

# Spallation Neutron Source (SNS)

## Opportunities for Mechanical Engineers

**Graeme Murdoch**

**Deputy Director & Engineering Group Leader**

**Neutron Facilities Development Division**



# Outline

- **Personal Bio**
- **SNS Accelerator/Target Layout**
- **Neutron Science Directorate**
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# Personal Bio

- **Born Scotland**
- **High School in Scotland**
- **Technician Apprenticeship – 4 years**
  - Associates Equiv. in ME
- **Worked at Steelworks, Scotland – 4 months (real work!)**
- **ISIS Spallation Neutron Source, Oxford, England – 10 months**
- **British Broadcasting Corporation (BBC), London, England – 6 years**
- **ISIS Spallation Neutron Source, Oxford, England – 15 years**
  - BTech. Equiv. ME (2 yrs), MS Equiv. ME (5 yrs)
- **Spallation Neutron Source, Tennessee – Since Aug 2001**
- **Next - ???**

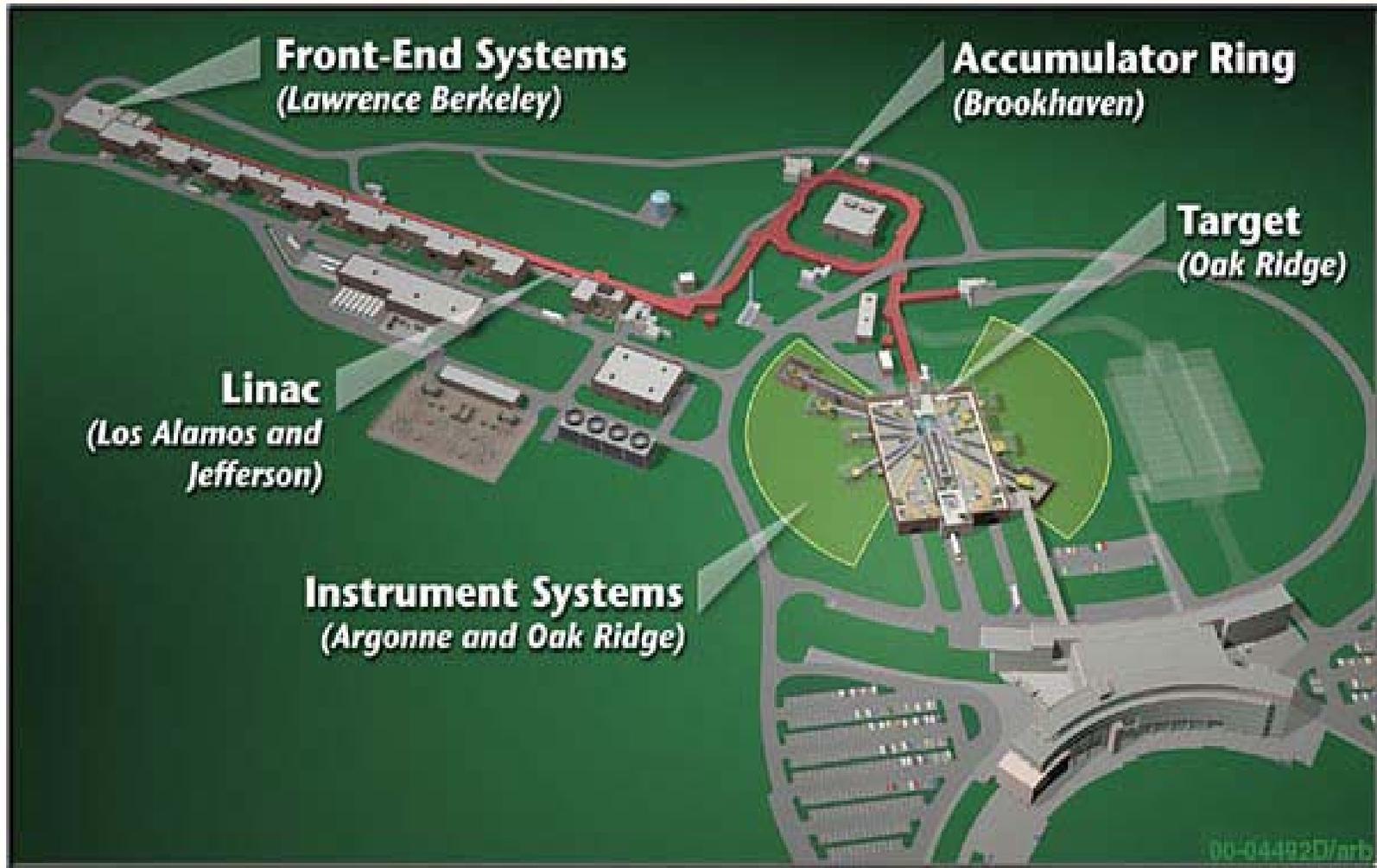


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# SNS Accelerator/Target Layout



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# SNS Site – June 2006

- The SNS began operation in 2006
- At 1.4 MW it will be ~8x ISIS, the world's leading pulsed spallation source
- The peak neutron flux will be ~20-100x ILL
- SNS will be the world's leading facility for neutron scattering
- It is a short drive from HFIR, a reactor source with a flux comparable to the ILL

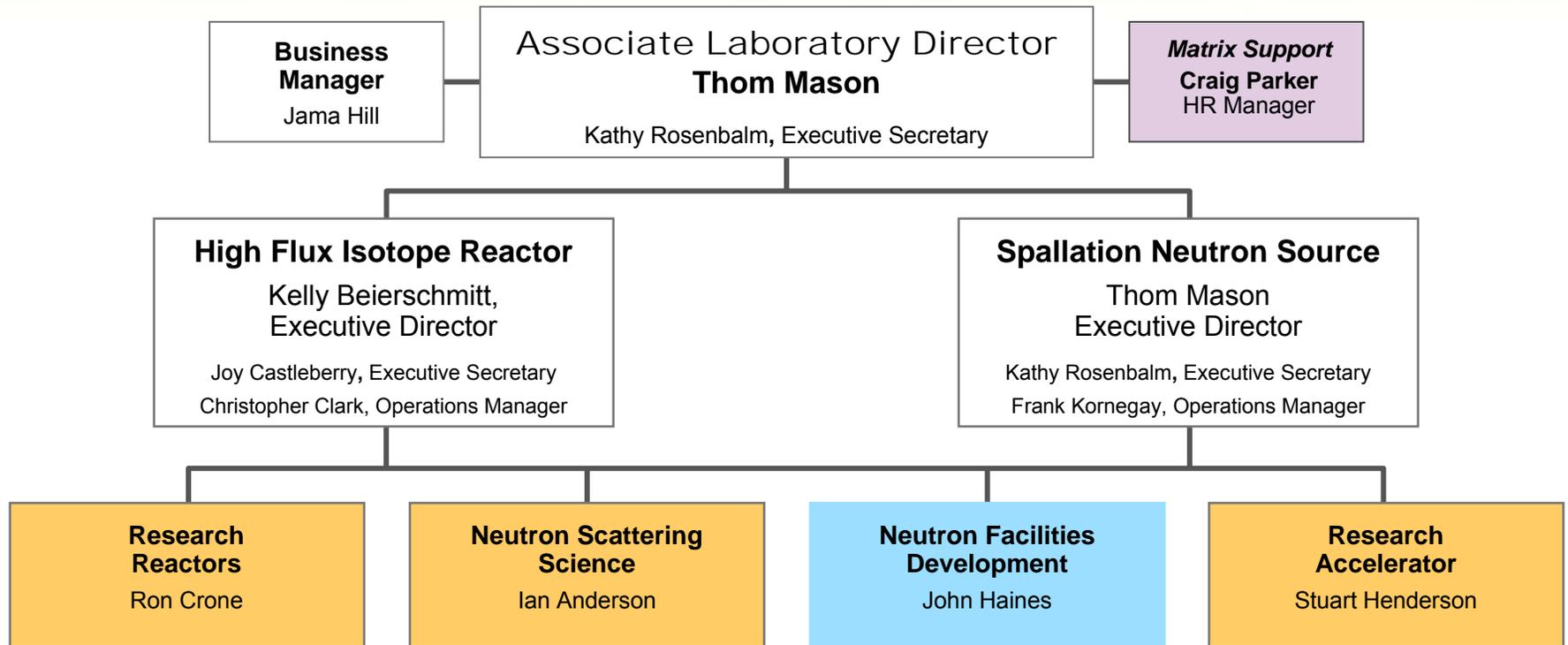


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# Neutron Sciences Directorate

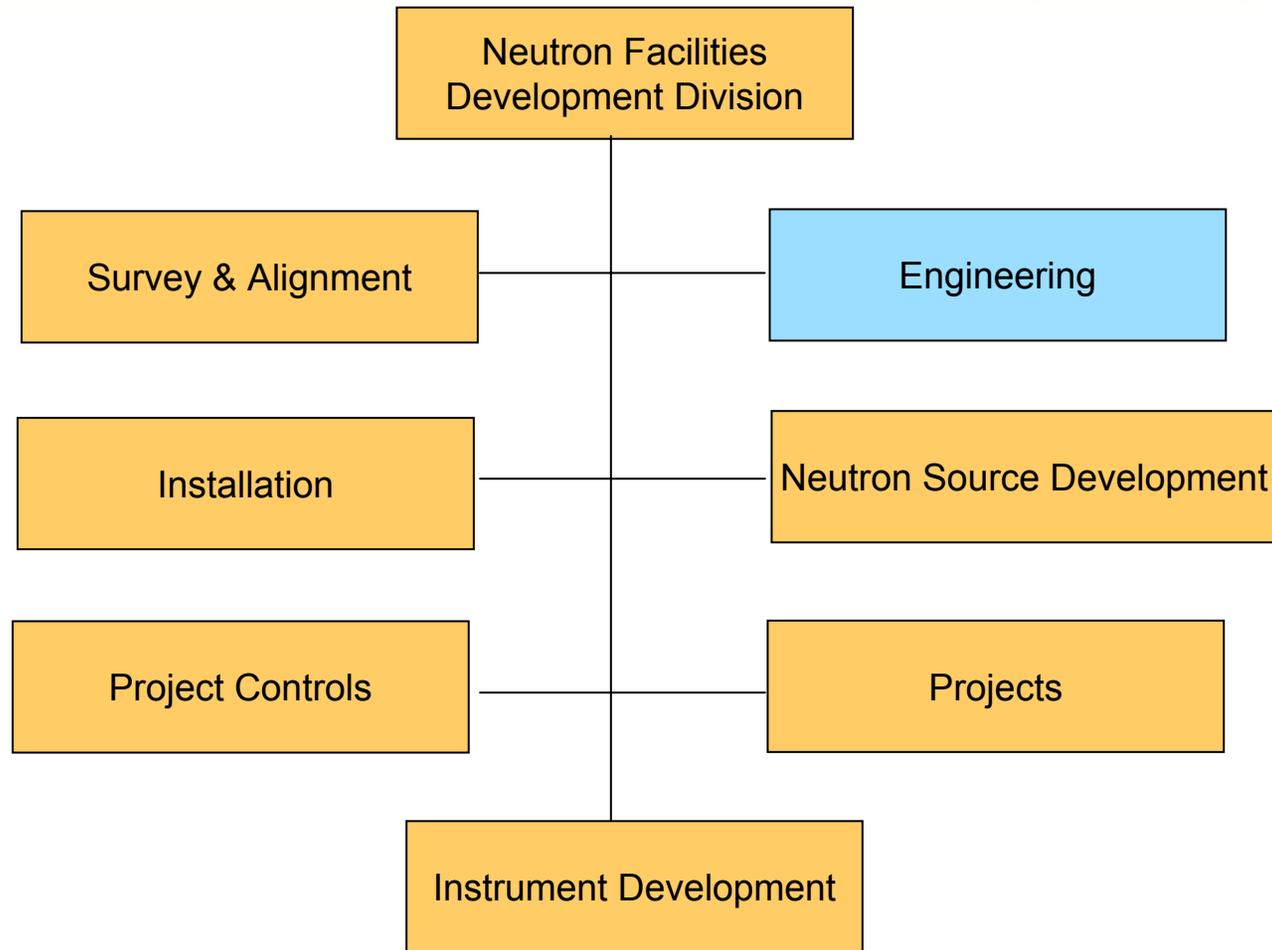


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# Neutron Facilities Development Division



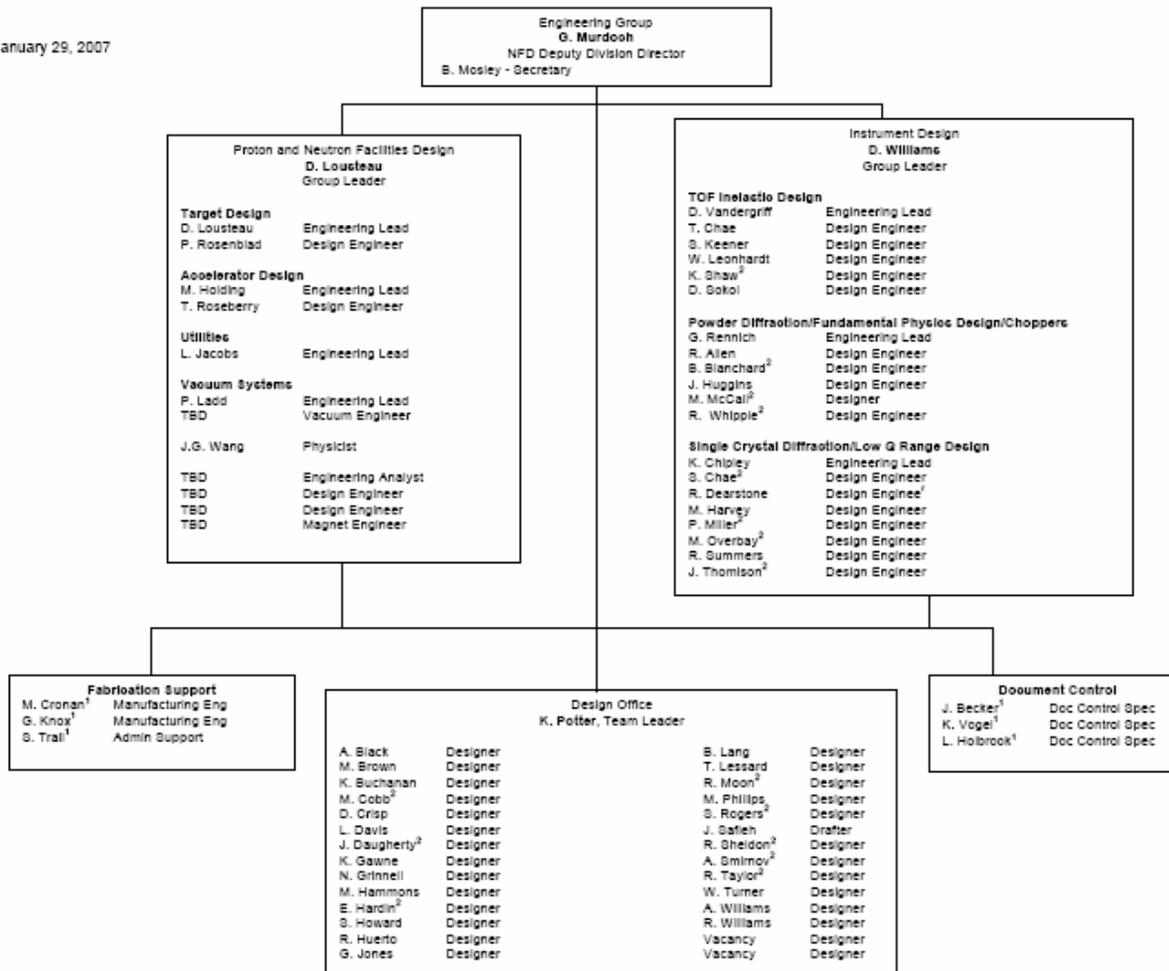
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# Engineering Group Organization

January 29, 2007



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# Engineering Group Responsibilities

- **All Mechanical Design & Project Engineering for SNS Facility & (HFIR Instruments)**
- **Proton & Neutron Facilities Design**
  - Target Design
  - Accelerator Design
  - Mechanical Utilities
  - Vacuum Systems
  - Magnet Design
  - Finite Element Analysis (FEA)
- **Instrument Design – SNS & HFIR**
  - TOF Inelastic Design
  - Powder Diffraction/Fundamental Physics & Choppers
  - Single Crystal Diffraction/ Low Q Range Design
- **Design Office**
- **Fabrication Support**
- **Document Control**



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# Engineering Group Core Skills & Education

- **Mechanical Engineers** – (BS, MS & PhD)
  - Design
  - Project
  - Analysis
  - Water
  - Seismic
  - Materials Selection
- **Vacuum Engineers** – (BS, MS)
  - System Design
  - Surface Science
- **Engineering Analysts** – (MS, PhD)
  - FEA (Structural, Thermal & Fluids)
- **Magnet Physicist/Engineer** – (MS, PhD)
  - Beam Dynamics
  - Electromagnetic
- **Designers** – (A.A.S, ProE, AutoCAD etc)
  - Mechanical
  - Piping



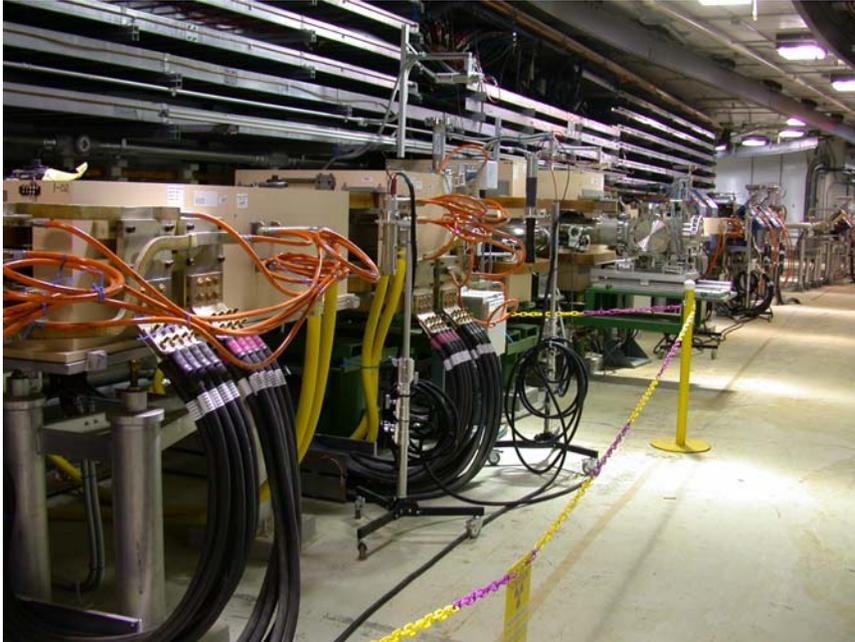
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# Accelerator Engineering

## View Inside Accumulator Ring Tunnel

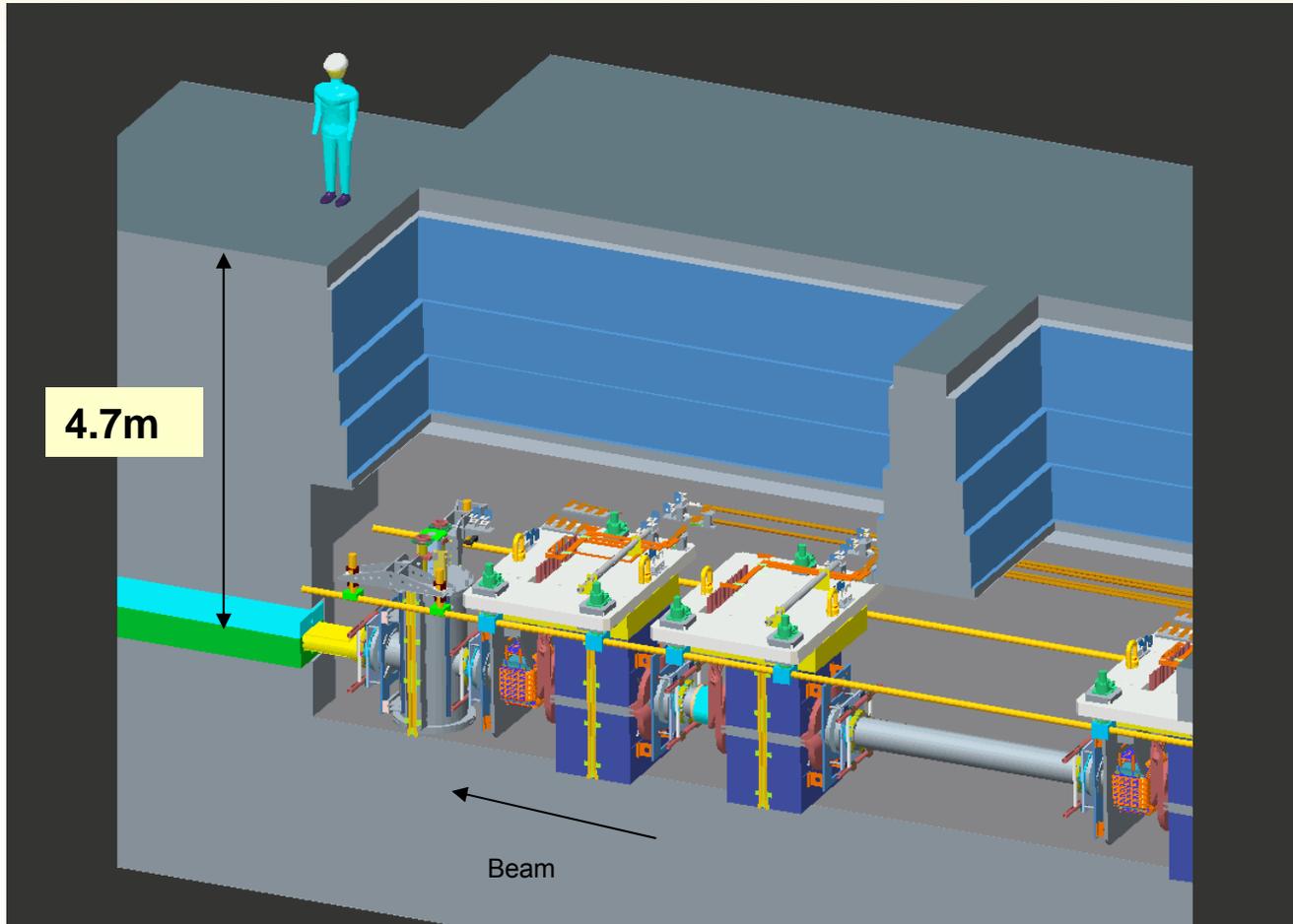


**Injection Straight Section**



**Extraction Straight Section**

# Accelerator Engineering, cont'd

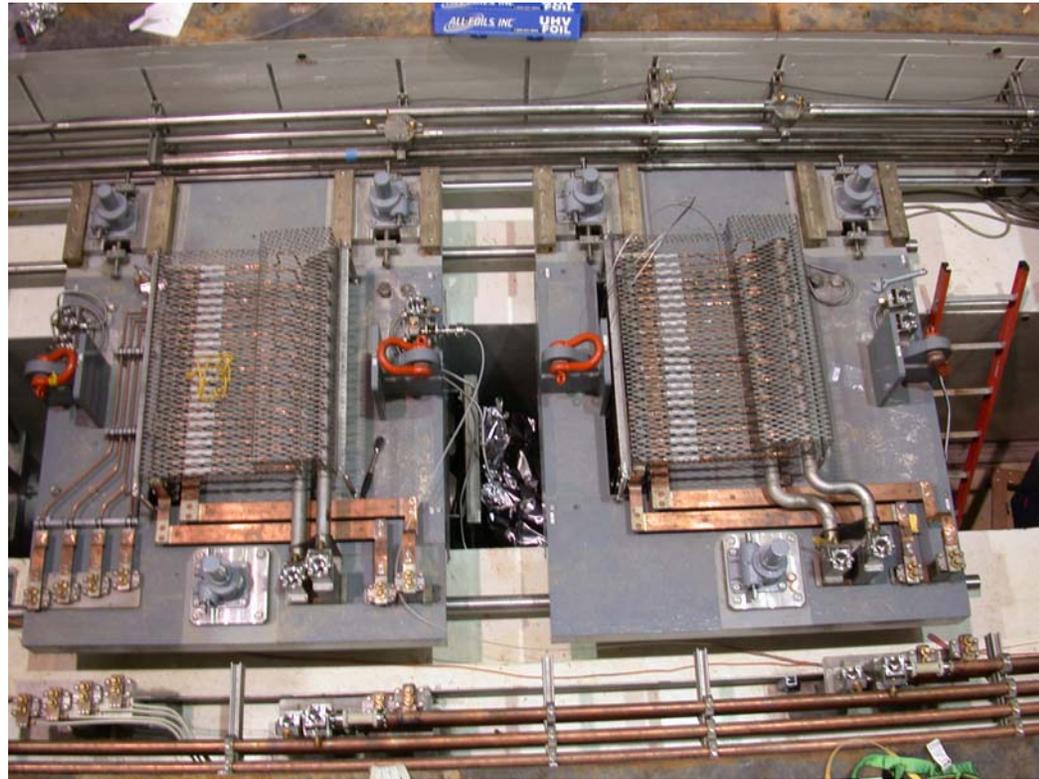


**ProE Model of Final 20m of Accelerator Tunnel**

# Accelerator Engineering, cont'd

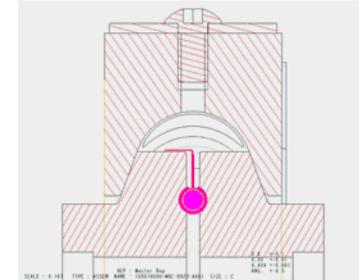
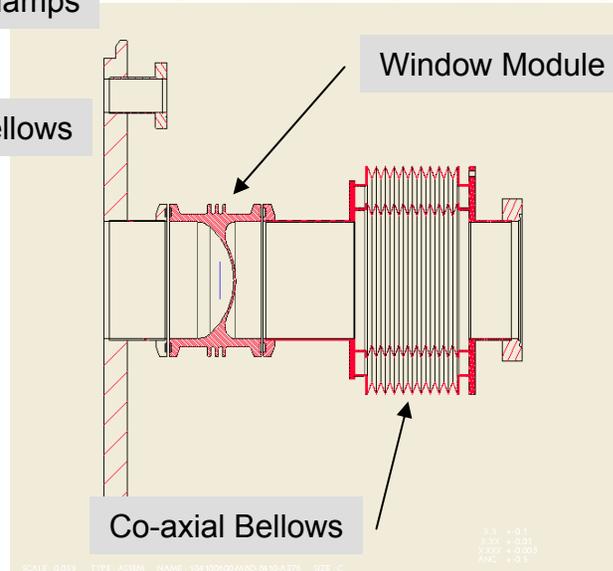
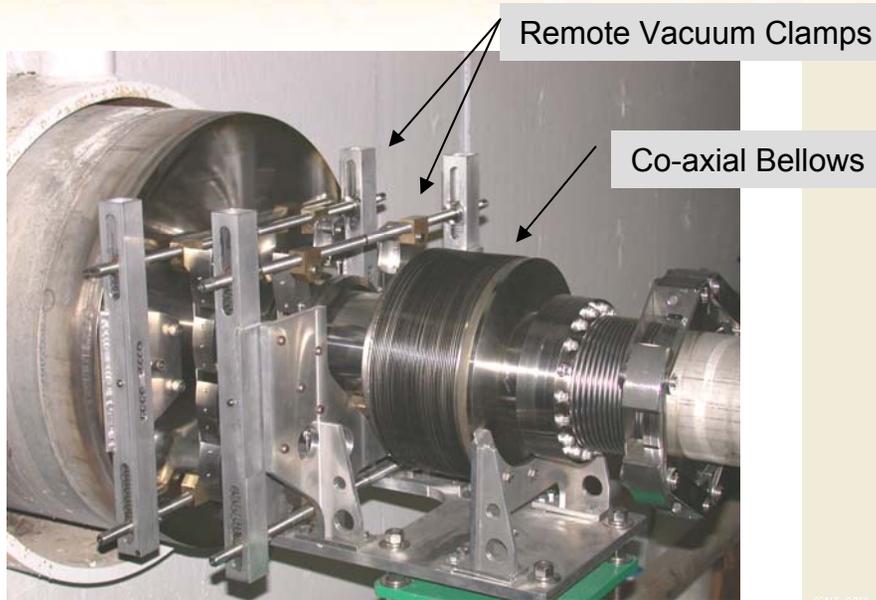


**Magnet Installation**



**Two 28T Magnets Installed**

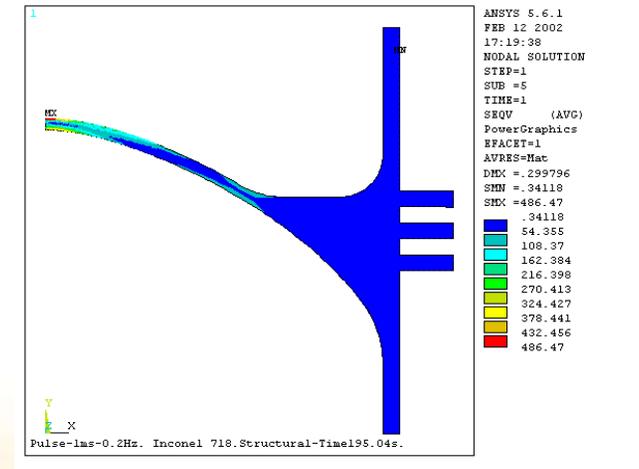
# Accelerator Engineering, cont'd



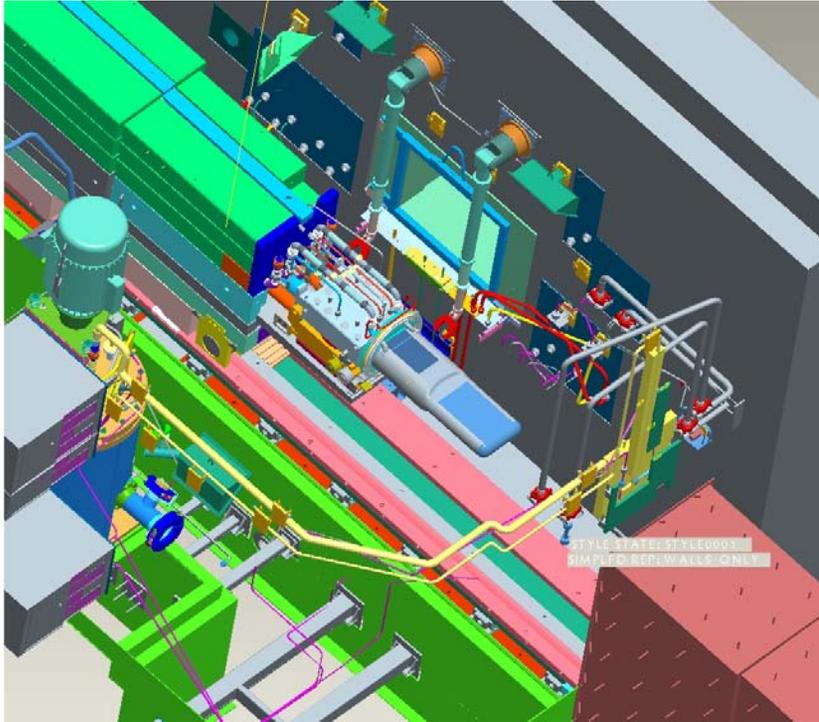
Helicoflex Delta Seal

## Linac Dump Window Active Handling

- Incorporates removable window, co-axial bellows assembly & remote vacuum clamp
- Assembly Installed – Leak Rate  $10^{-12}$  torr-l/s
- Window removal/replacement practiced & documented
- Work completed and accepts routine beam from linac



# Target Engineering

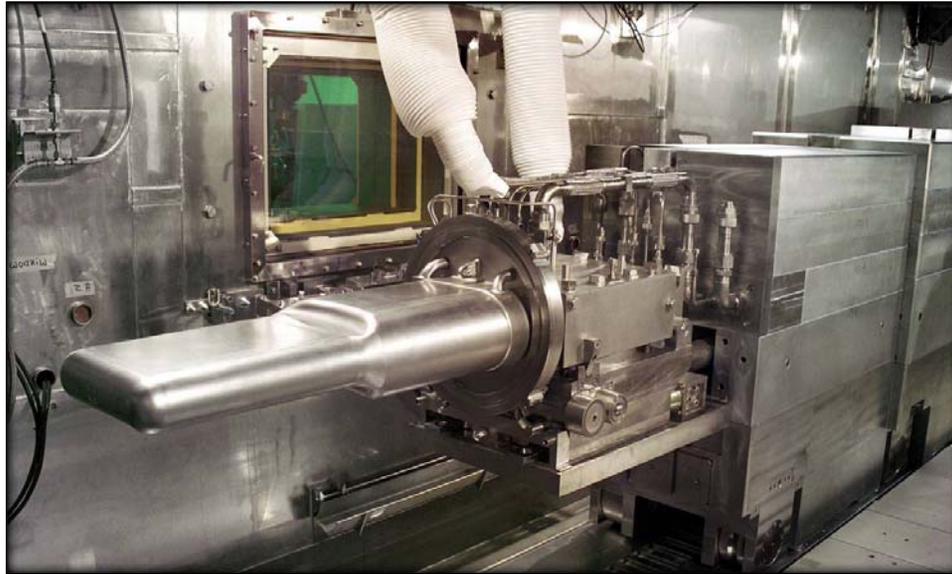


**ProE Model of Target Assembly**

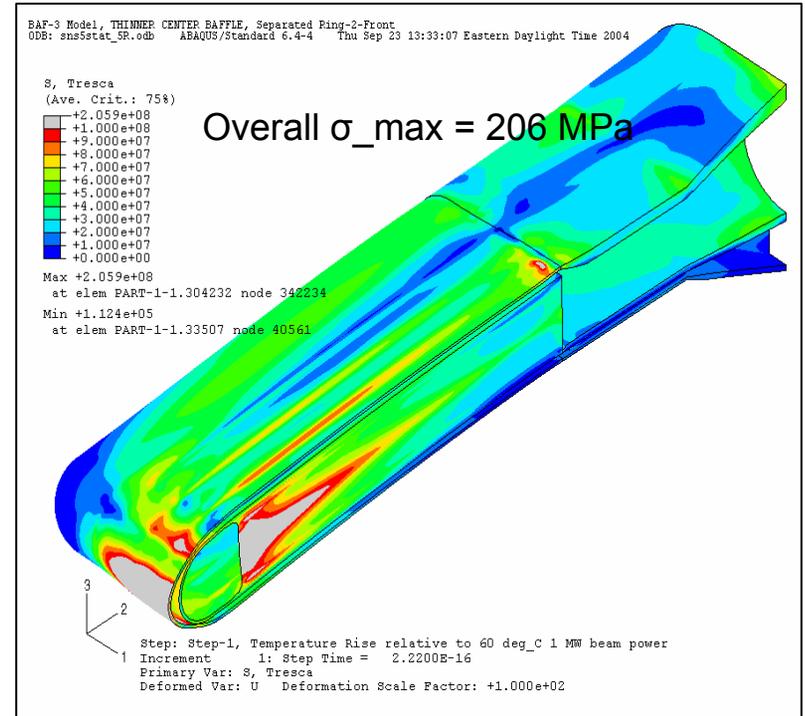


**Target Trolley under Assembly**

# Target Engineering, cont'd

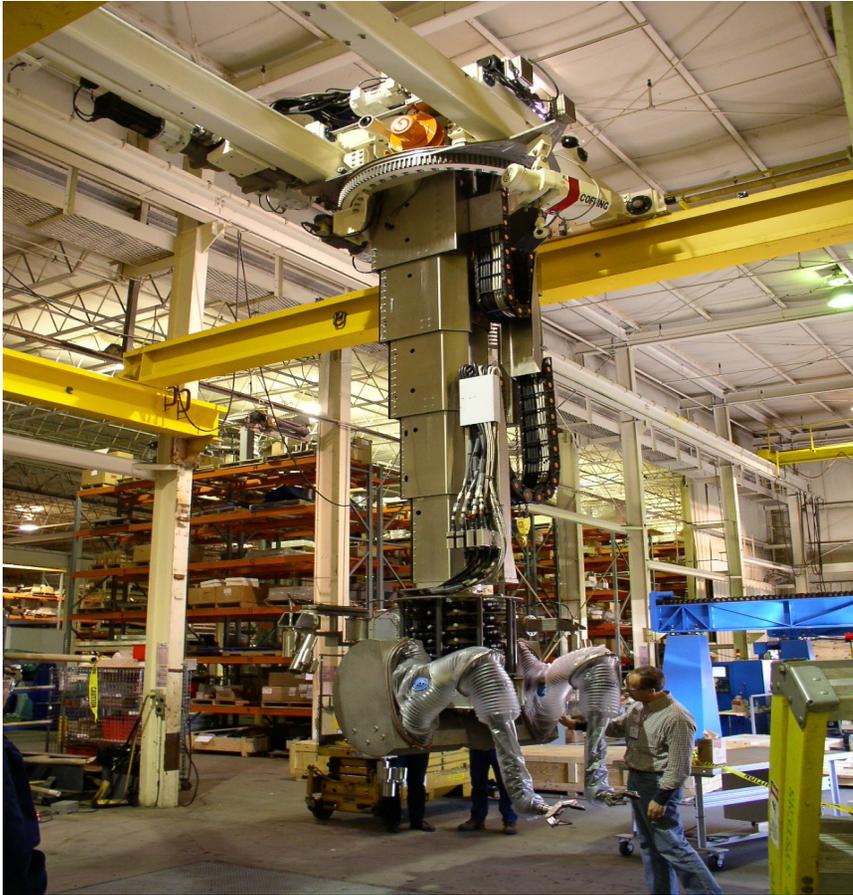


**Mercury Target**



**FEA Showing Maximum Thermal Stress on Body**

# Target Engineering, cont'd



**Tele-robotic Manipulator**



**Installed in Cell**

# Target Engineering, cont'd



**Time for a Coffee Break!**



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# Beam-line Instruments



**ARCS Vacuum Chamber**



# Current Advertised Positions in Group

- **Engineering Analyst (1)**
- **Design Engineers (2)**
- **Magnet Design Engineer (1)**
- **Vacuum Engineer (1)**
- **Mechanical Designers (2)**

Link: <http://jobs.ornl.gov/>

Email: [murdochgr@sns.gov](mailto:murdochgr@sns.gov)



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