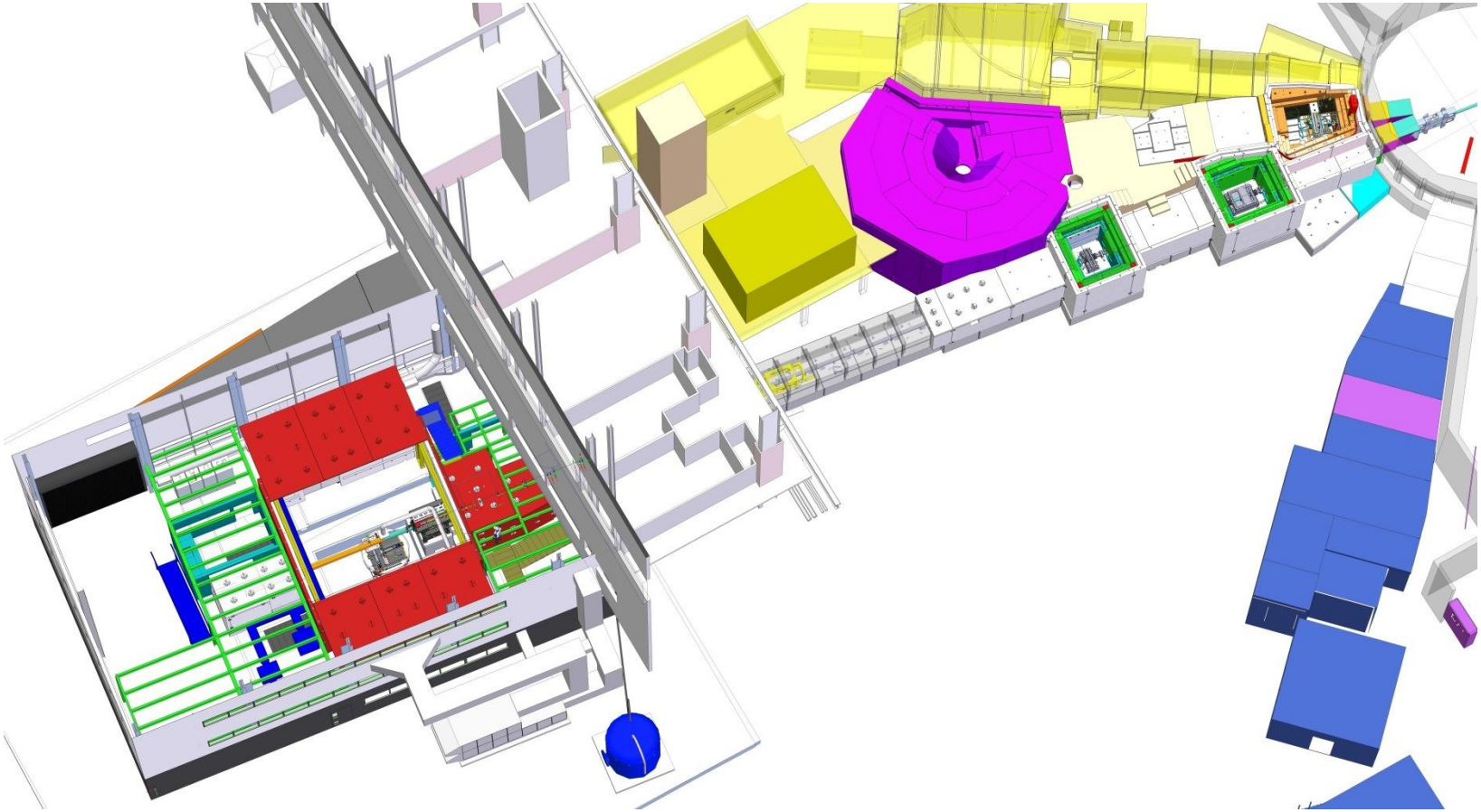


Evolution:

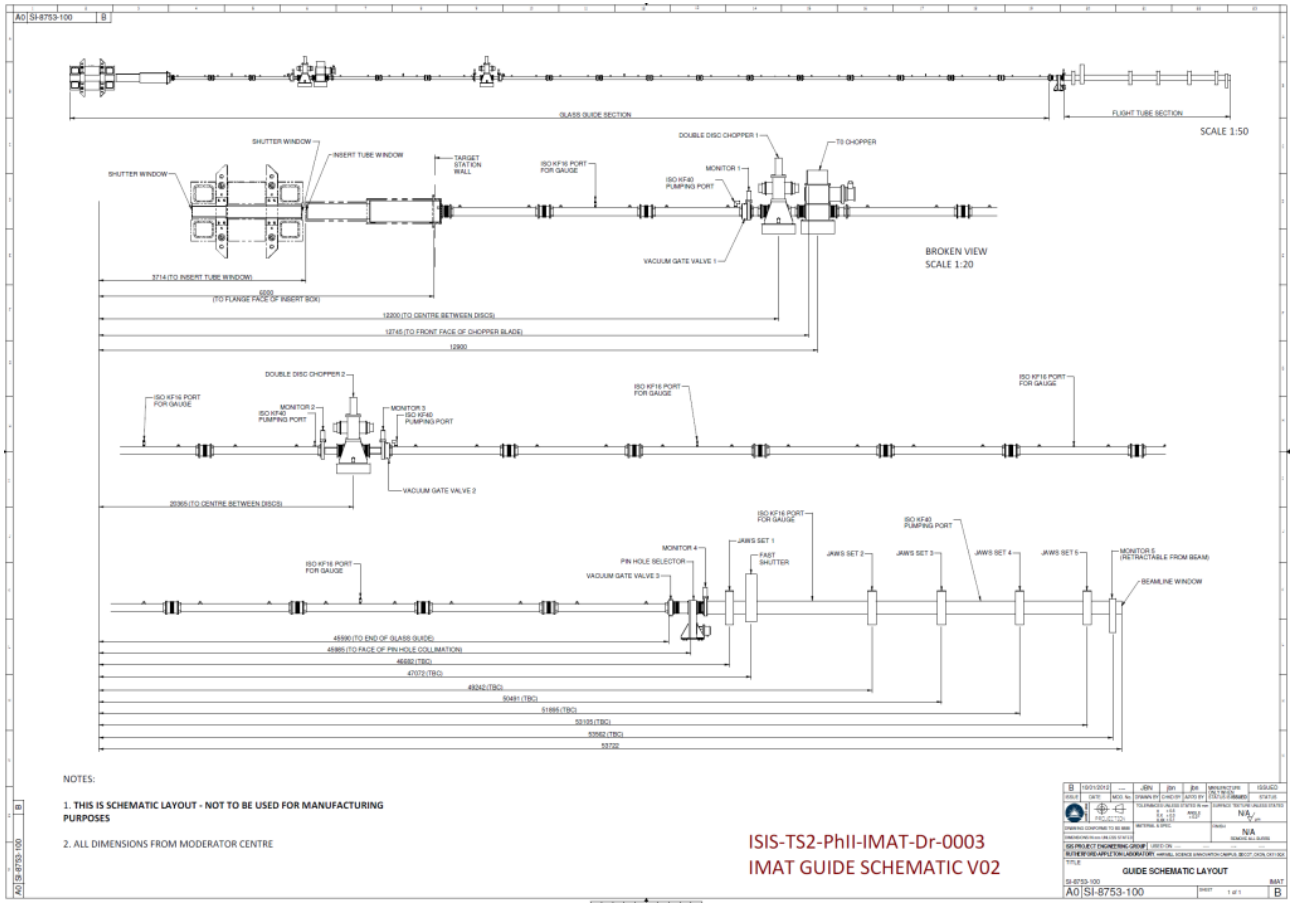
- Realistic shielding space envelope
- Access around beamline
- Space for instrument control equipment

Instrument Detail Design



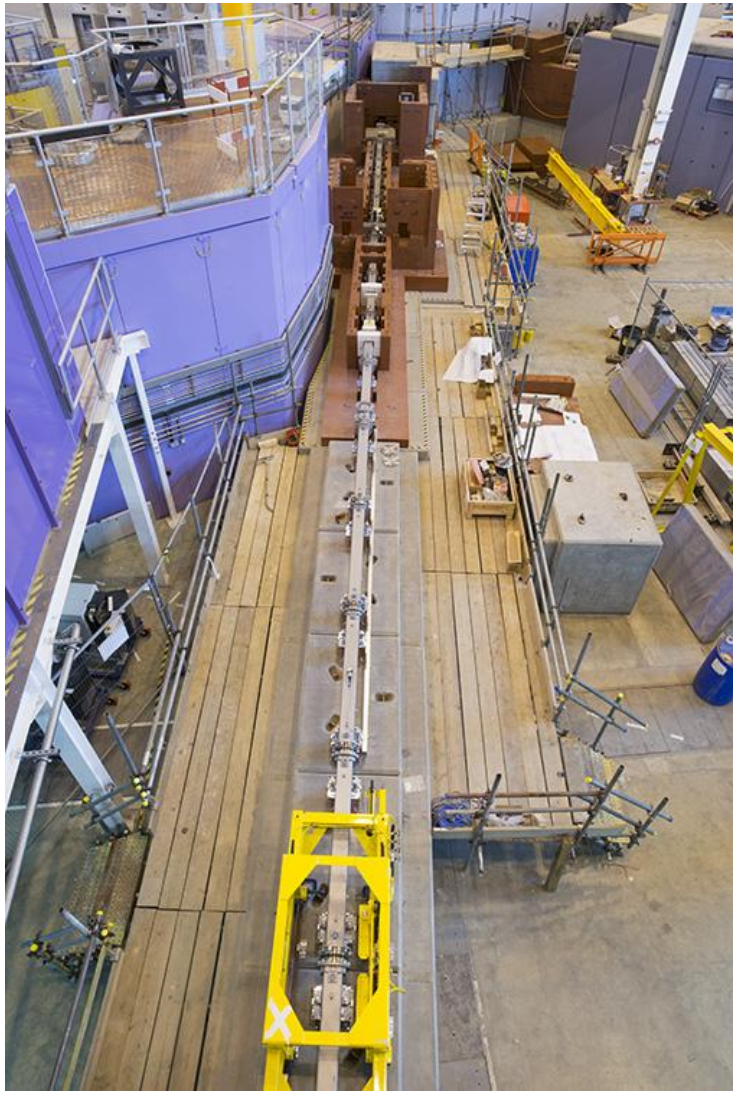


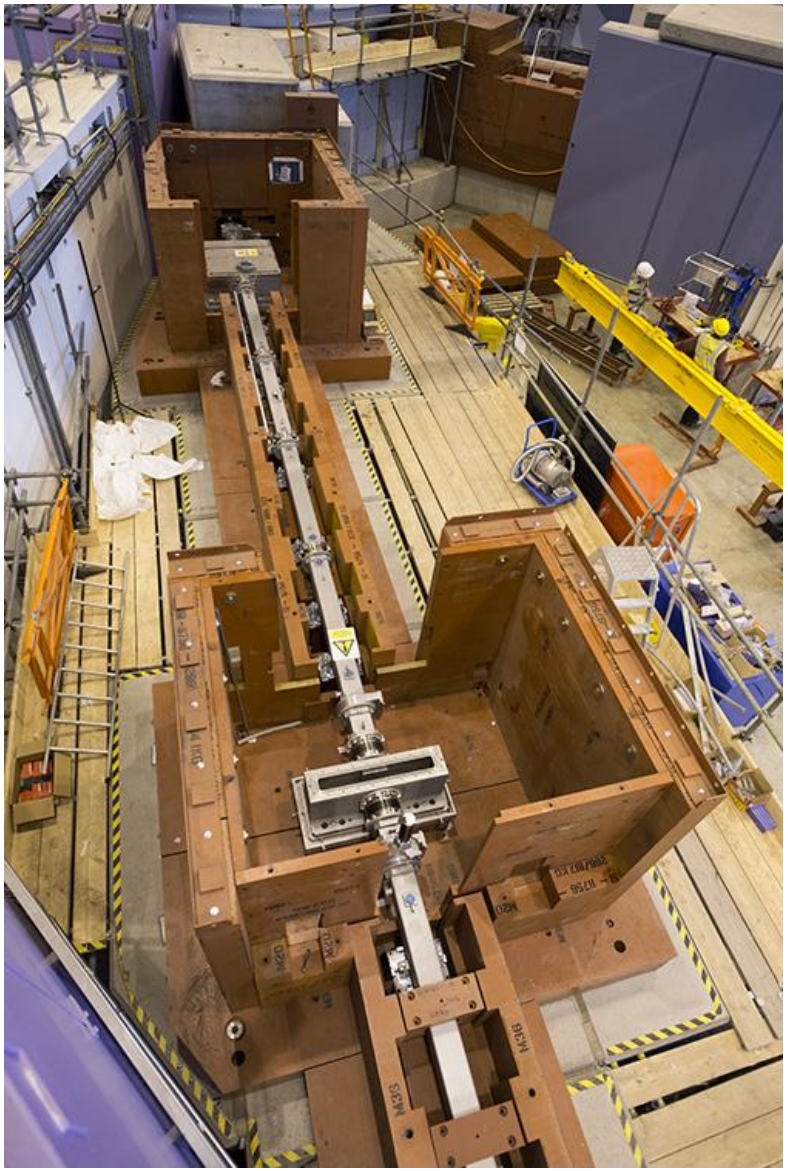
Neutron Guide



- Straight 95x95mm M=3 super mirror guide
- **Increase reliability**
- **Improve serviceability**
- **Improve diagnostic features**

Neutron Guide





Neutron Guide

Neutron Guide

Vacuum gate valve

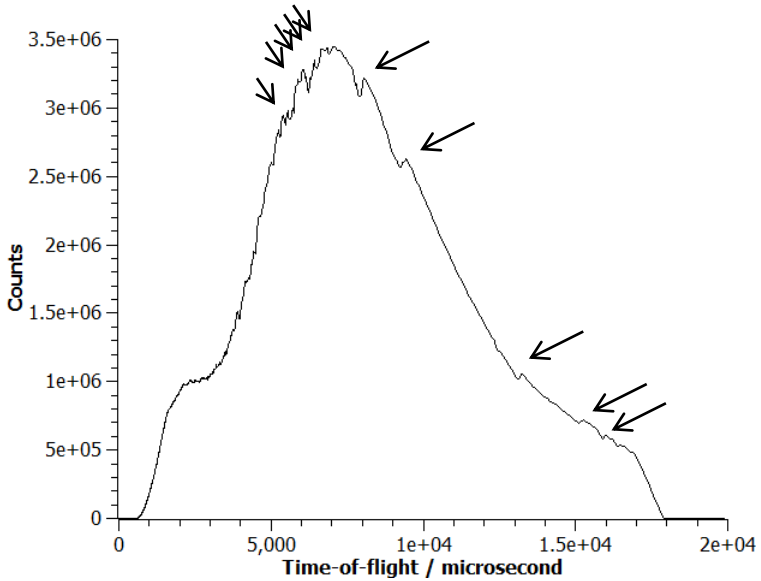
Chopper housing

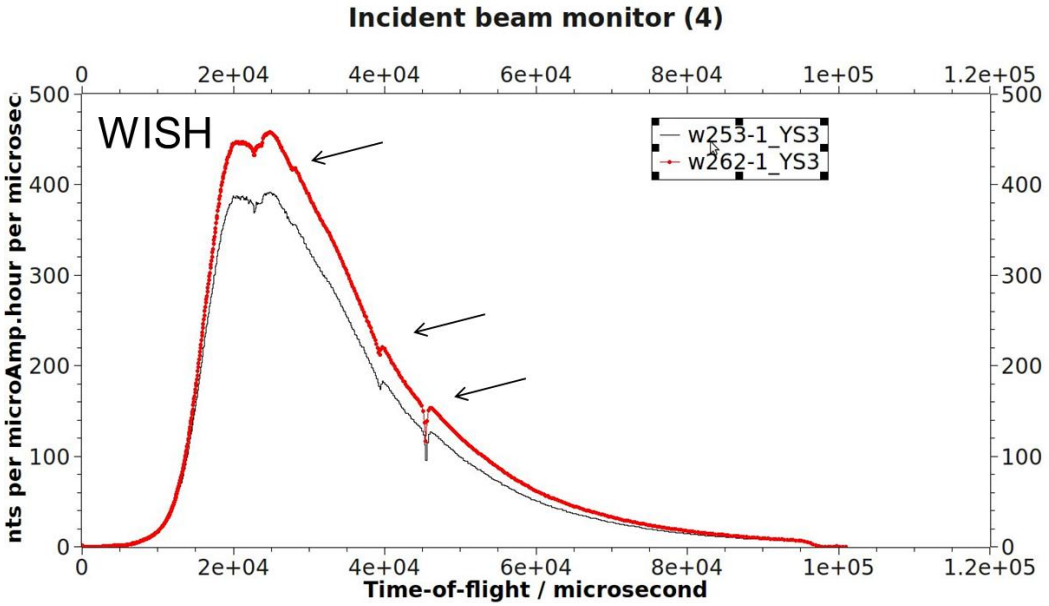
Diagnostic beam monitors

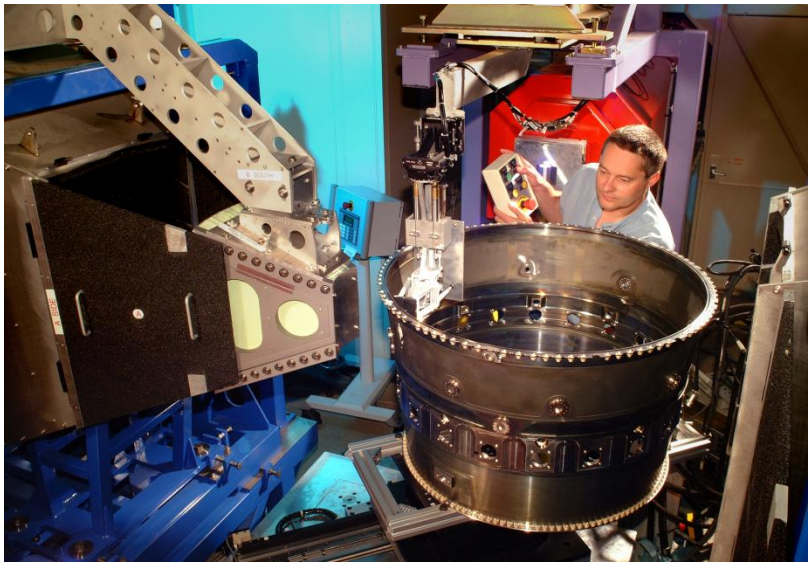
Survey nest points

Neutron Guide

Incident Beam Profile







Choppers

Choppers

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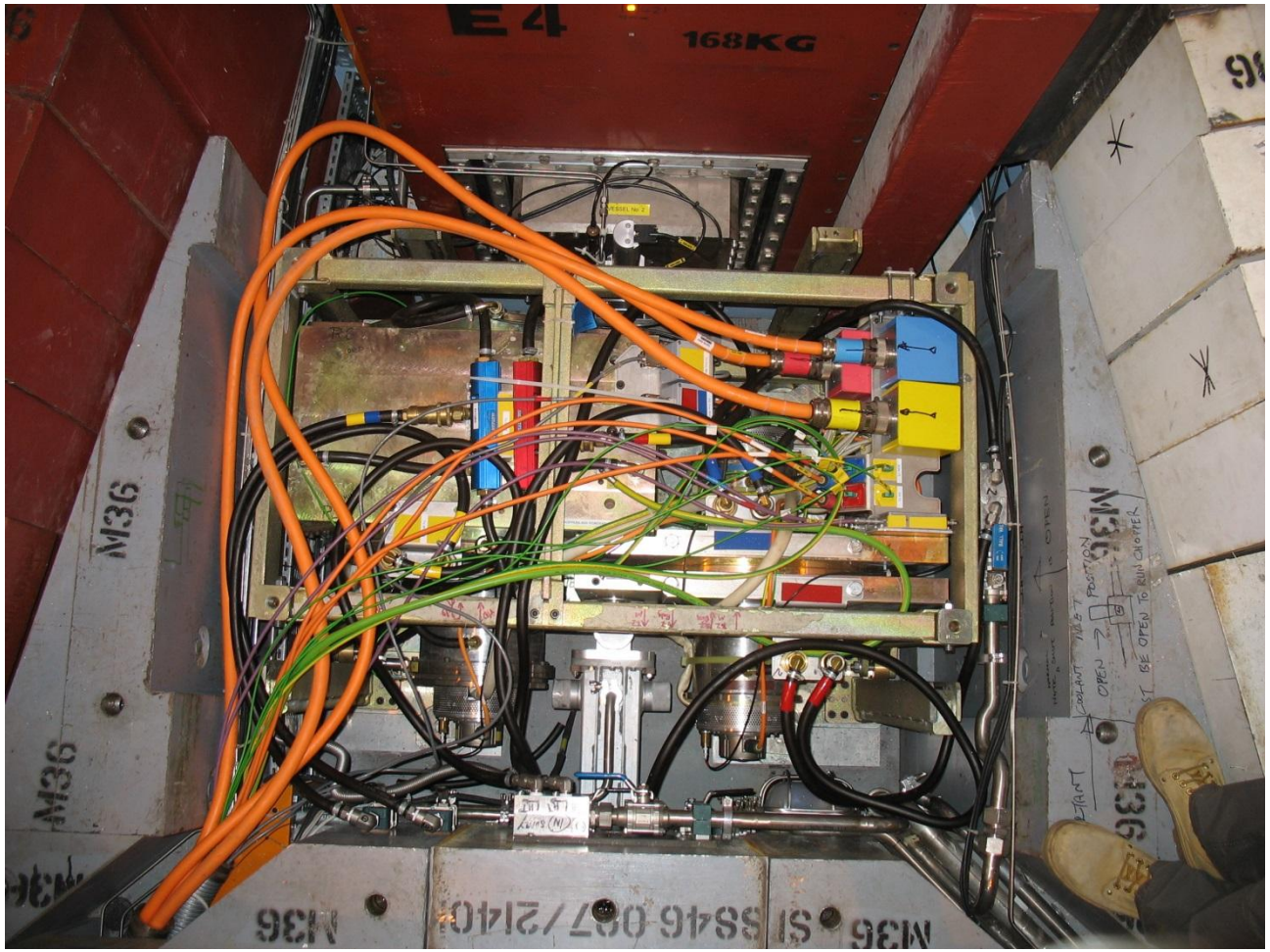
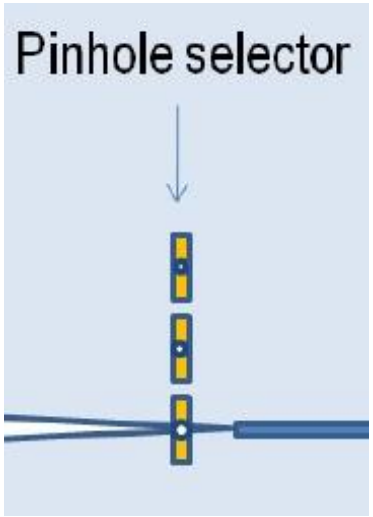
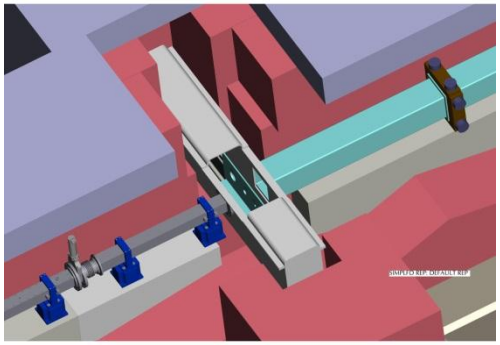
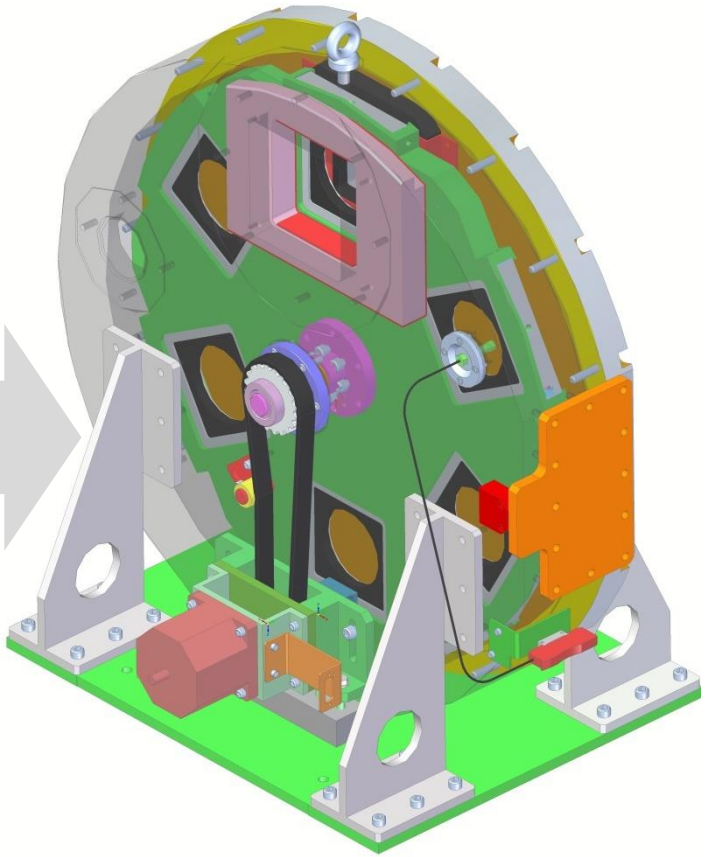


Choppers

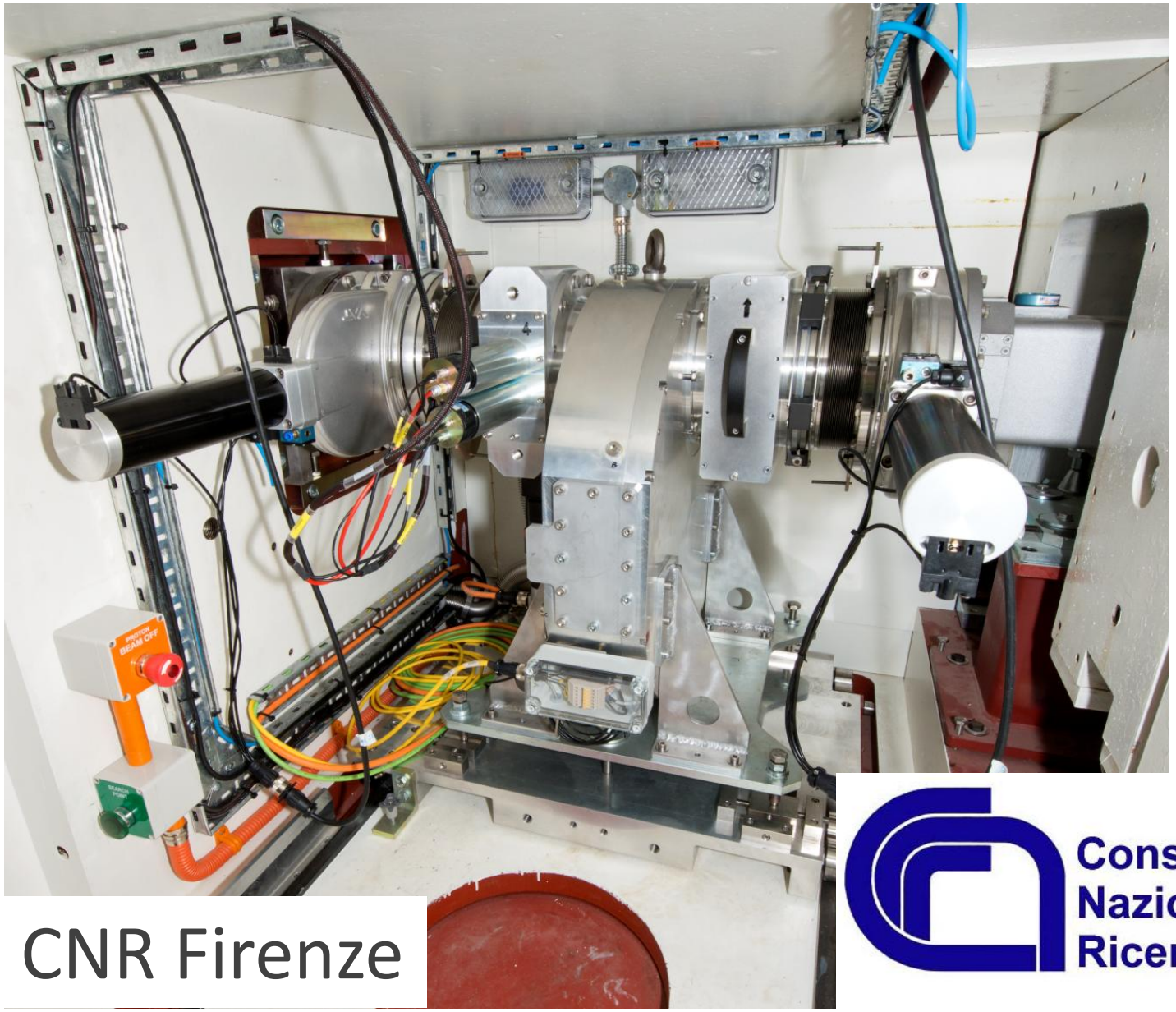
Pin-hole Selector







Pin-hole Selector



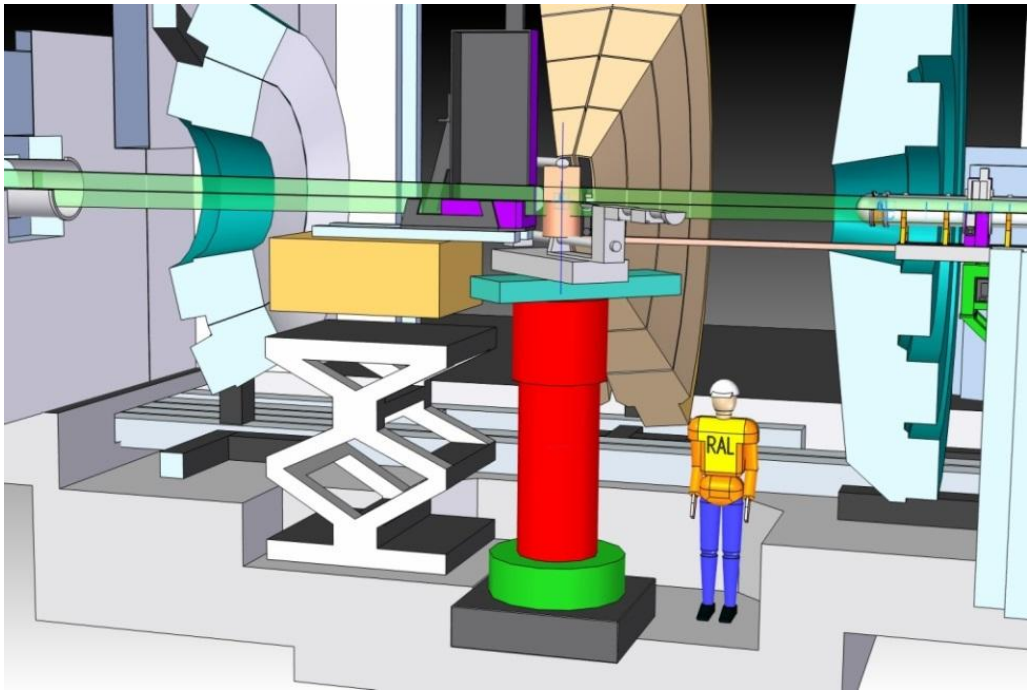
CNR Firenze

Consiglio
Nazionale delle
Ricerche

Beam Collimation

Sample Positioner

IMAT Sample Positioning System	
Axes of motion	7
Travel	
X	± 500 mm
Y	± 500 mm
Z	± 500 mm
θ1	370 degrees
Φ1	± 15 degrees
Φ2	± 15 degrees
Θ2	Continuous rotation
Load	**1.5 tonnes**



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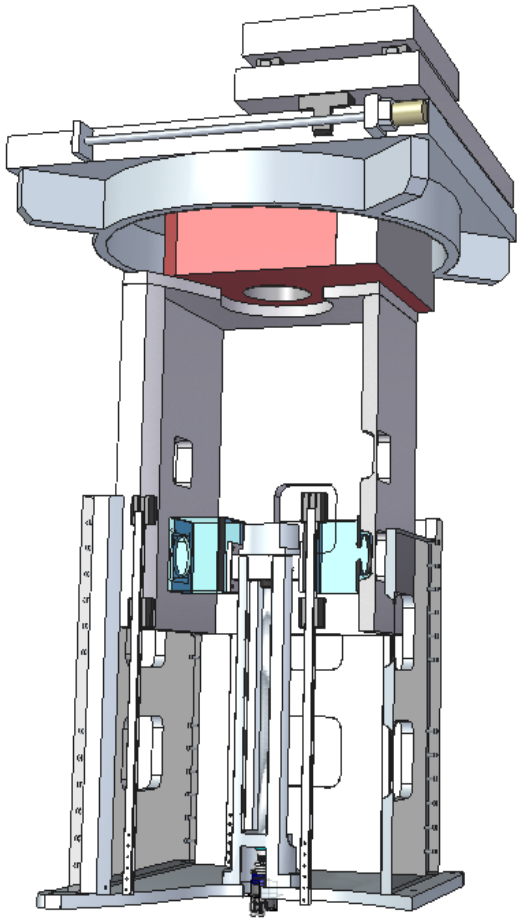

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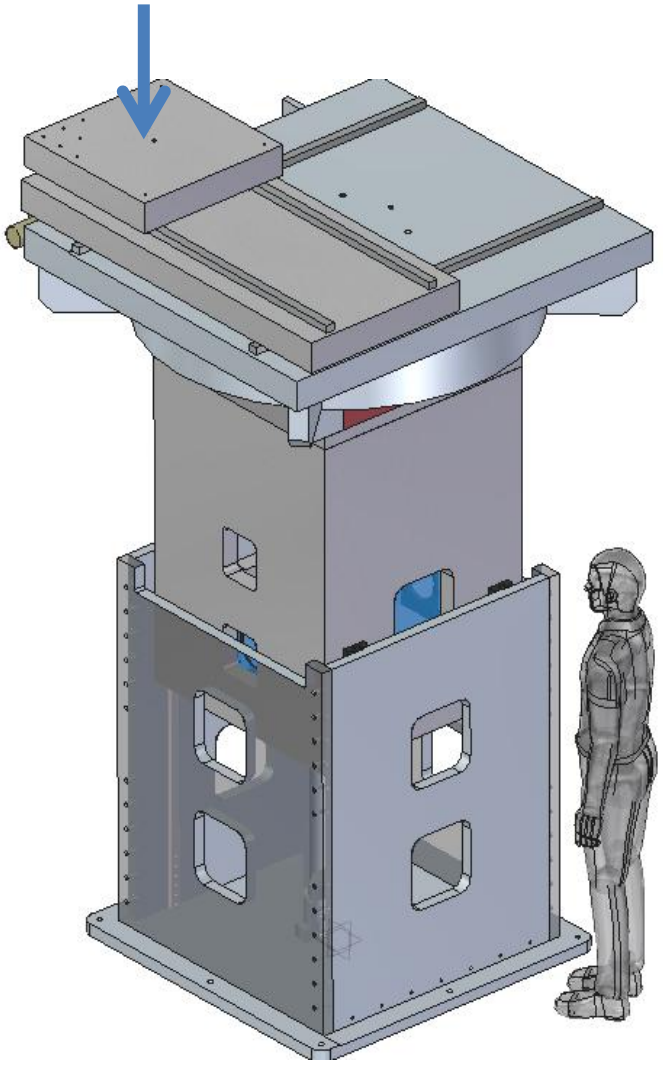
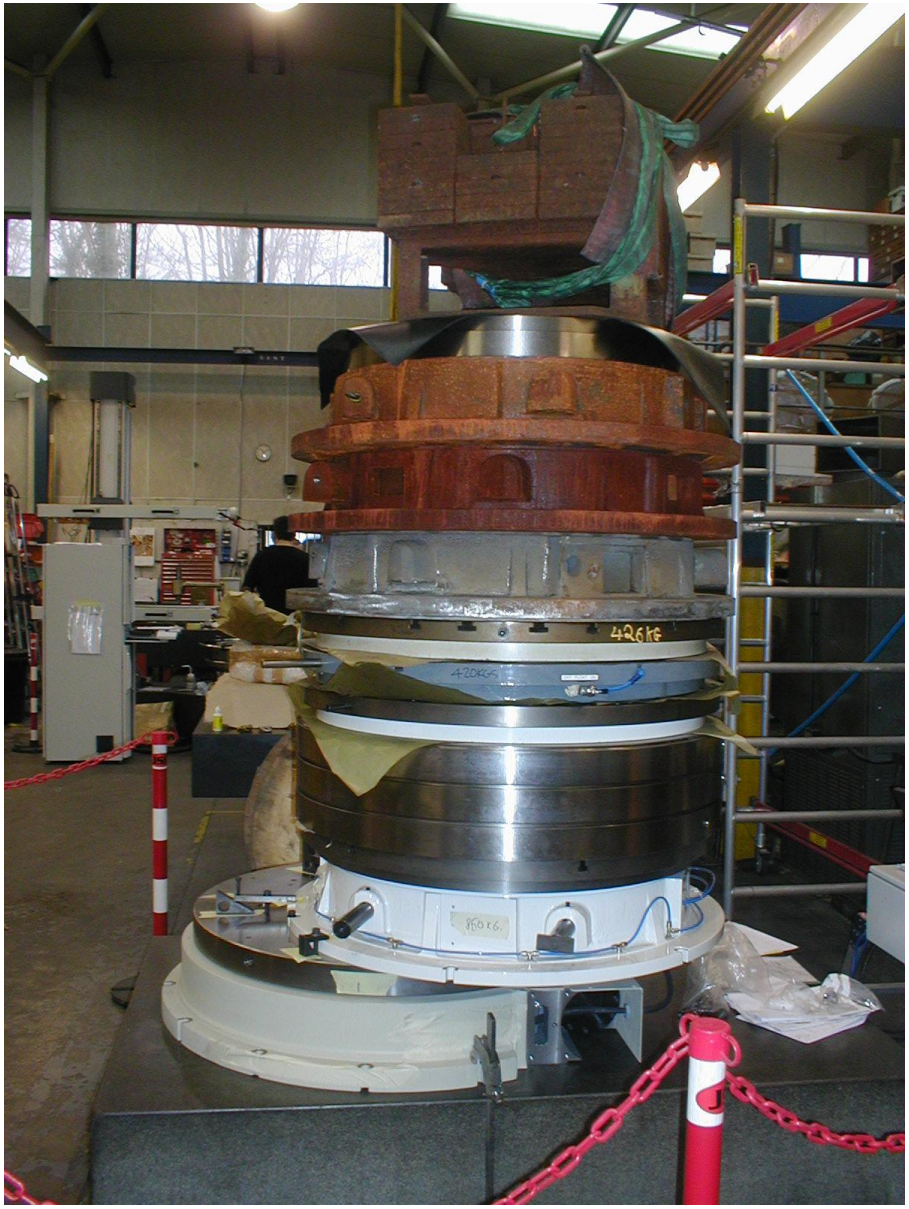


Sample Positioner

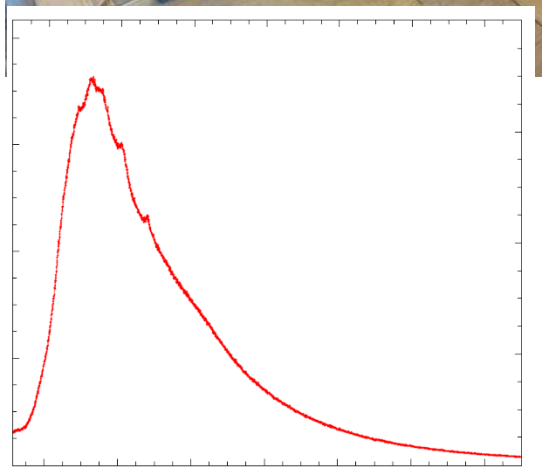
Sci-Tech DARESBURY

STFC Daresbury
Engineering Technology Centre

Sample Positioner



Neutrons!



Questions?