

STATUS OF THE BACKSCATTERING SPECTROMETER

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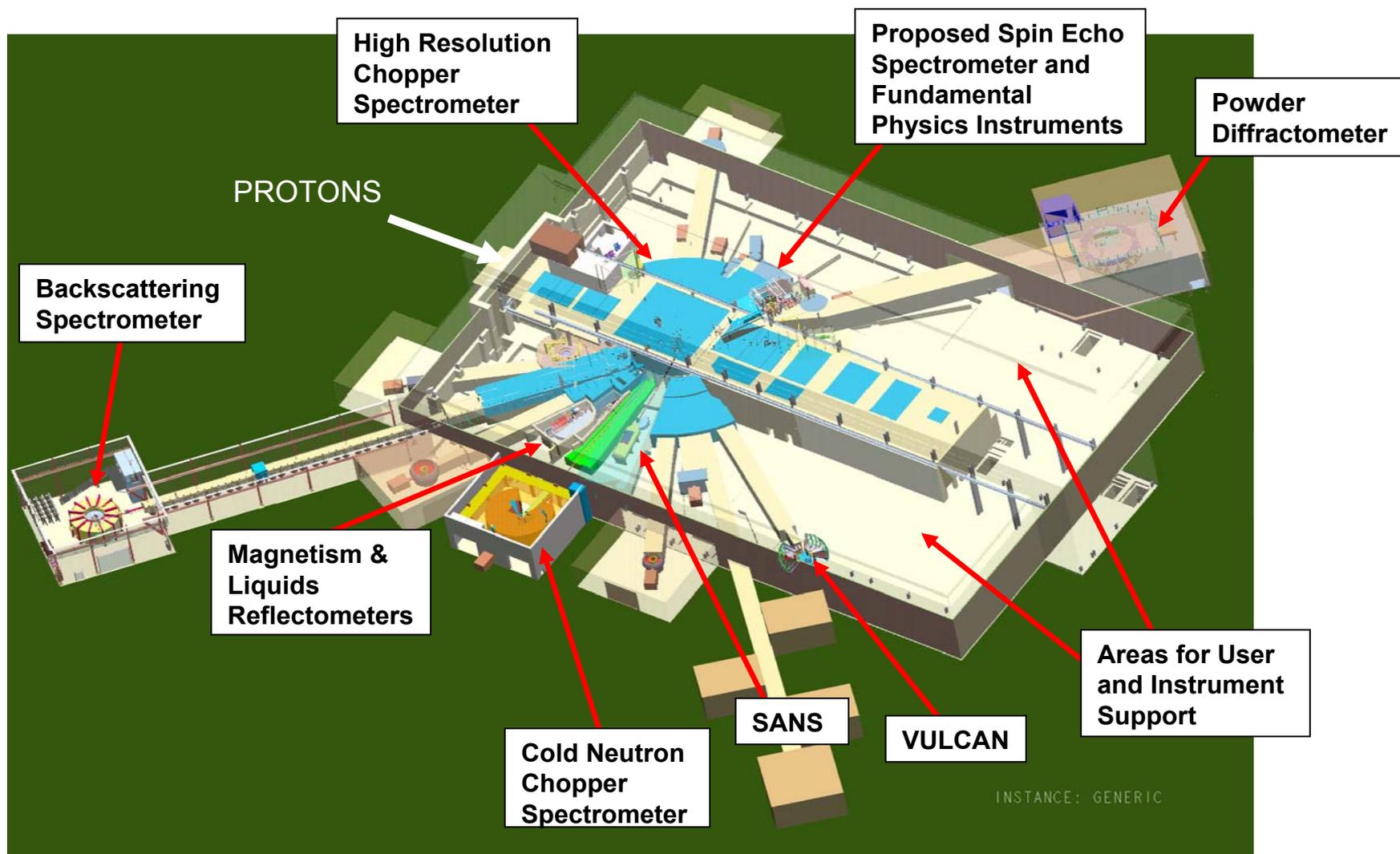
October 9-11, 2002

Instrument History

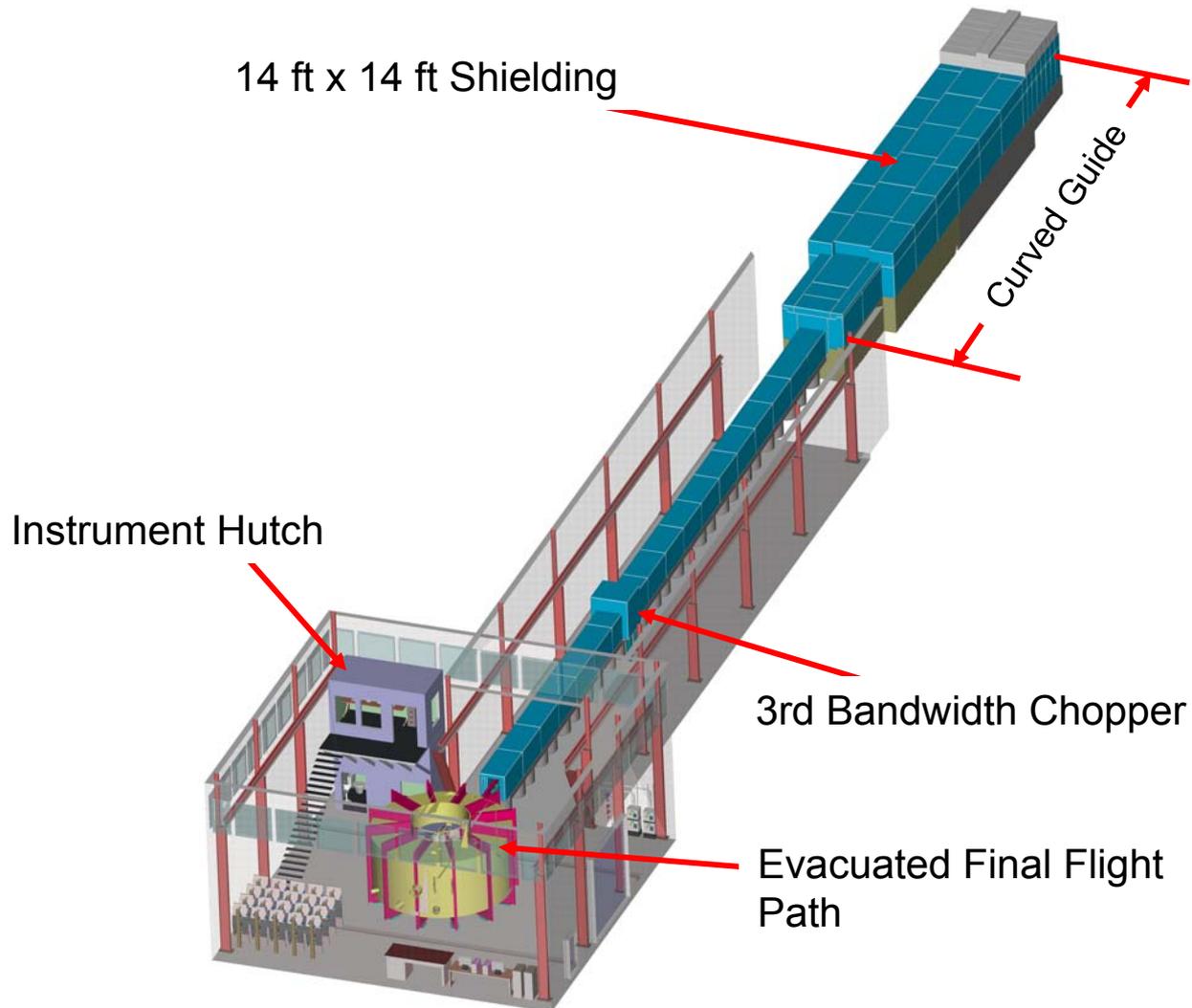


- First IAT meeting – Argonne National Laboratory May 14, 1999
- Conceptual Design presented to SNS Experimental Facilities Advisory Committee (IOC) at the July 1999 meeting
 - EFAC strongly recommended full design and development of detailed cost and schedule
- Baseline Design Review held at ANL August 13, 2000
 - provided check on cost, schedule, and engineering feasibility
- Scientific Capabilities Review – August 2000
 - very positive, universal enthusiasm for instrument design
- Instrument formally added to the SNS project baseline August 31, 2000

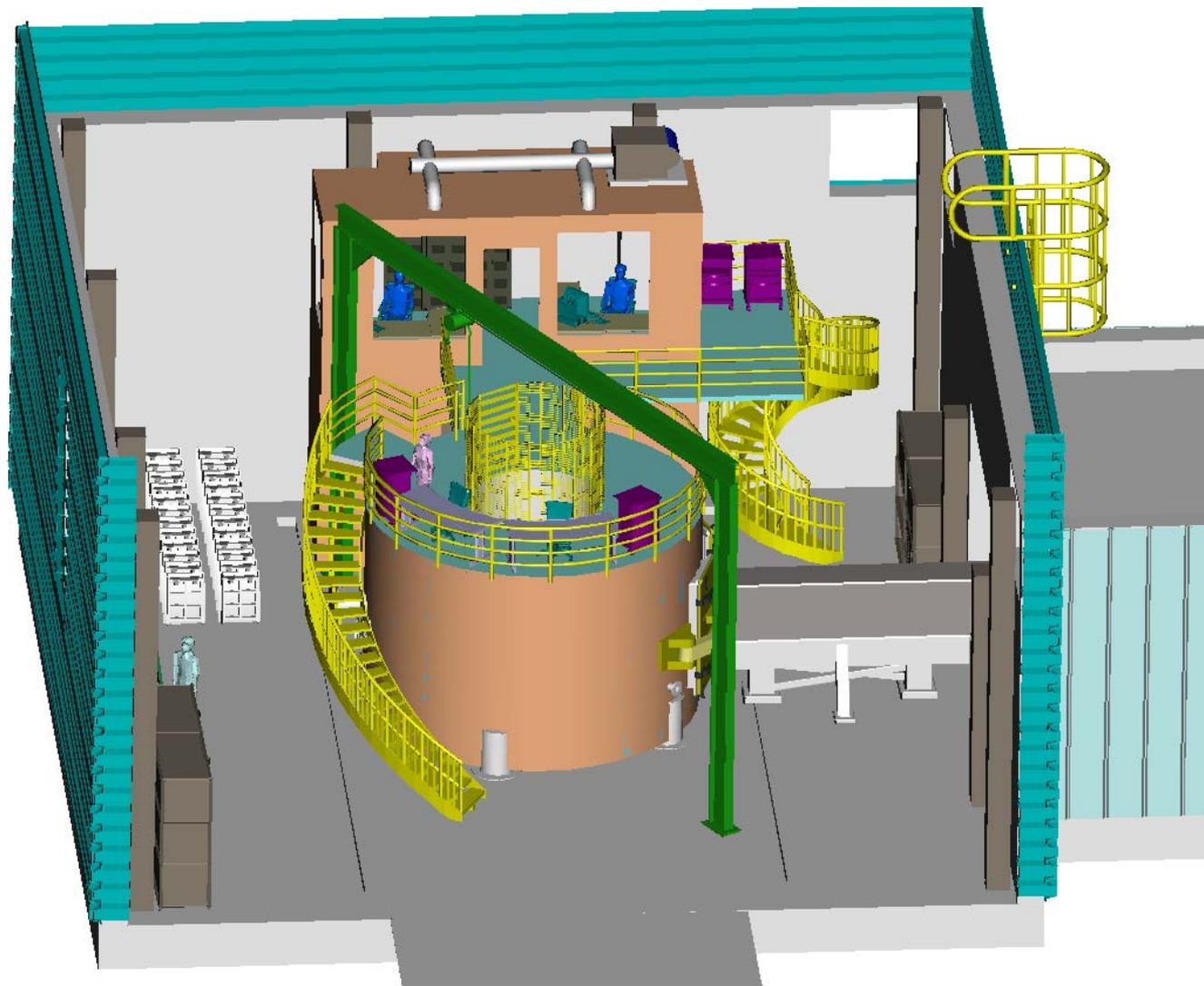
Target/Instrument Building



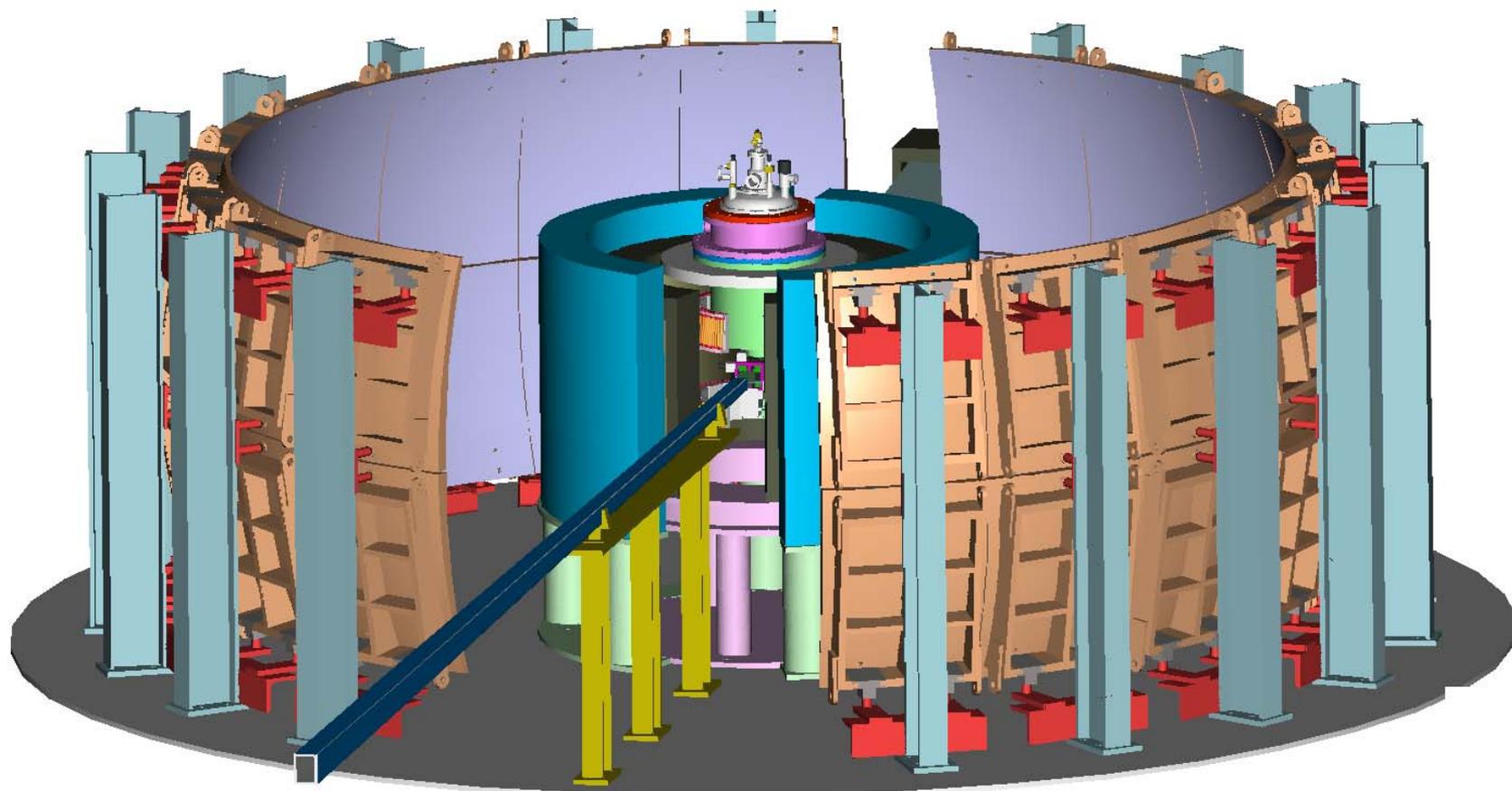
Instrument View



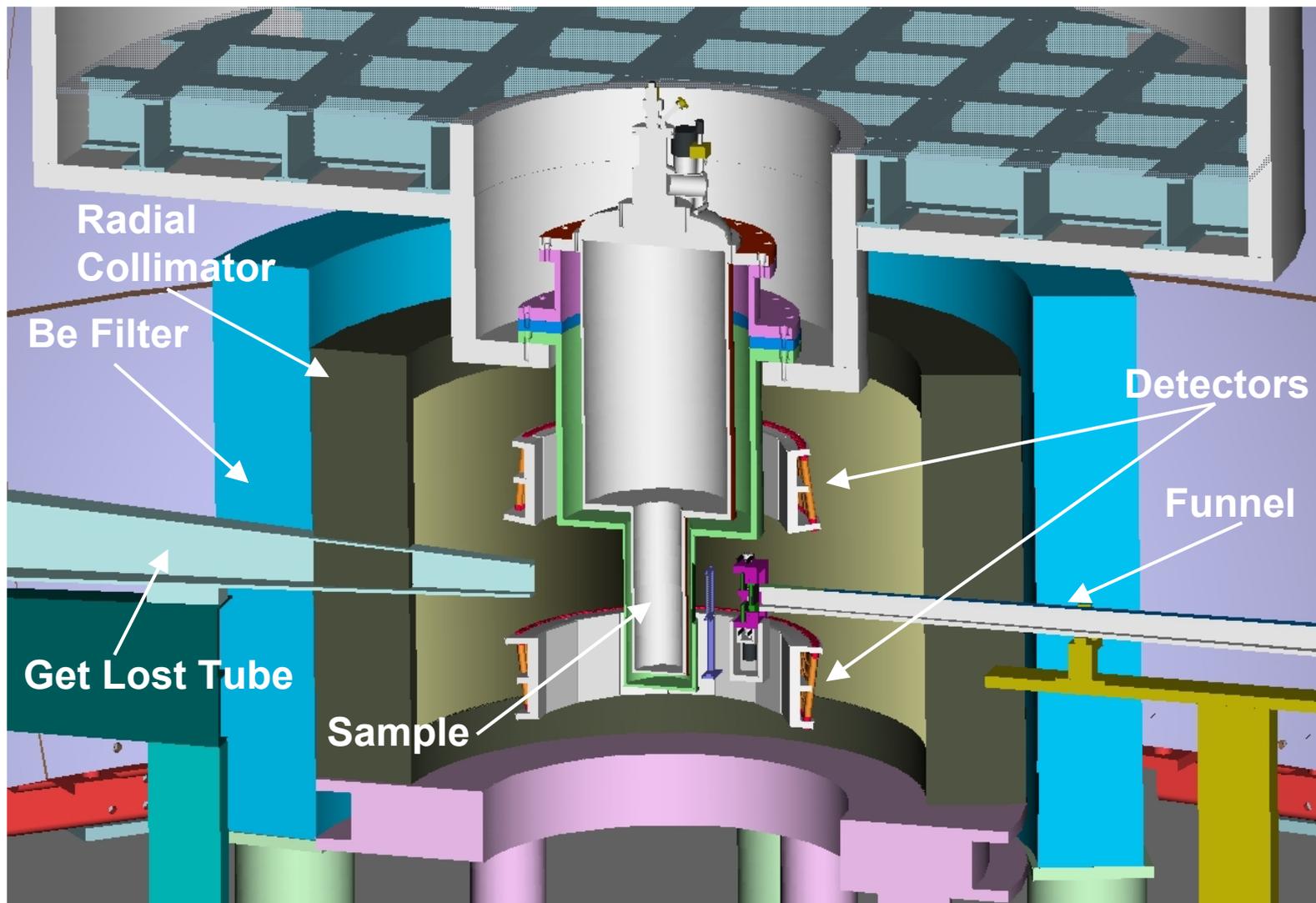
Rendering of Scattering Tank in Spectrometer Building



Final Flight Path



Close Up of Sample Region



Instrument Parameters



- Source/Moderator
 - Decoupled supercritical Hydrogen, centerline poisoned
 - $\delta t_0 = \lambda \times 5.77 + 8.8$ (μsec)
- Incident Flight Path - 84 m moderator-sample position
 - Curved Guide: 10 cm wide x 12 cm tall, 1000 m radius of curvature, line-of-sight at 31 m
 - Straight Guide: 10 cm wide x 12 cm tall
 - Converging Funnel exit: 3.25 cm x 3.25 cm, stops 27.5 cm from sample
 - gains (relative to no guide) of 1350 @ $\lambda = 6.3 \text{ \AA}$, 400 at $\lambda = 3.3 \text{ \AA}$
- Chopper System - 3 bandwidth/frame overlap choppers
- Sample – nominal dimensions 3 x 3 cm²
- Analyzer Crystals
 - Si (311): $\lambda_f = 3.273 \text{ \AA}$, $\delta d/d \sim 4.0 \times 10^{-4}$, 2.03 ster, 12.5 m², bandwidth 0.785 \AA
 - Si (111): $\lambda_f = 6.267 \text{ \AA}$, $\delta d/d \sim 3.5 \times 10^{-4}$, 2.03 ster, 12.5 m², bandwidth 0.785 \AA
- Radial Collimator – restricts analyzer view of the sample, reduces detector acceptance of neutrons scattered by the filter
- Filter Cryostat – removes high order analyzer crystal reflections (Si(111) only)
- Final Flight Path - 2.5 m sample - analyzer, ~ 2 m analyzer – detector
- Detector Choice – ³He tubes,
 - peak count rate (elastic, 30% scatterer) 4000 counts/cm² /sec

Procurement Status (1)



- Neutron Guides have been ordered from CILAS
 - vendor visit in July
 - Glass is purchased
 - Guide layout, mechanical interfaces approved
 - Coating begins November 2002
 - Delivery mid-2004
- Bandwidth Chopper Layout/requirements finalized
 - Procurement option has been exercised
 - Delivery August 2003
- Evacuated Scattering Tank
 - Design/Fabrication/Install Procurement
 - Pre-bid vendor meeting held September 24, 2002
 - Bids are due October 15, 2002
 - Delivery January 2004

Procurement Status (2)



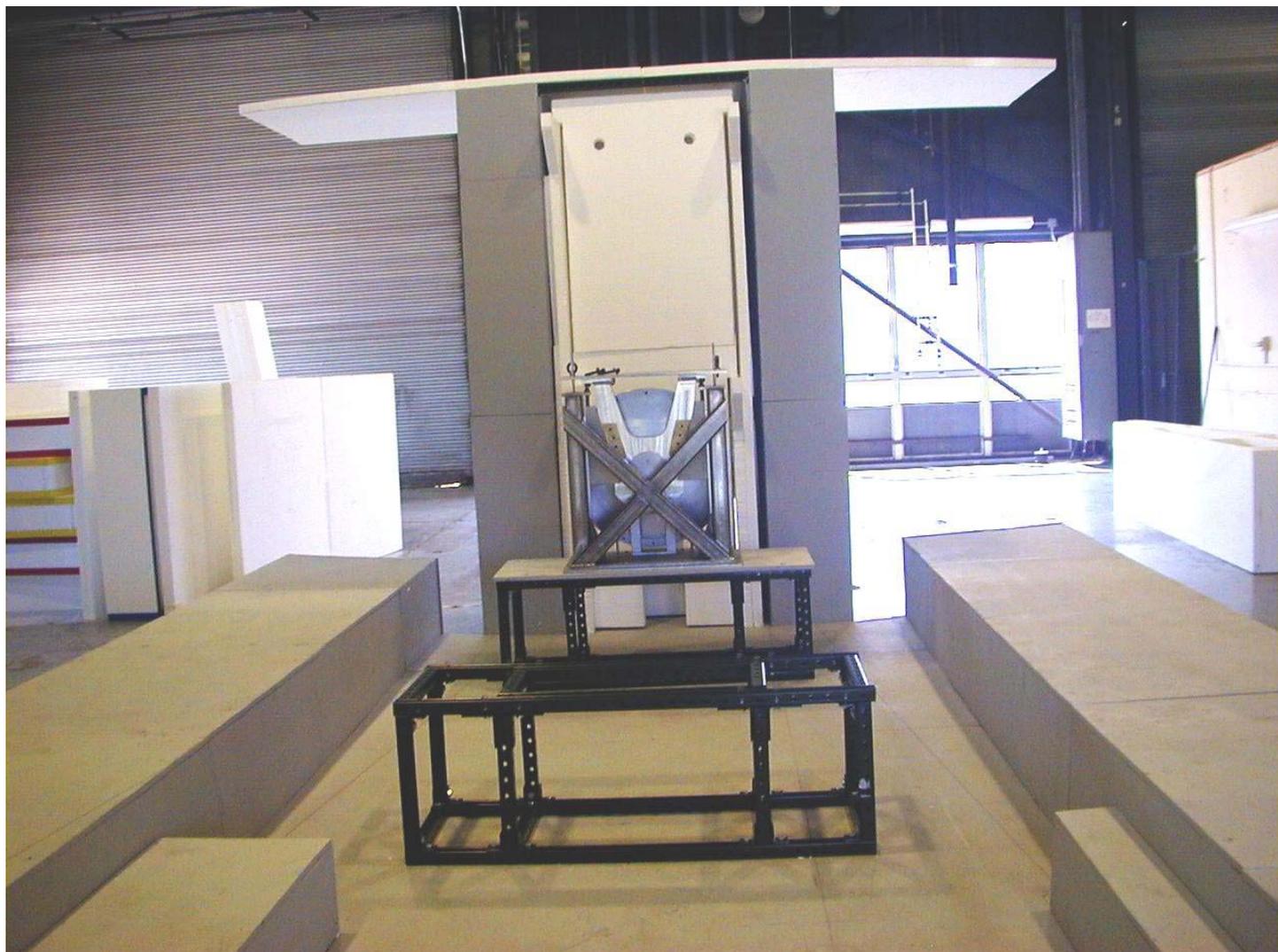
- Core Vessel and Shutter Inserts
 - Design reviews (part of shared activities) finished
 - Package into procurement
 - Delivery expected Feb. 2004
- Analyzer Crystals
 - Initial complement for testing ordered (0.9 mm to 2 mm thick)
 - Delivery expected November 2002

Design Status: Shielding



- Mockup complete
- Calculations complete
 - heavy shielding is steel and heavy/regular concrete
 - past line of sight (30 m – 40 m) 10 in steel
 - 40 m – 80 m 5 in steel (gamma shielding)
- ~ 80% complete for “up-close” (to 9 m from moderator)
- ~ 60% complete for “heavy” (to 9 m to 30 m)
- ~ 60% complete for “mid-line” (to 30 m to 80 m moderator)

Mockup Pictures (1)



Mockup Pictures (2)



Mockup Pictures (3)



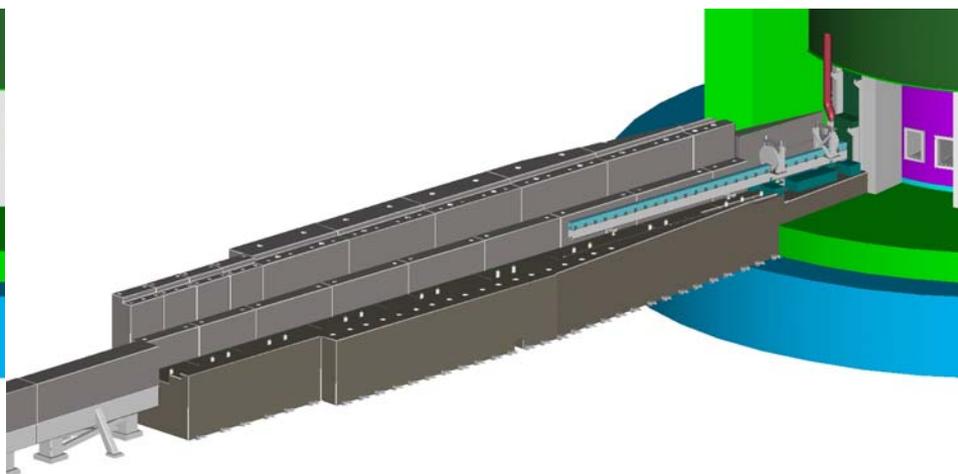
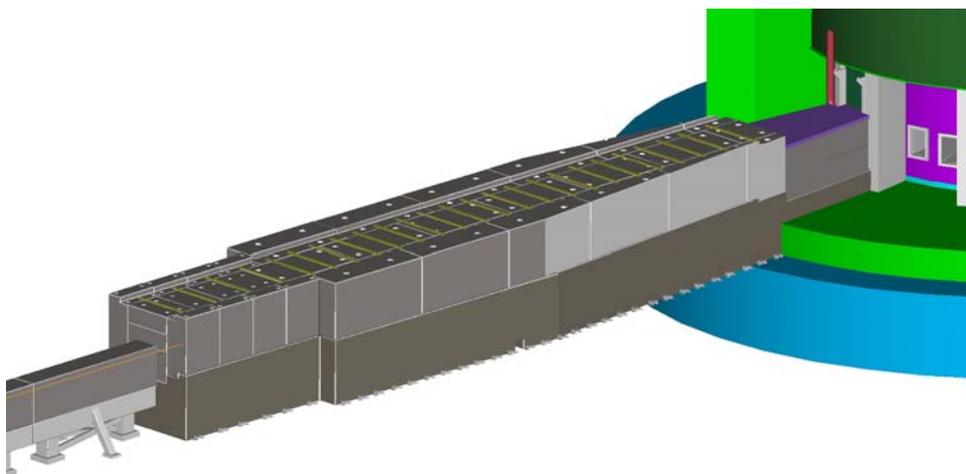
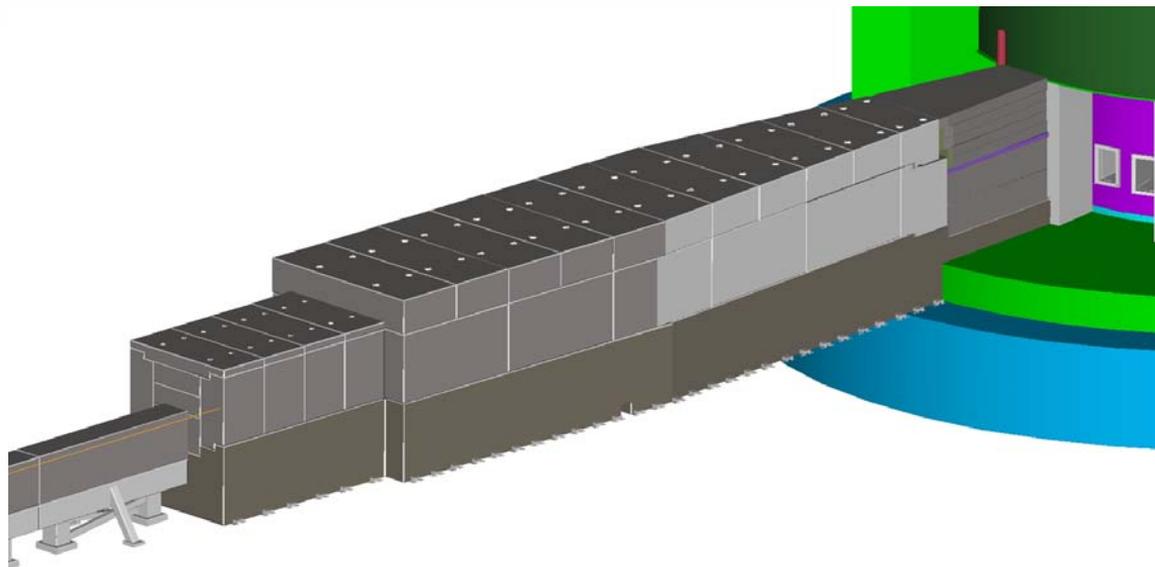
Mockup Pictures (4)



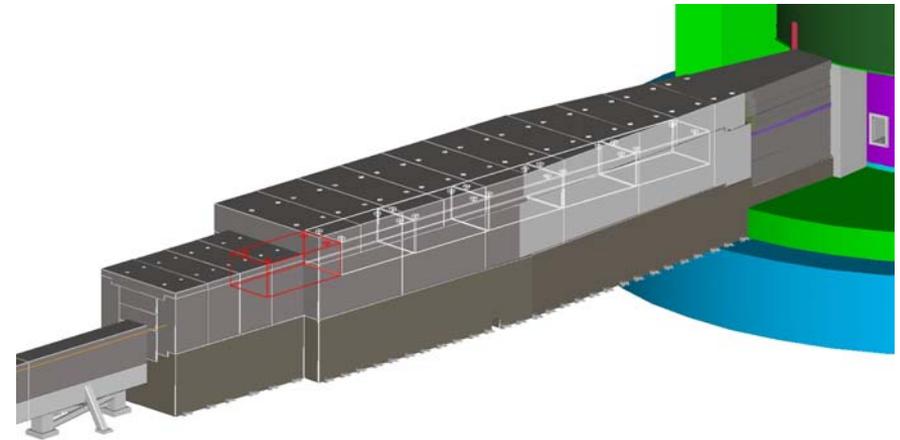
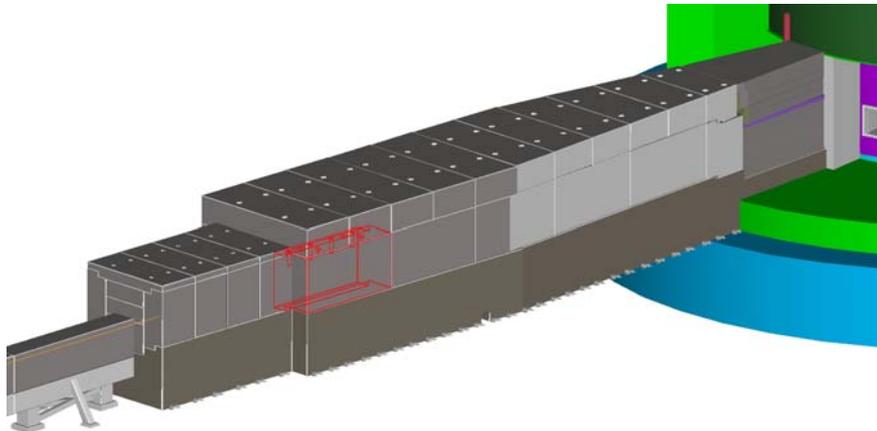
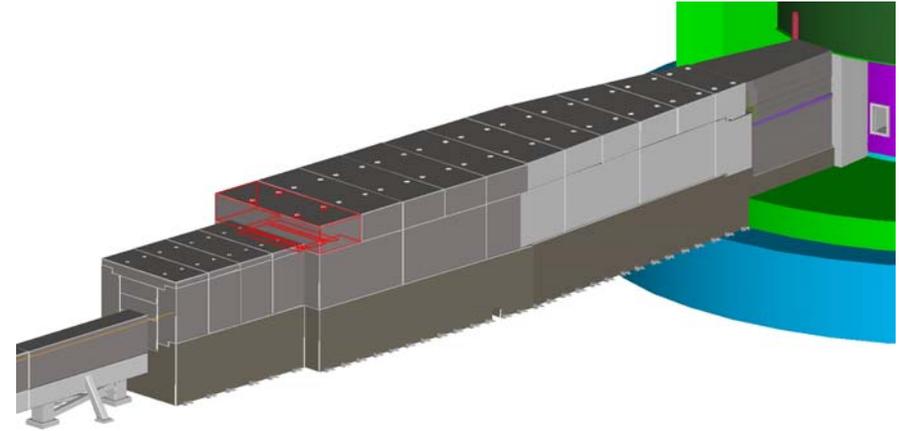
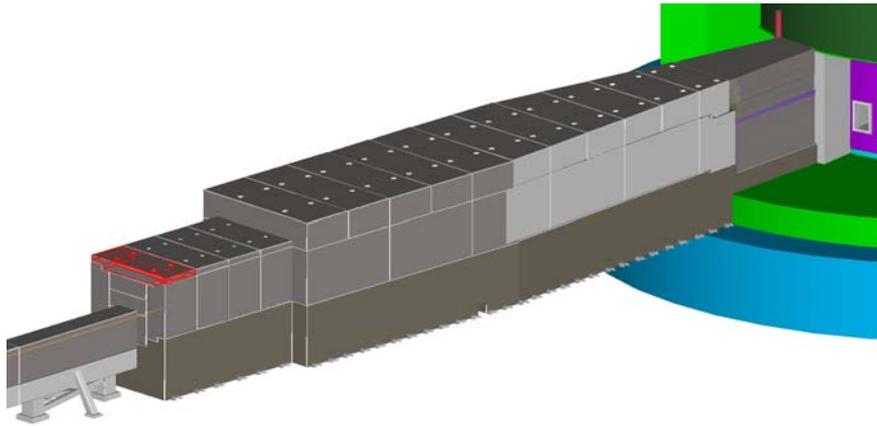
Mockup Pictures (5)



Shielding Design



Shielding Design

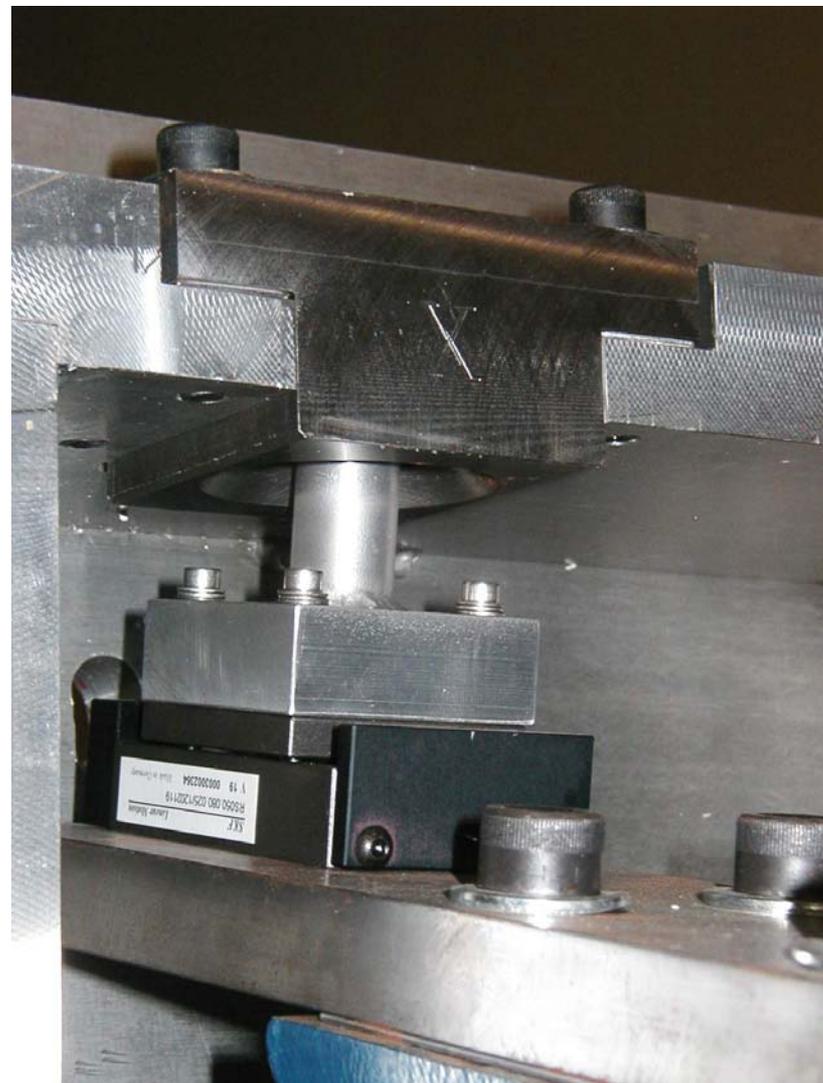


Design Status: Analyzer Crystal/Mounts

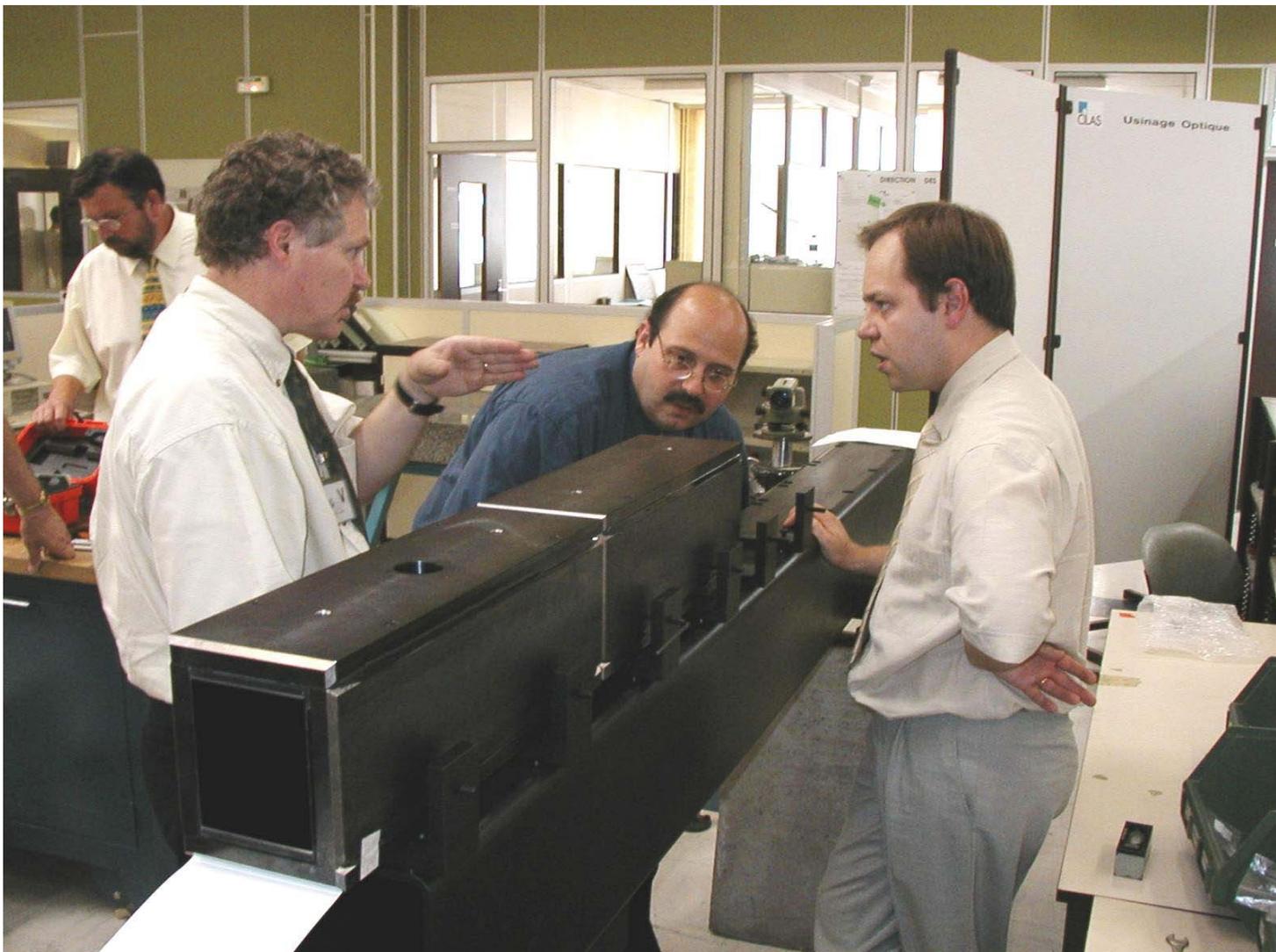
- Prototype of Alignment System Fabricated
- Gluing “derrick” finished
- Initial complement of crystals ordered
 - 5 thicknesses (0.9 to 2.0 mm)
- Major Design Effort this FY



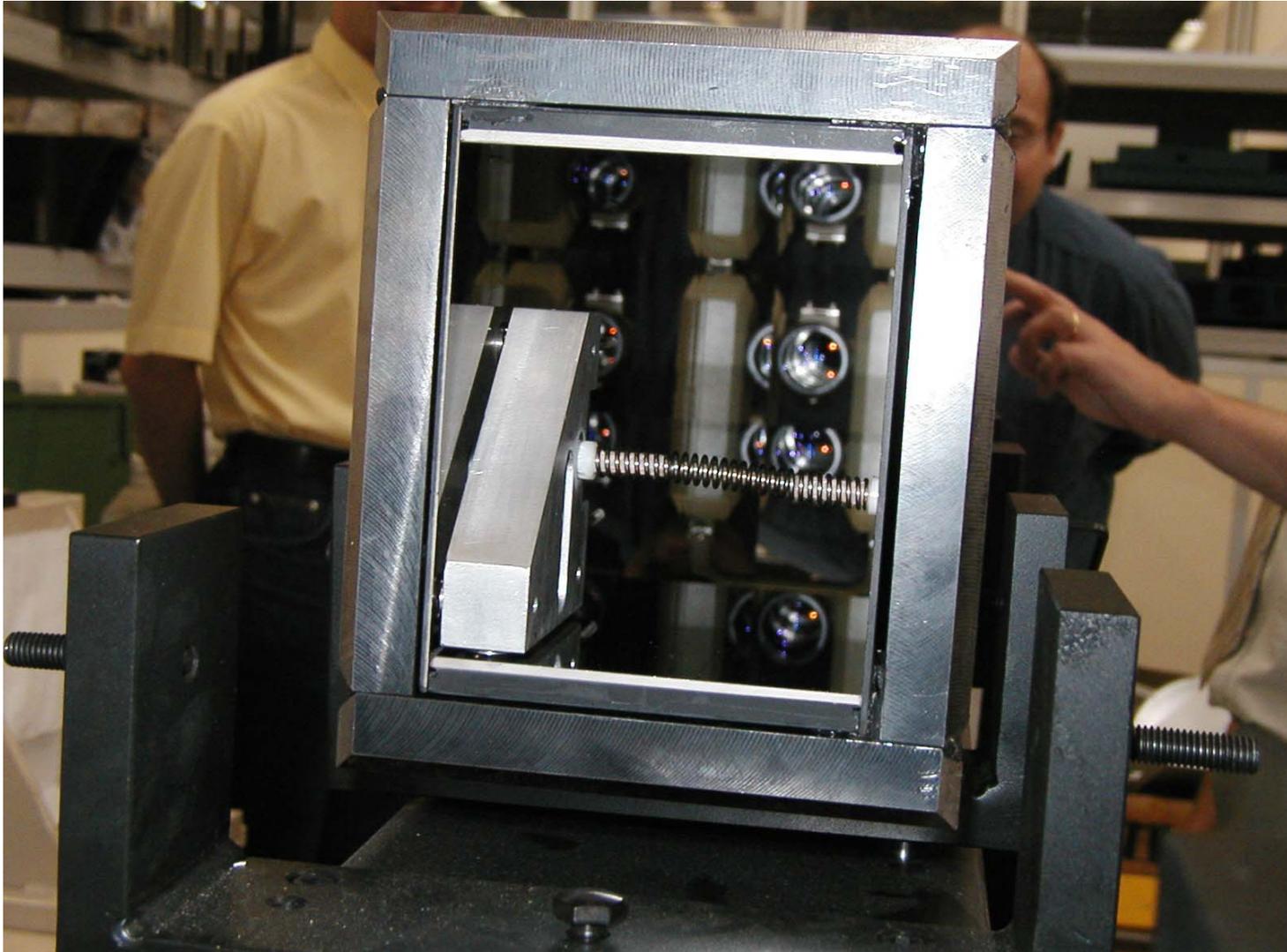
Prototype Analyzer Mount/Adjustment



Neutron Guide (CILAS) Prototypes (1)



Neutron Guide (CILAS) Prototypes (1)



Major FY 03 Efforts



- Analyzer Crystals
 - Bending/gluing tests
 - Neutron characterization
- Completion of Shielding Drawing Package
- Monitor Procurements
 - design interactions with scattering tank vendor
- Sample Area Integrated Design
 - Detector/Monitor mounts/electronics
 - Radial Collimator (technical specification)
 - Sample Well (FEA)
 - Slits/Apertures
- **Goal is to complete all major engineering design tasks this FY with exception of Be filter cryostat**

Major Milestones (Future)



- Purchases Complete (Delivery)
 - Inserts - 1st Quarter 2004
 - Scattering Tank- 1st Quarter 2004
 - Analyzer Mounts/Alignment- 1st Quarter 2004
 - Guide - mid-2004
 - Radial collimator – 3rd Quarter 2004
 - Shielding – 4th Quarter 2004
 - Analyzer Crystals - 4th Quarter 2004
 - Detectors – Early 2005
 - Beryllium/Cryostat – 1st Quarter 2005

Major Milestones (Future)



- Install Complete
 - Scattering Tank – 1st Quarter 2004
 - Poured in place Shielding - 2nd Quarter 2004
 - Core vessel/Shutter Inserts – mid-2004
 - Install/Stage Shielding -1st Quarter 2005
 - Analyzer Crystals – 2nd Quarter 2005
 - Detectors/DAS – mid-2005
 - Guides – Early to mid-2005
 - Bandwidth Choppers mid-2005
 - Radial Collimator/Beryllium Filter Cryostat – 3rd Quarter 2005
 - Final Shielding (Stackable) - beginning 4th Quarter 2005
 - DAS/Detector Checkout complete – December 2005

- **COMMISSIONING**
 - Begin December 2005

