High Flux Isotope Reactor

and the

Center for Neutron Scattering

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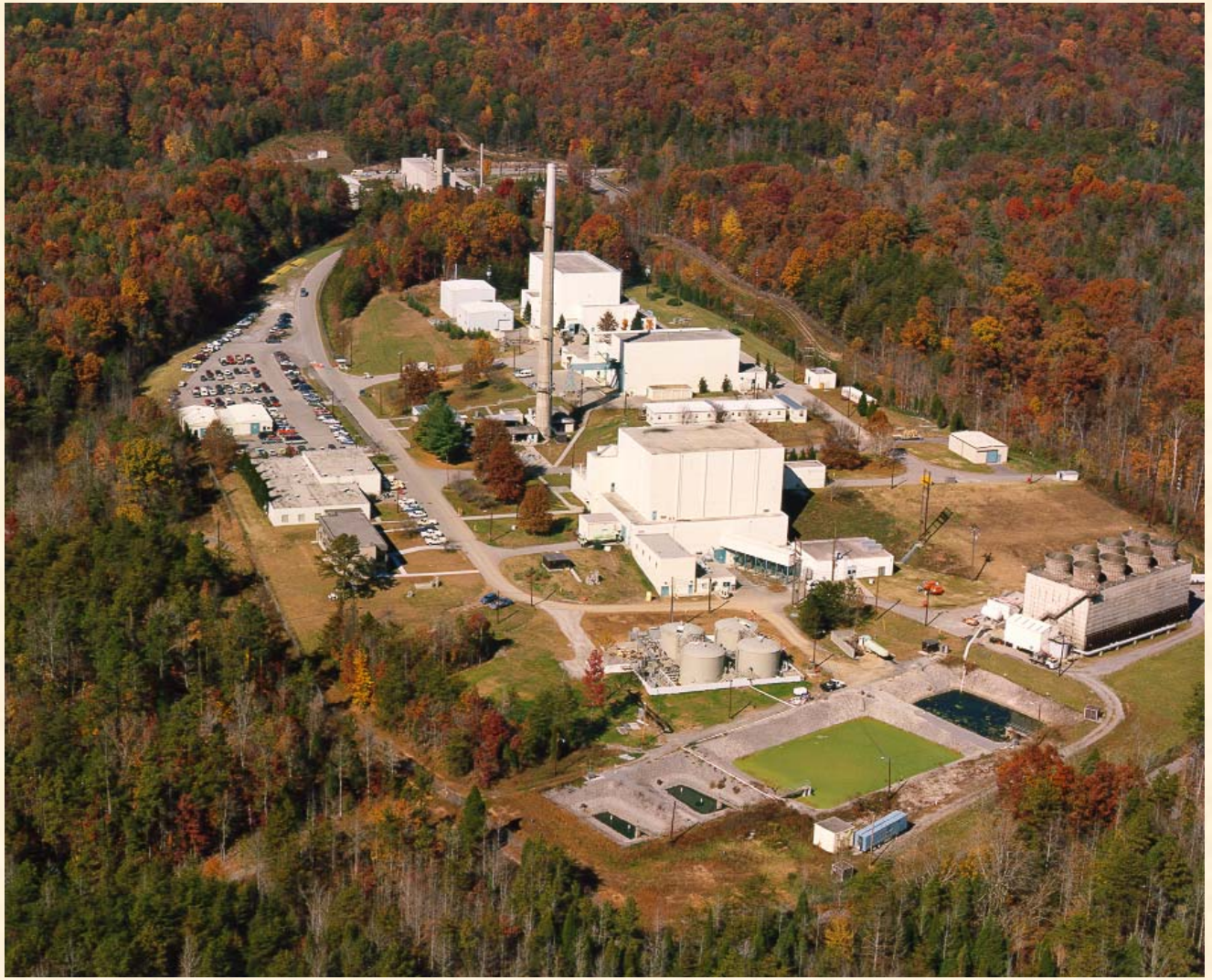
Oak Ridge National Laboratory

High Flux Isotope Reactor

- The HFIR is the only high-flux reactor-based source of neutrons in the US, operating at a power of 85 MW
- US national user facility
- Began operation in 1966
- Upgrade project began in 1998
- Be reflector replaced in 2001
- Cold source installation 2006
- Stations for 15 beams
  - 8 thermal beams
  - 7 cold beams



A Time of

Growth, Change, Challenge and Opportunity

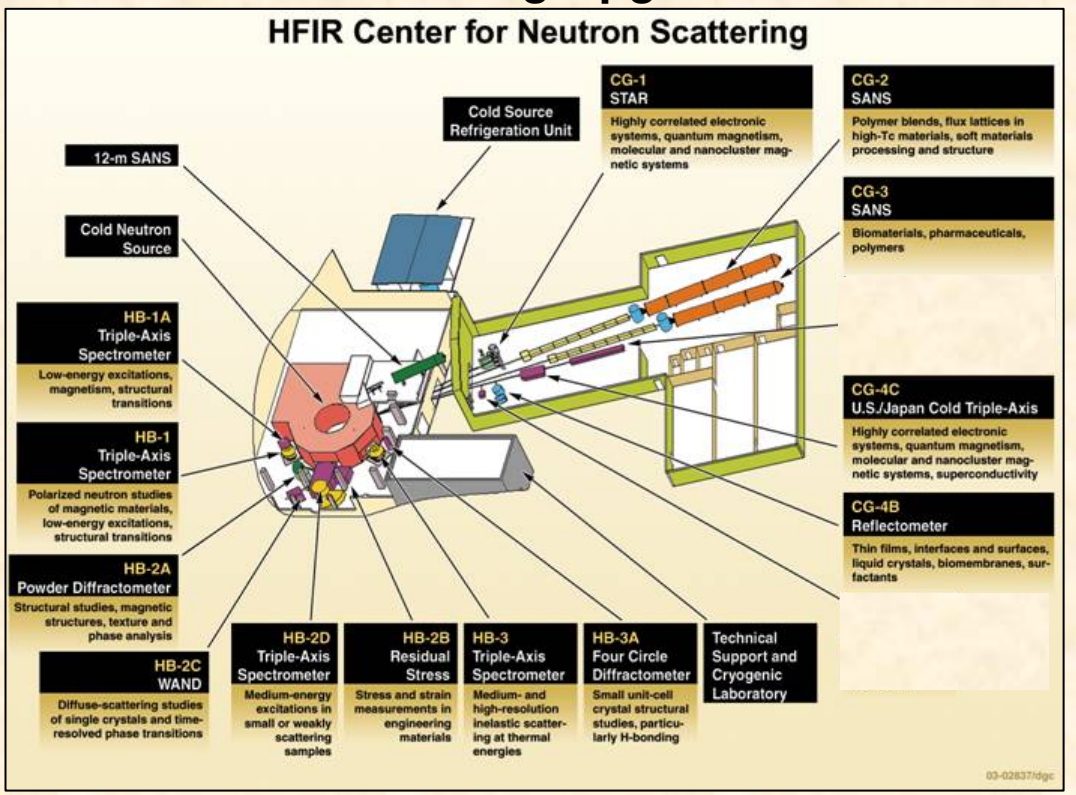
for HFIR and CNS

- HFIR formal neutron-scattering user program is underway and should grow significantly in the future.
- This year is a key year for the HFIR cold source and there is much work to be done.
- The management of HFIR and CNS has changed.
- In the future HFIR and SNS will merge into a common directorate. There will be a common user program.
- ORNL will be unique in the world with both pulsed and continuous high flux neutron sources.

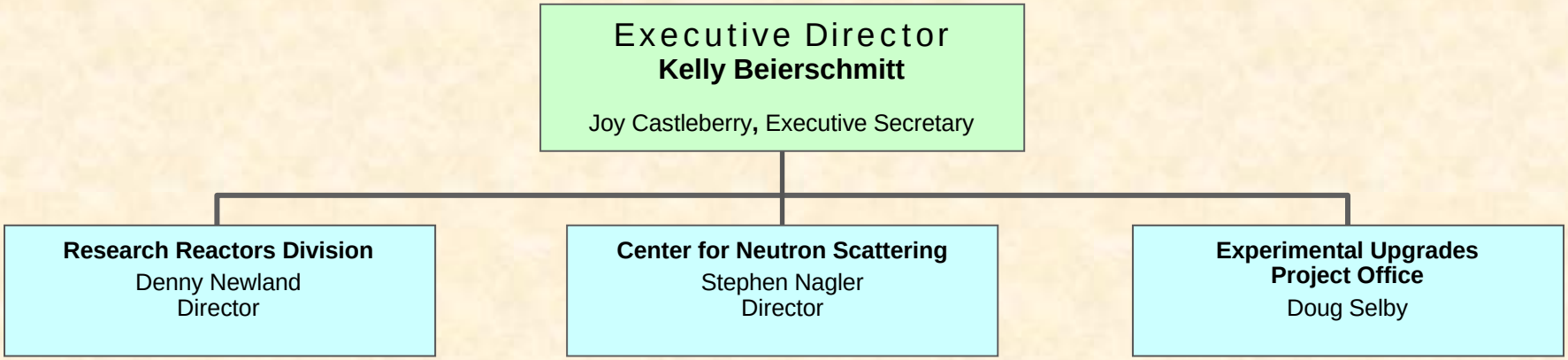
Neutron scattering upgrades at HFIR

- New and upgraded instruments
- Cold source brightness comparable to the world's best
- Improved thermal neutron intensity for most experiments
- Active user program serving 500 annually
- Complementary to SNS

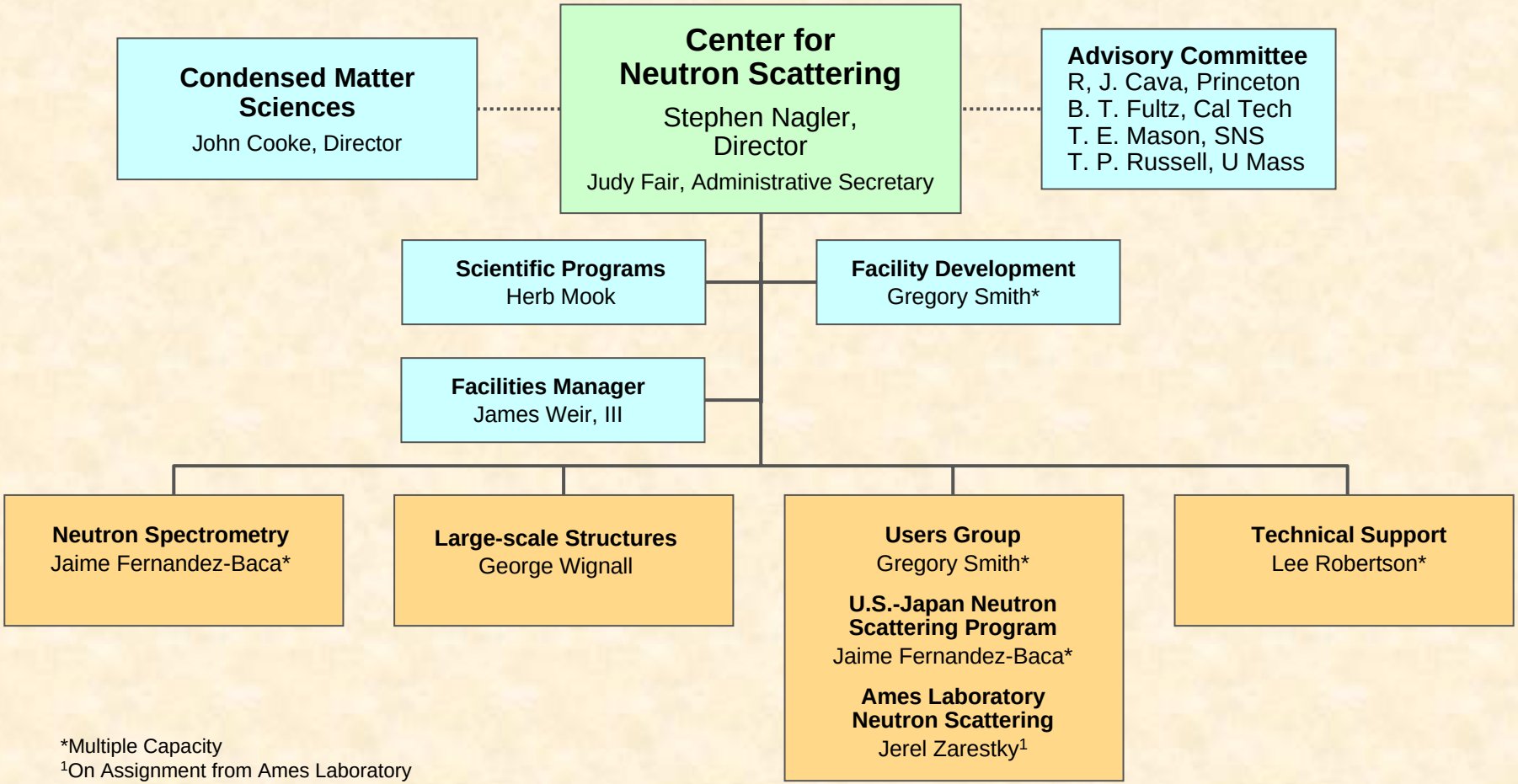
Neutron Scattering Upgrades at HFIR



High Flux Isotope Reactor interim organization



The future plan: SNS and HFIR will merge into a neutron sciences directorate. The Associate Laboratory Director for Neutron Sciences (Thom Mason) will implement the new organization.



*Multiple Capacity
[1]On Assignment from Ames Laboratory

HFIR Neutron Scattering User Program

- FY 2005 saw the user program extended to 5 instruments: Triple axis spectrometers HB1, HB1A, and HB3, the MIRROR reflectometer, and the residual stress diffractometer.
- The submitted proposals included 125 different users.
- There were 96 unique users physically performing neutron scattering experiments at the HFIR.
- Of these, there were 40 “first time” users at HFIR.
- A major effort was made to accommodate external users in the summer, and as a result most of the approved proposals have been run.
- We anticipate a new call for proposals during the spring of 2006.
- As SNS commences operations the user programs will be integrated.
- Planning is underway for a neutron scattering user support building at HFIR.

Improving HFIR Operability

- Historically, HFIR availability has exceeded that of ILL.
- Evaluations show that HFIR can operate through 2035 or longer.
- Plan is for predictable operations with high availability with 8 to 10 cycles per year once the cold source is running.
- Recently unplanned outage days have been problematic. Over 80% of these have been due to either equipment problems or regulatory issues.
- The outages arising from equipment issues are being addressed through investment in new infrastructure to ensure long term reliability.
- The biggest cause of unplanned outages has been regulatory issues. With the agreement of DOE new policies are being implemented to deal with these, and this should significantly improve the HFIR availability in the future.

Major Push: Cold Source Installation in 2006

- Right now ORNL is in the midst of a major push to install the HFIR cold source in 2006. This will restrict the operating days of HFIR for the next year.
- HFIR will run in December when preparations for beam tube installation are complete. The beam tube with cold source assembly will be installed in January.
- After extensive testing, HFIR should resume operations with cryogenic cooling by helium in June, 2006.
- Operating with hydrogen requires an operational readiness review. The target date for operations with hydrogen is October, 2006.

Instrument Related Timeline

2001 Be reflector replacement begins, plus new beam tubes and shutters.

2002 HB1 triple axis installed

2003 HB3, HB1A spectrometers installed
Formal user program initiated with three instruments

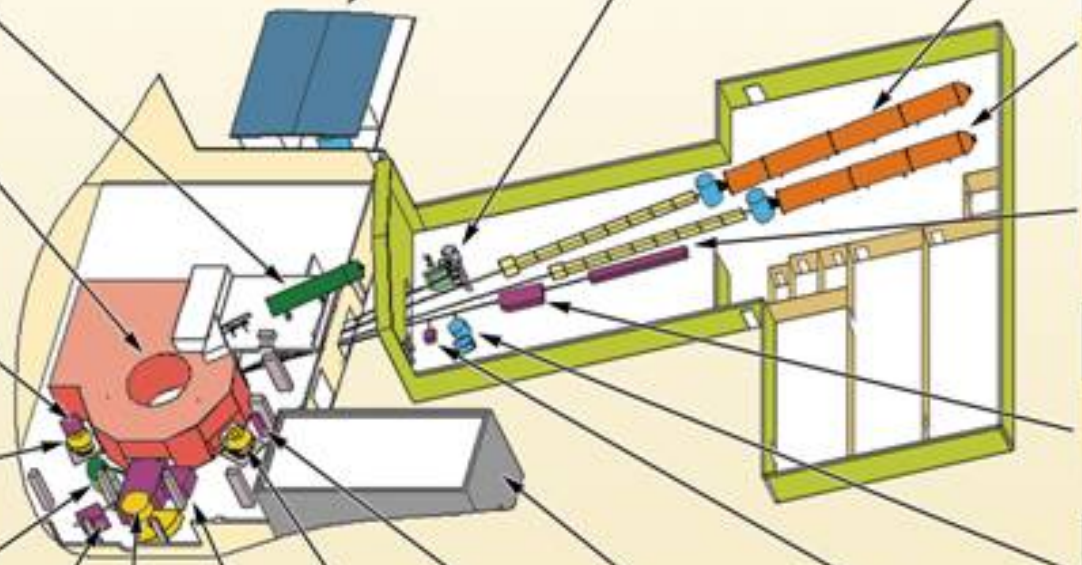
2004 Installation of HB2 instrument suite:
Residual Stress, Mirror Reflectometer, SNS test station, WAND

2005 Installation of SANS-1, four circle diffractometer
Reflectometer and Residual Stress added to user program

2006 Installation of SANS-2,
US-Japan CTAX2 ready to begin installation
Commissioning of SANS and four circle instruments

Future: powder diffractometer, CG1 (STAR), relocation of mirror, etc.

HFIR Center for Neutron Scattering



CG-1 STAR
Highly correlated electronic systems, quantum magnetism, molecular and nanocluster magnetic systems

CG-2 SANS
Polymer blends, flux lattices in high-Tc materials, soft materials processing and structure

Cold Source Refrigeration Unit

12-m SANS

Cold Neutron Source

CG-3 SANS
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Low-energy excitations, magnetism, structural transitions

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Polarized neutron studies of magnetic materials, low-energy excitations, structural transitions

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Technical Support and Cryogenic Laboratory

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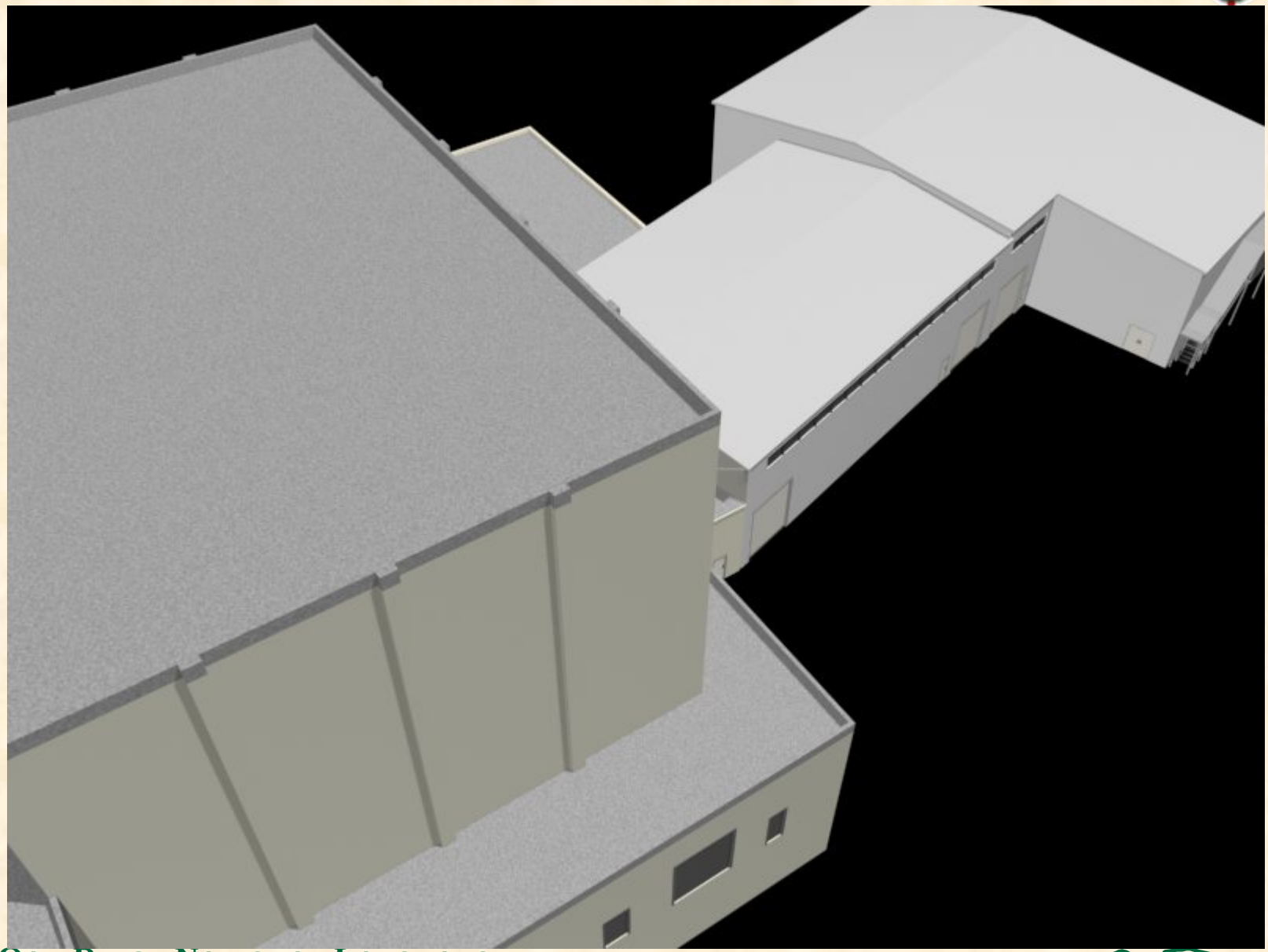

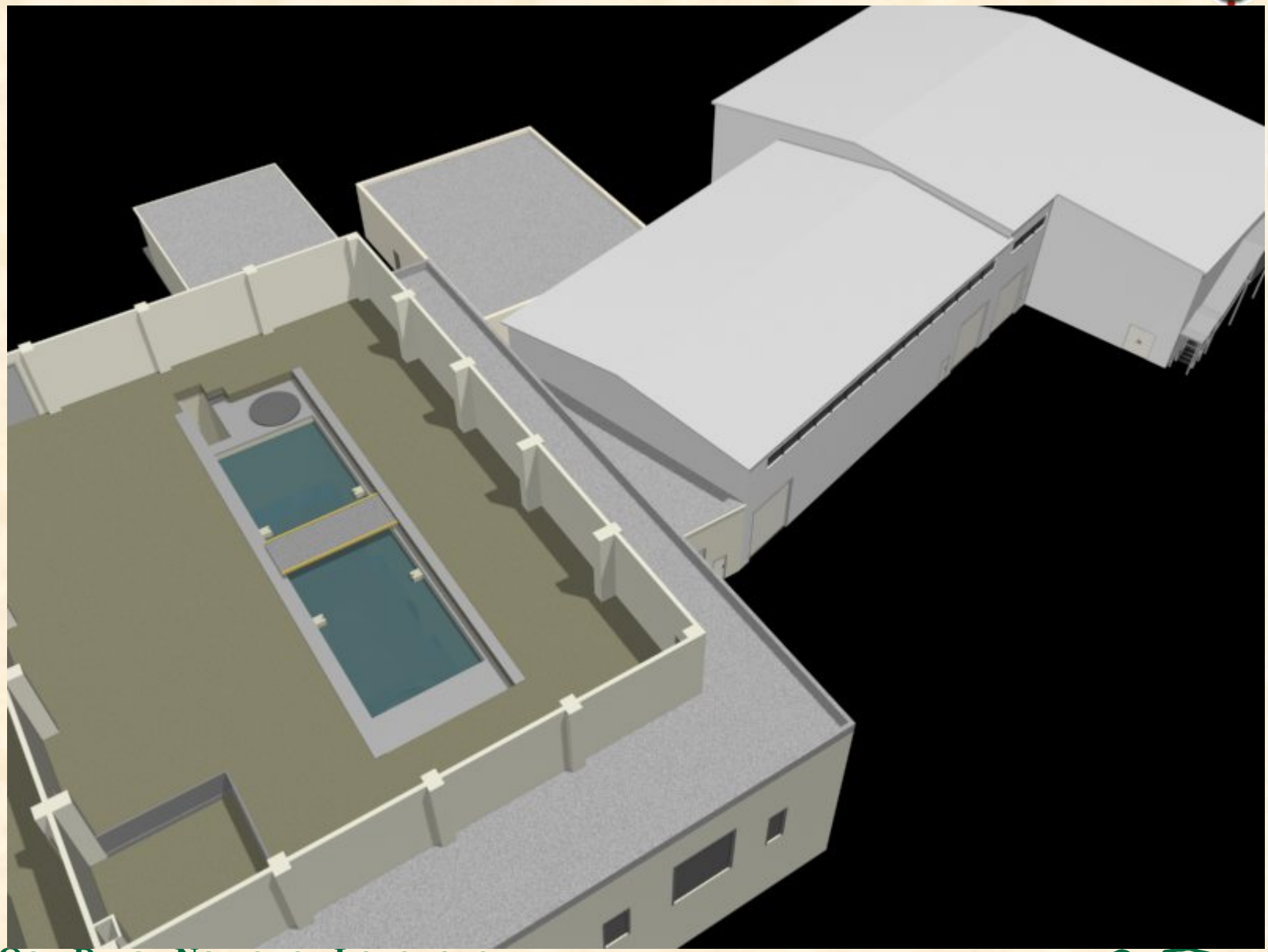

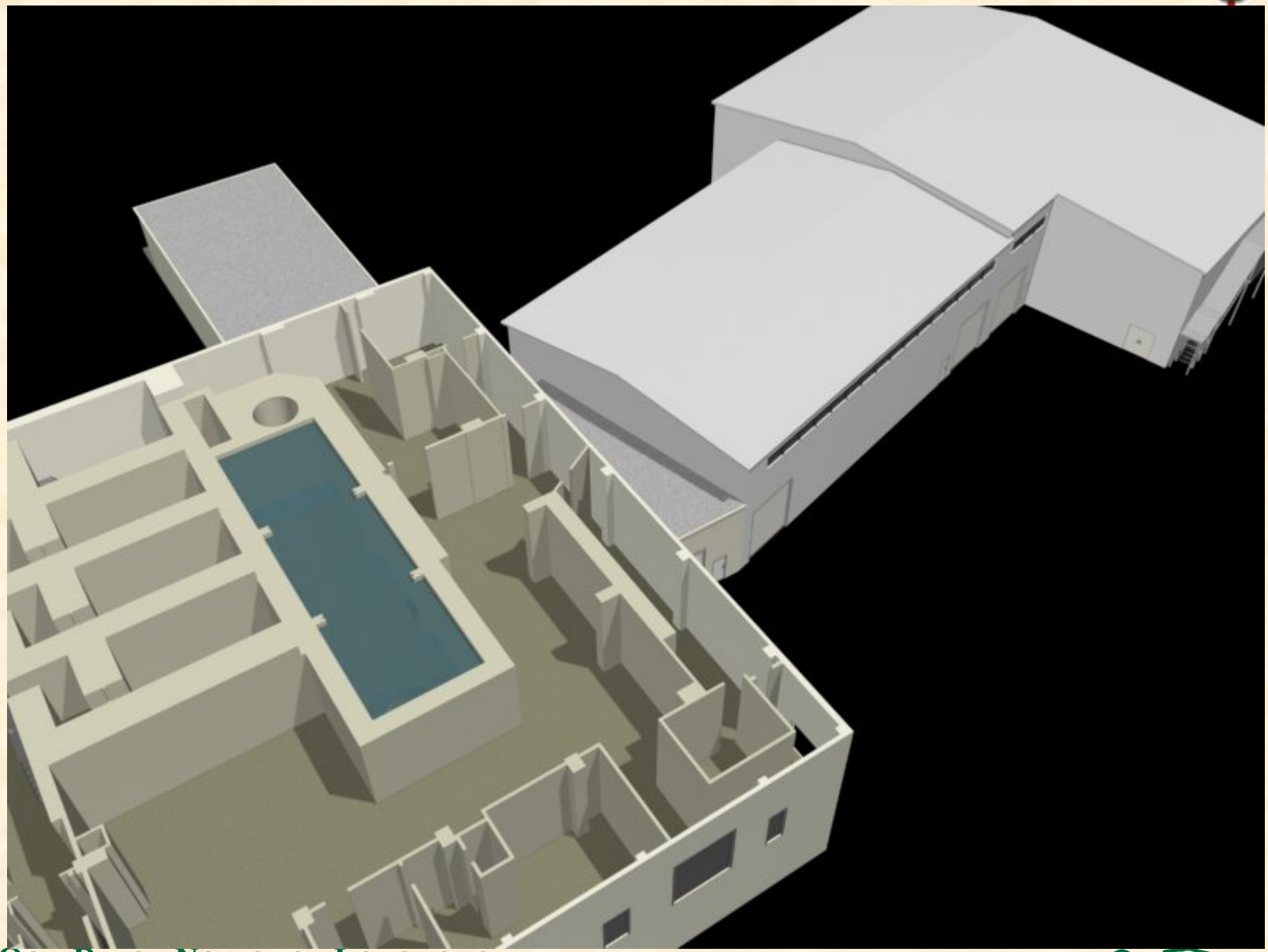

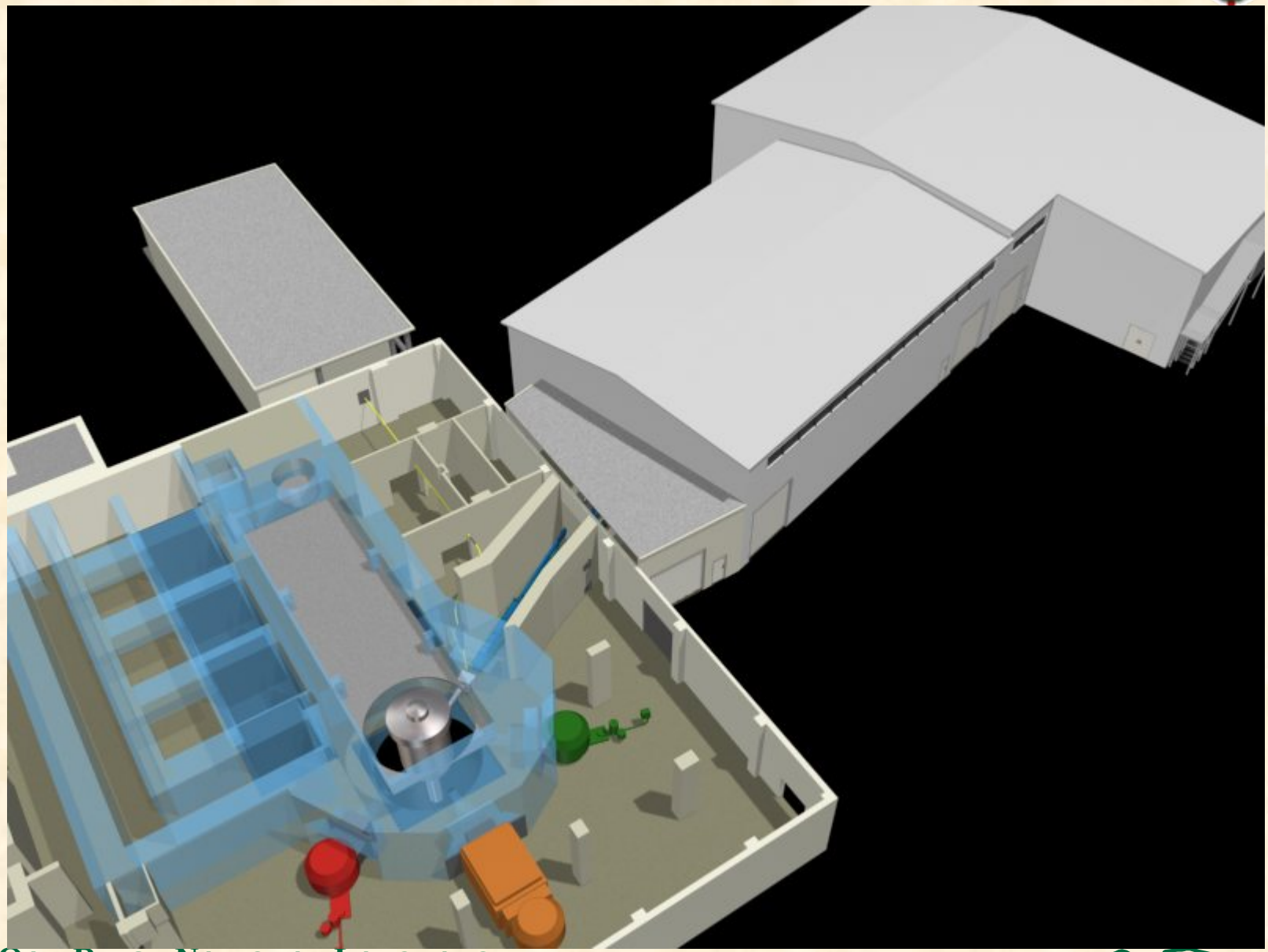

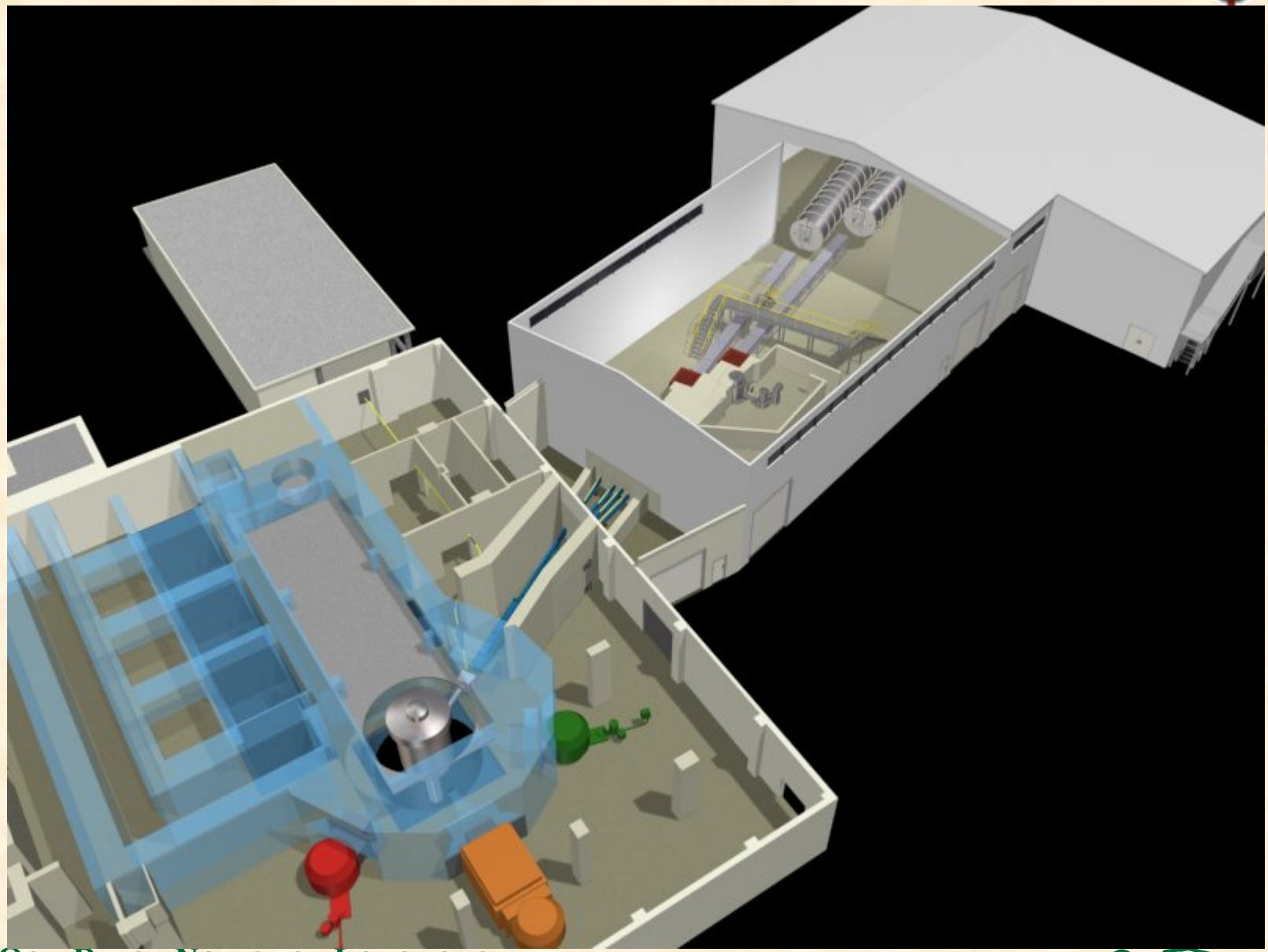

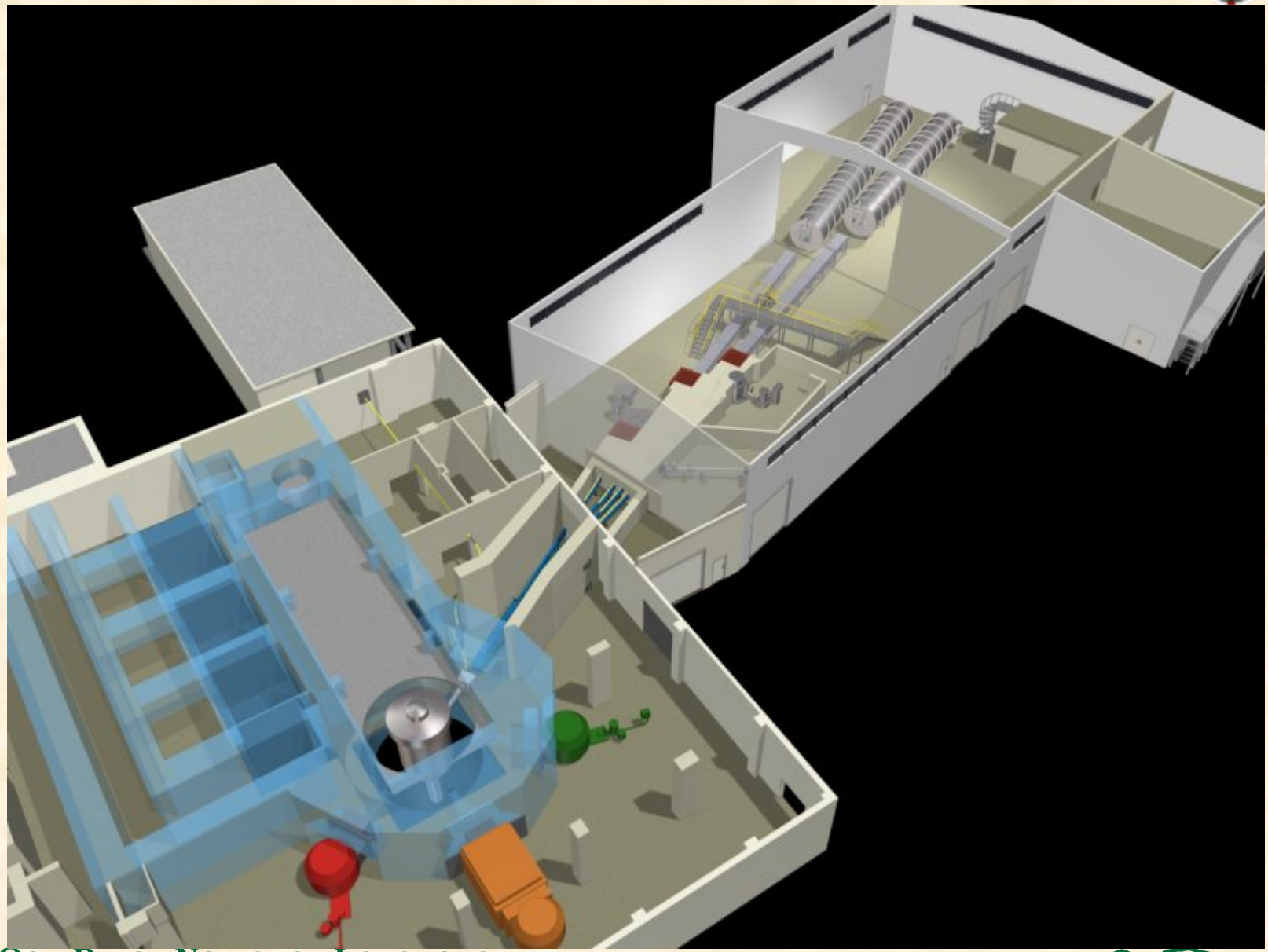

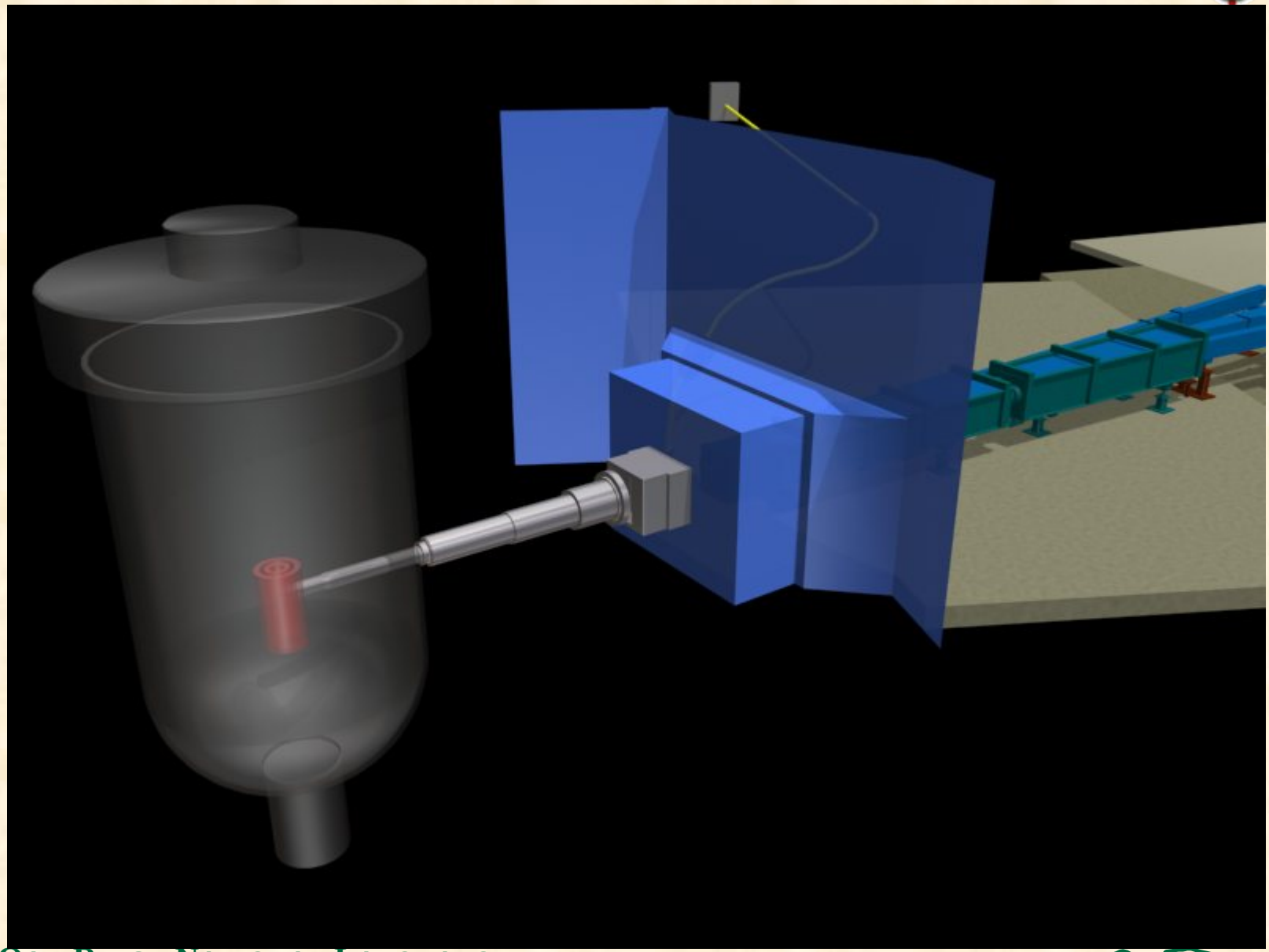

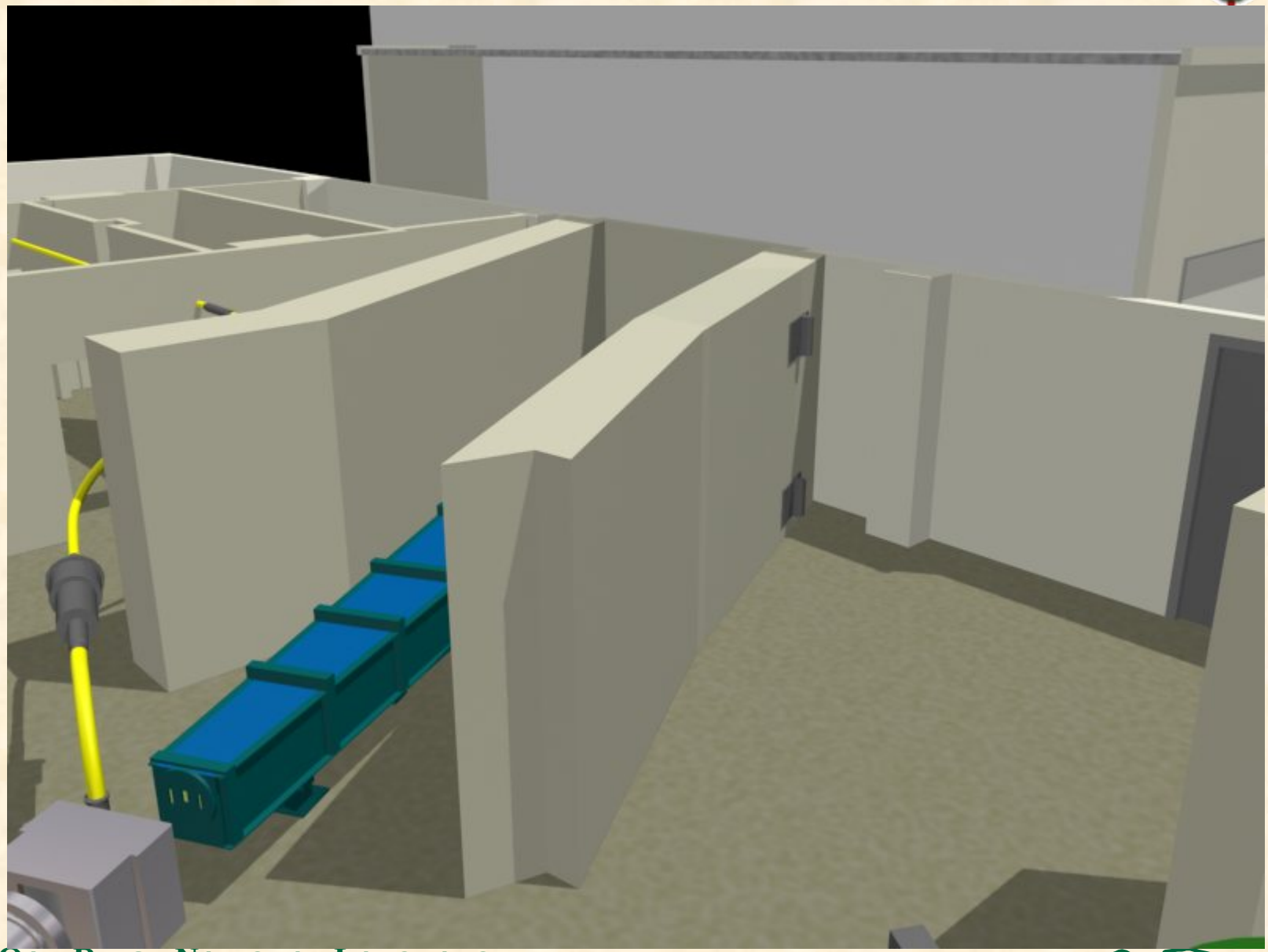

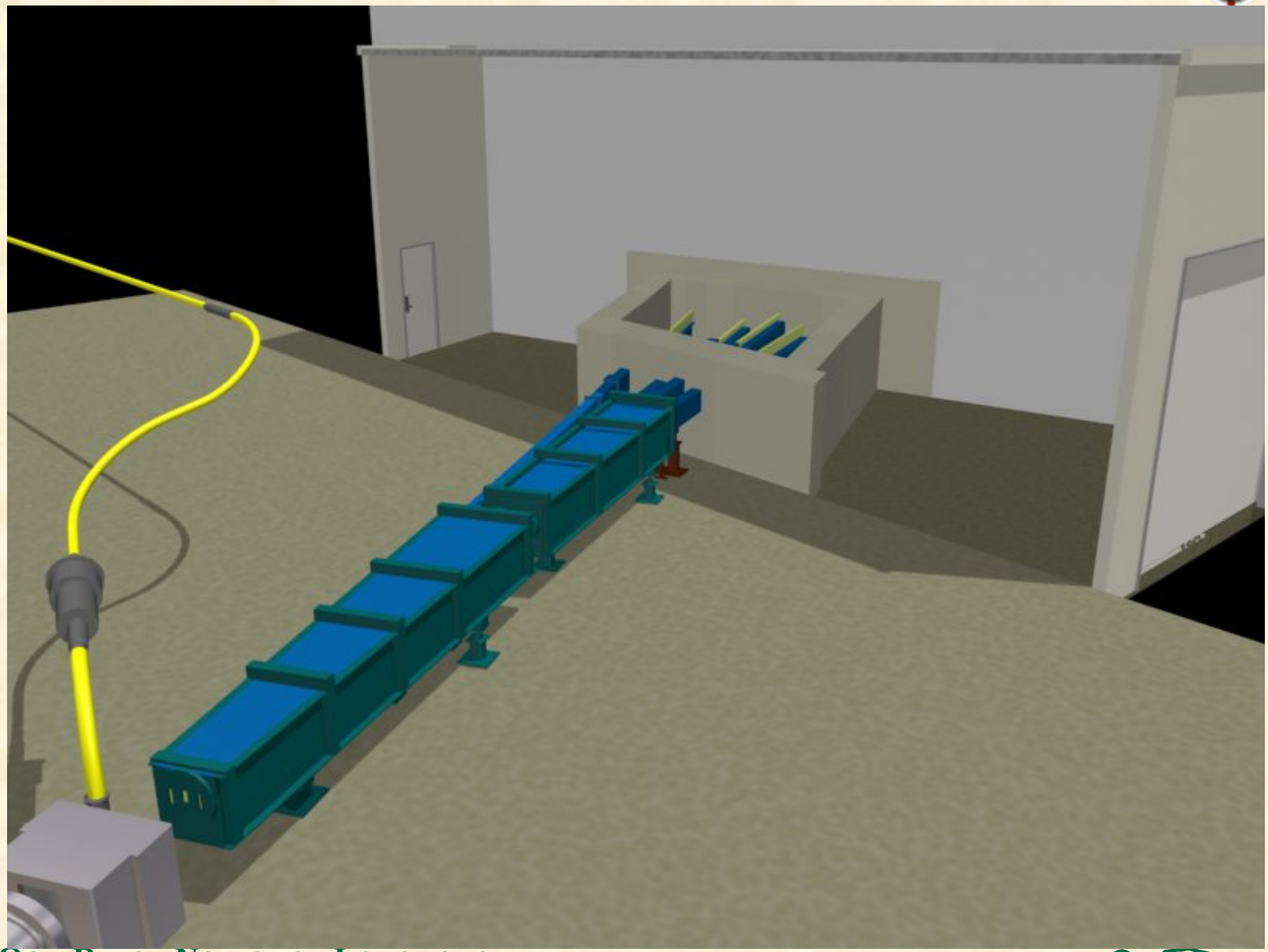

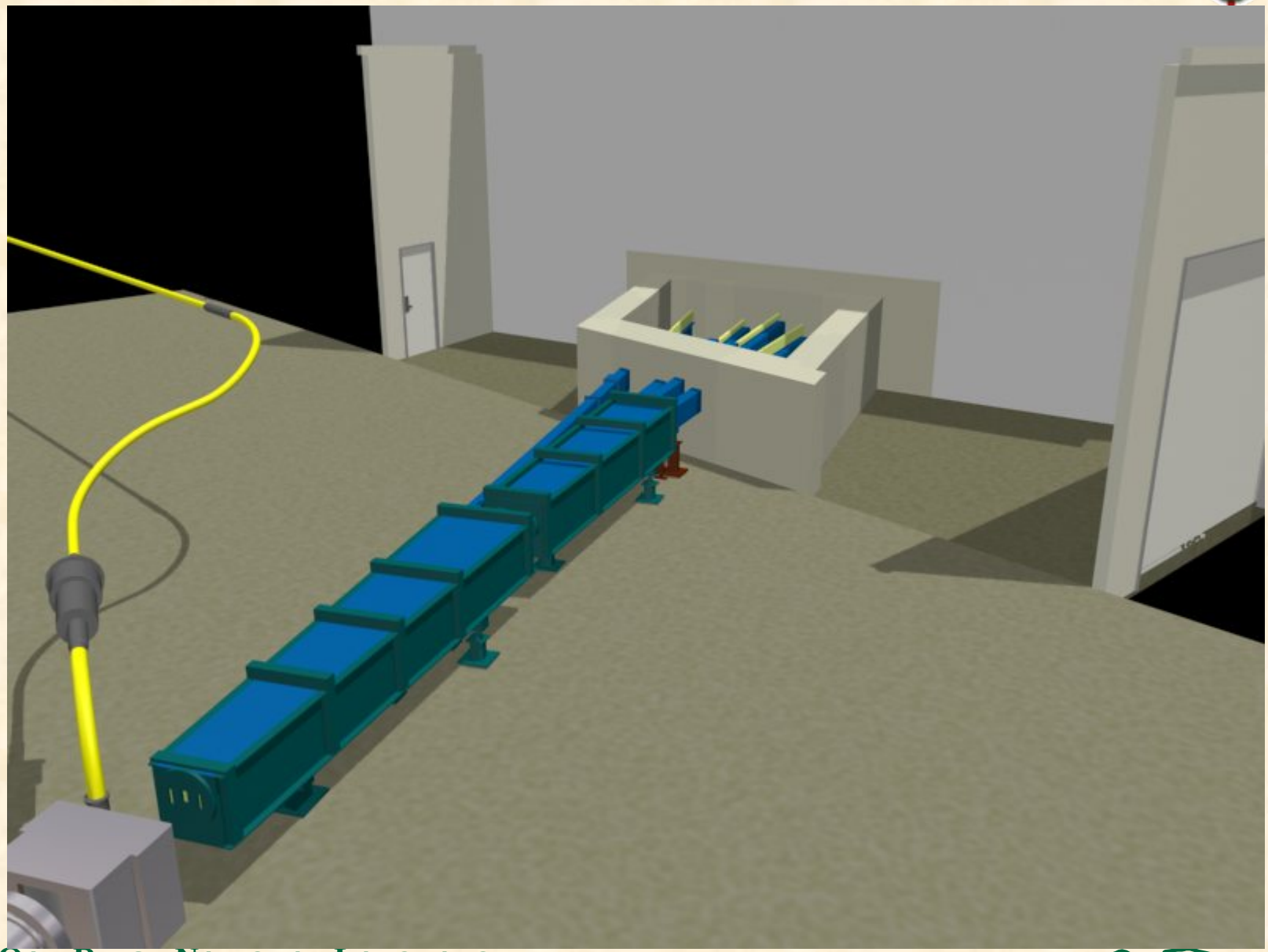

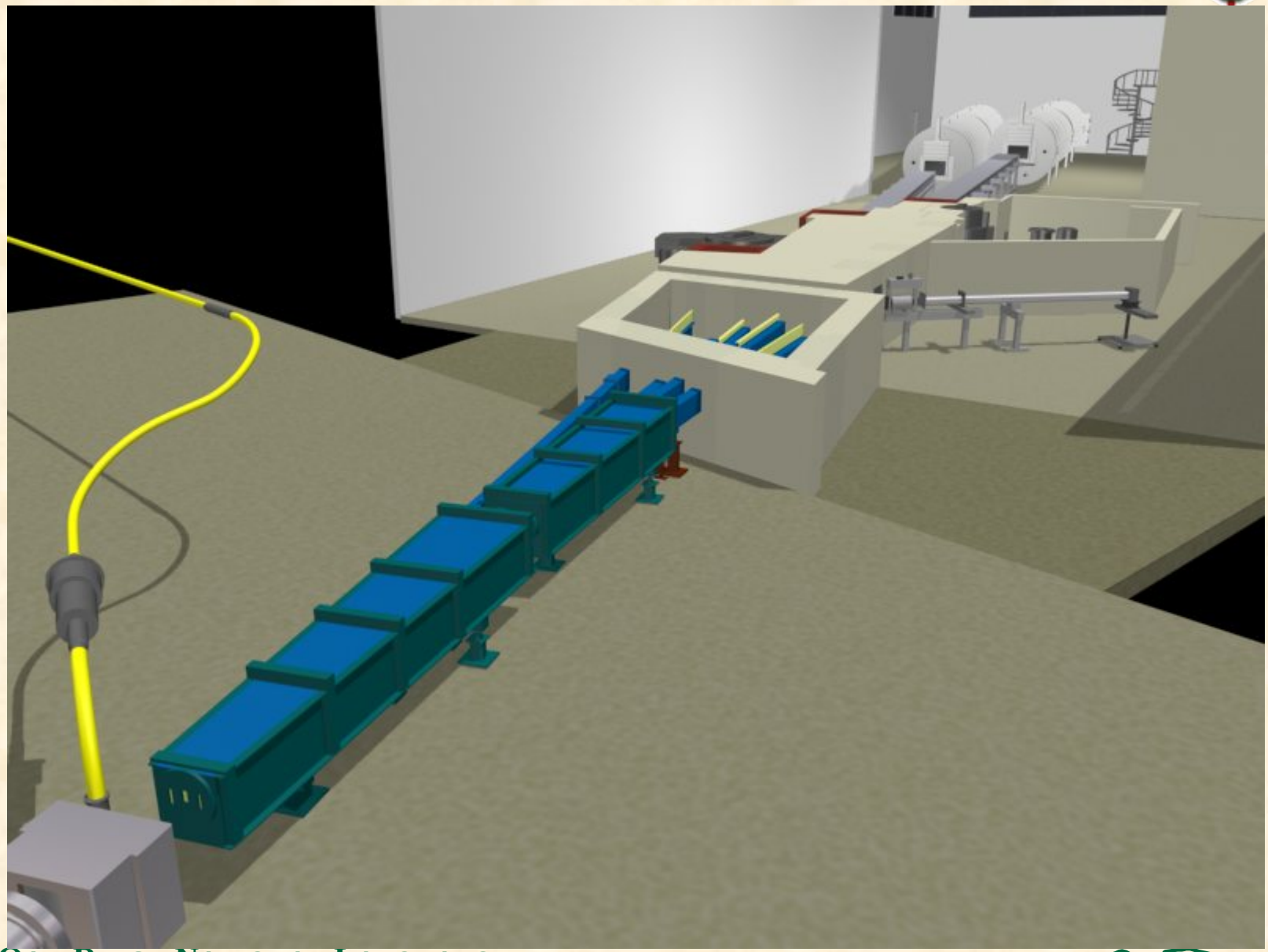

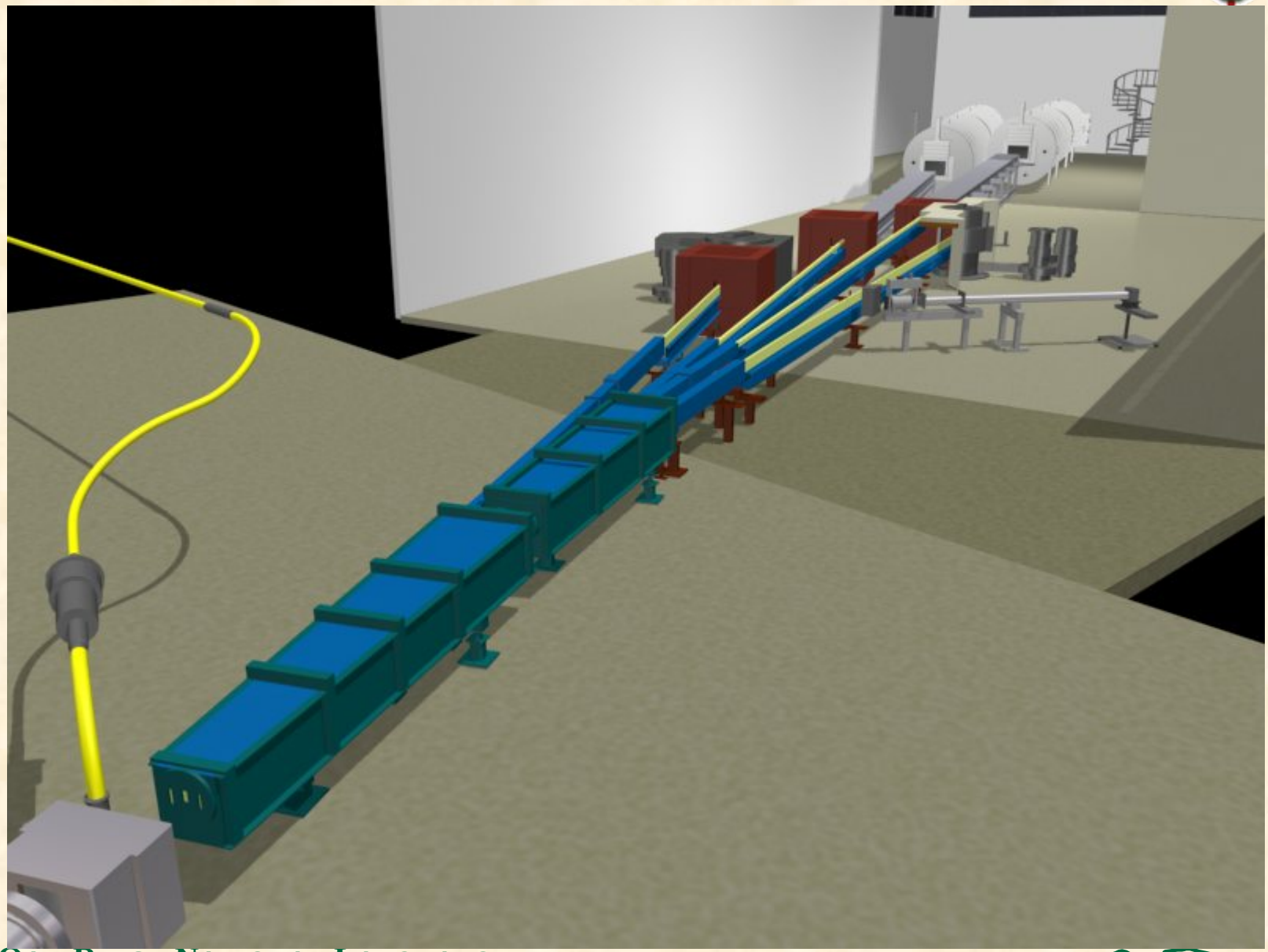

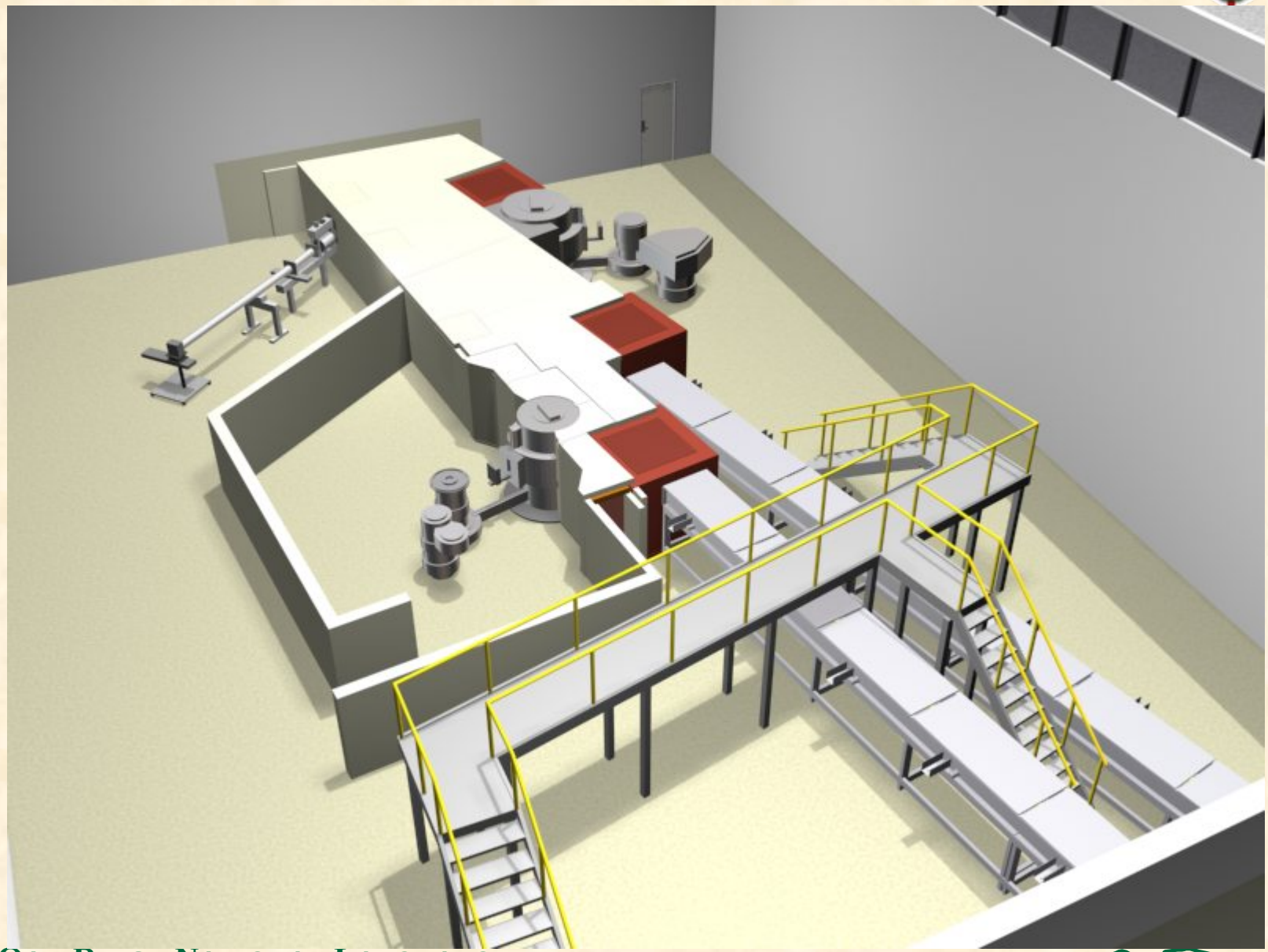

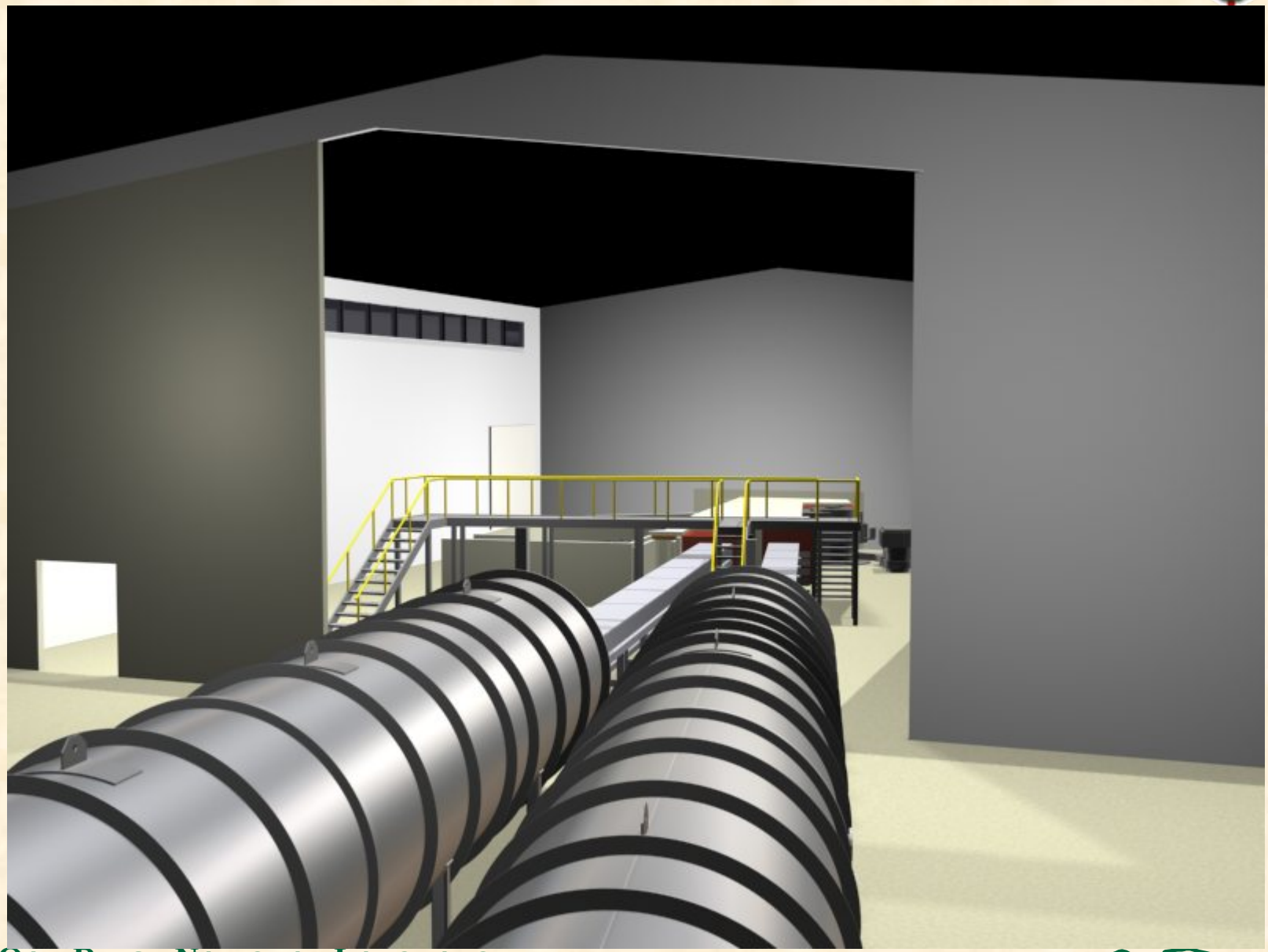

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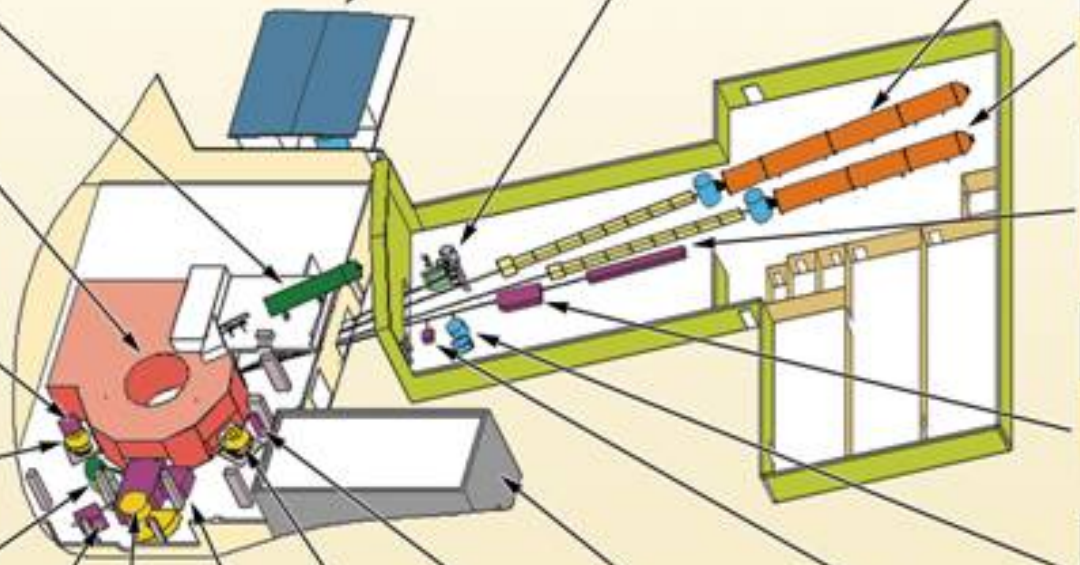

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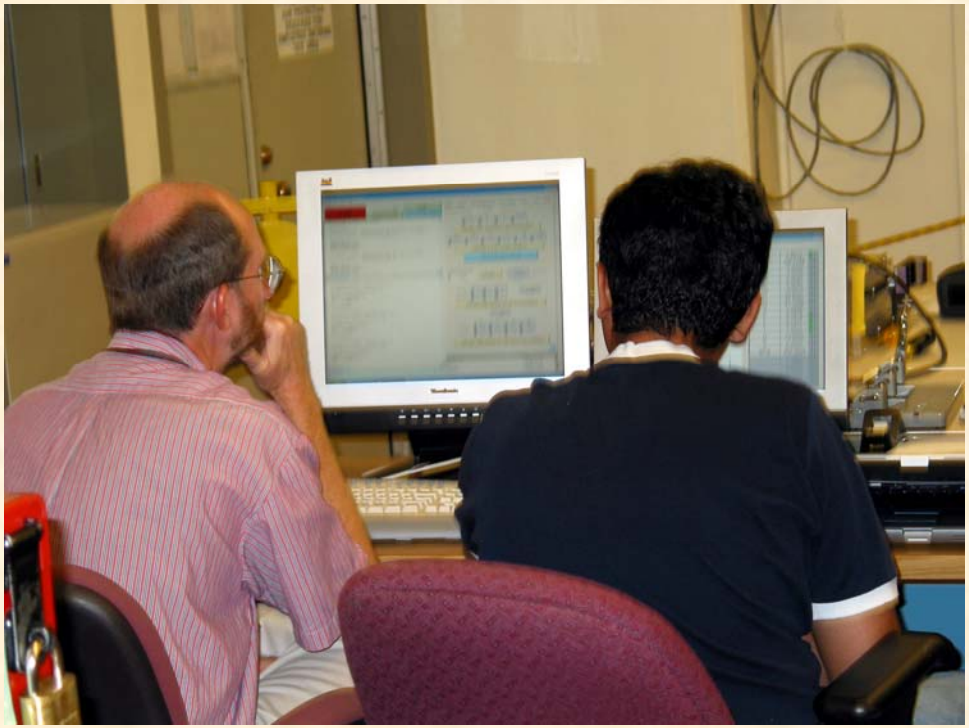
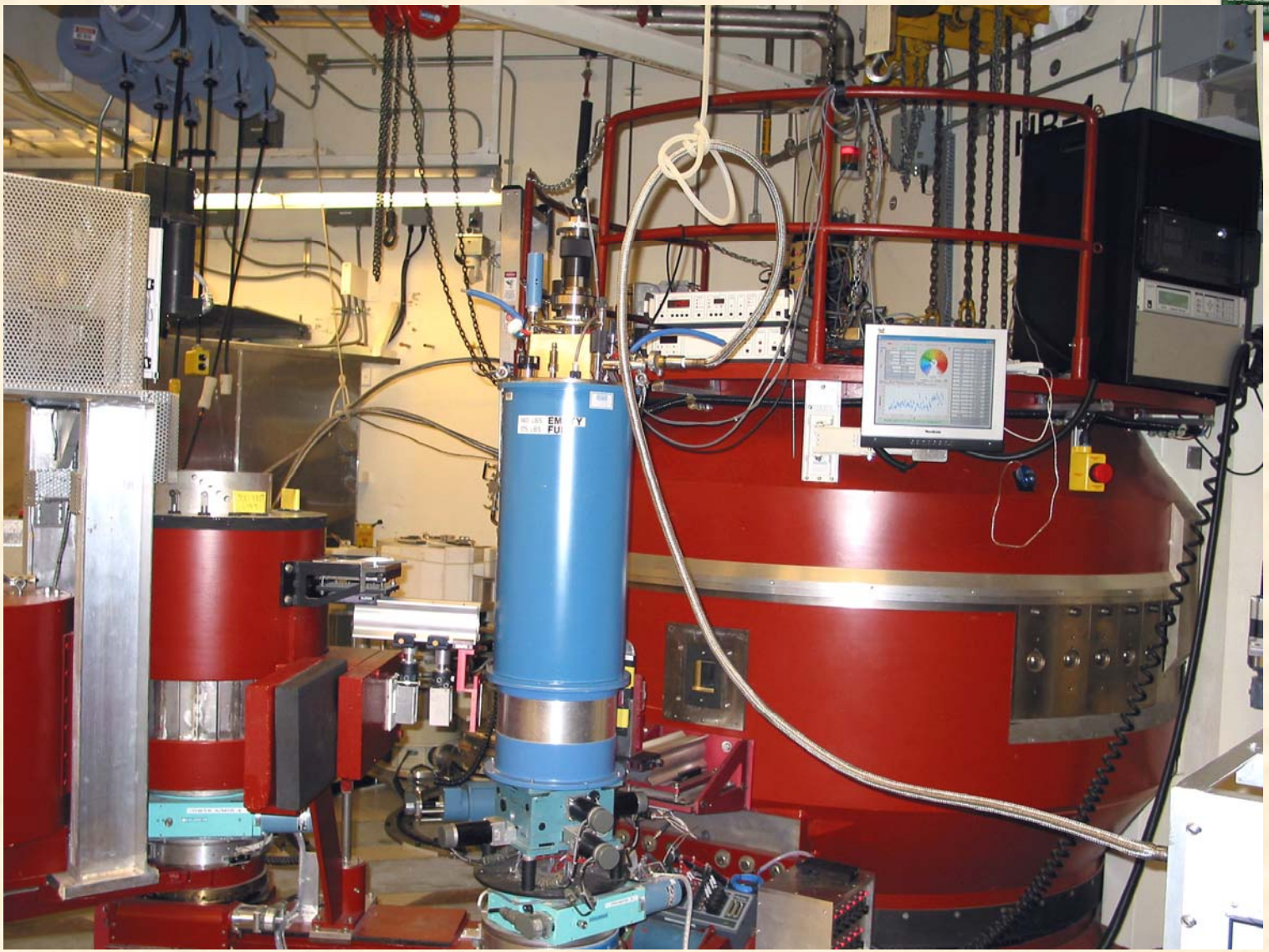
HIGH FLUX


REACTOR ON




DANGER
RADIATION
OPEN BEAM WHEN
RED LIGHT
IS ON
HB1A
Ames Laboratory
Iowa State University
DANGER
HIGH RADIATION AREA

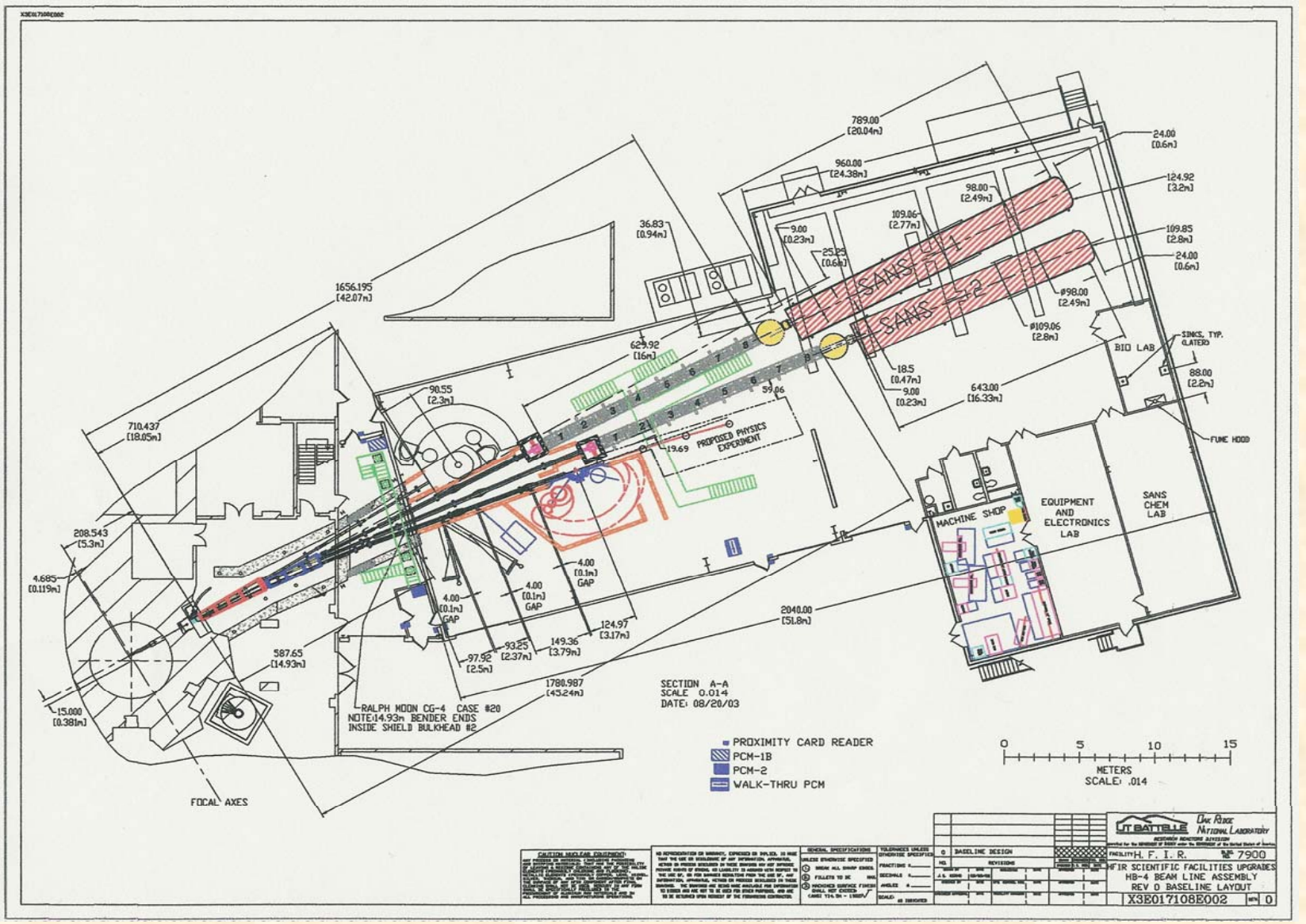



B-7
TEST IN
PROGRESS
DO NOT
DISTURB


12 TON
B
SOUTH
CAUTION
RADIATION AREA
NEUTRONS


B-8
DANGER
RADIATION
OPEN BEAM WHEN
RED LIGHT
IS ON

Cold Instrument Layout




EAST
EXIT


EAST
SOUTH