



Neutron Reflectometers at ORNL

W.A. Hamilton

HIFR, ORNL

F. Klose and J.F. Ankner

SNS, ORNL

October 2005

ORNL Reflectometers

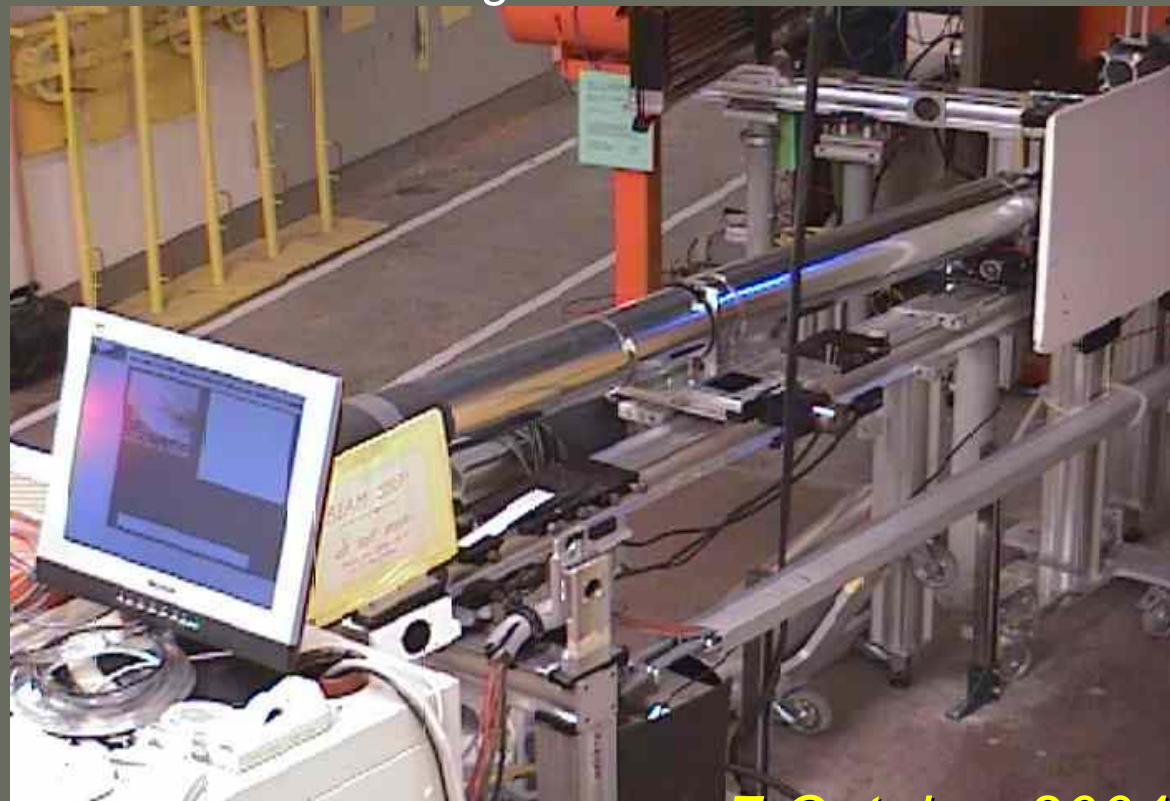
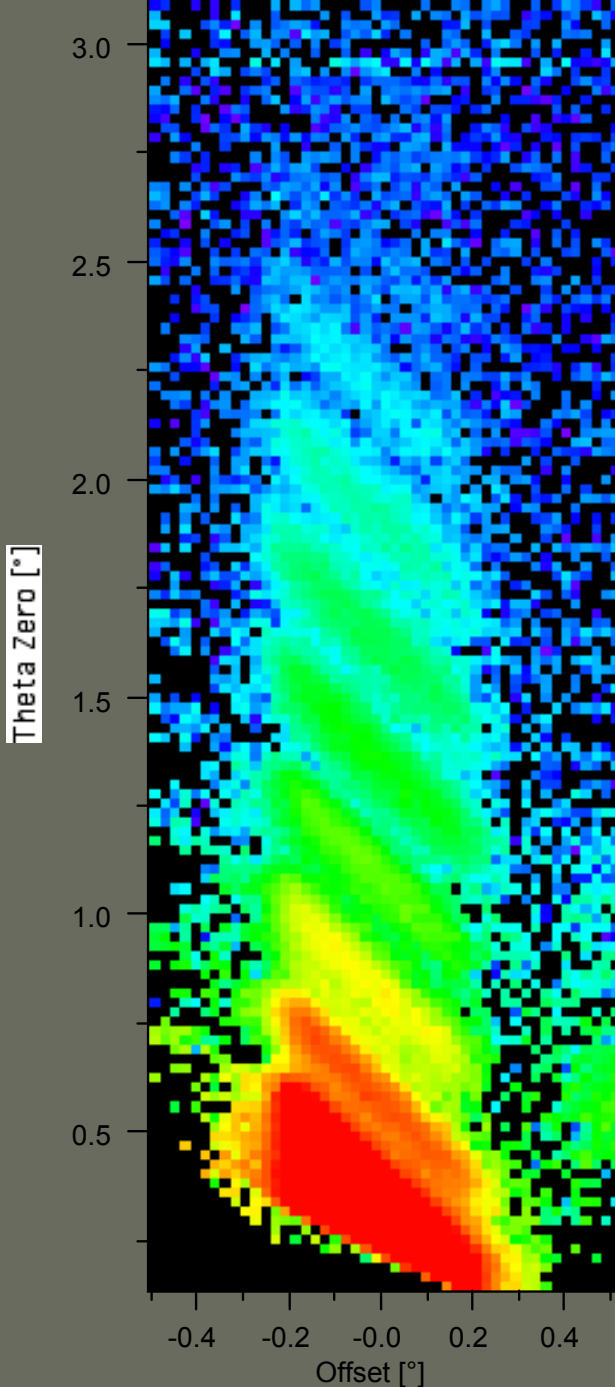
- MIRROR at HFIR
 - User program running now
 - Vertical sample geometry
- Magnetism Reflectometer at SNS
 - First experiments summer/fall 2006
 - Vertical sample geometry
 - Four-cross-section polarized beam
- Liquids Reflectometer at SNS
 - First experiments summer/fall 2006
 - Horizontal sample geometry

MIRROR Reflectometer on HB-2D

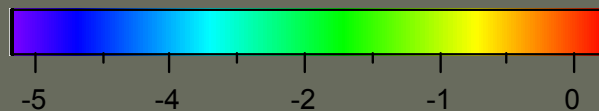
Recently (re-)installed in the HFIR beam room
wavelength is 4.25\AA

PG002 monochromation

Be filter for higher order contamination



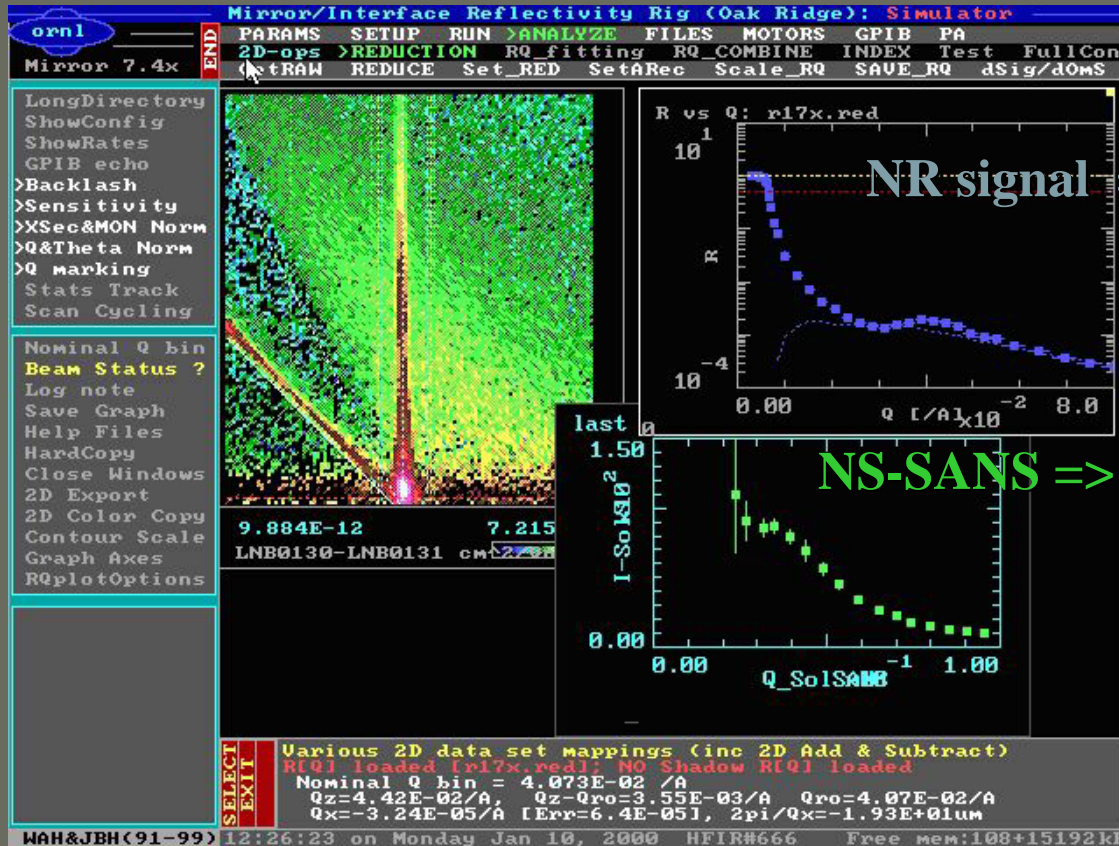
7 October 2004



NEW0017 - 7 October 2004

Future of MIRROR NR program

Current software offers the unique capability of integrated reduction of NR and NS-SANS allowing simultaneous monitoring of surface and bulk structure



NR signal => $R[Q_R]$ vs Q_R

(correctly) subtracts
NS-SANS background

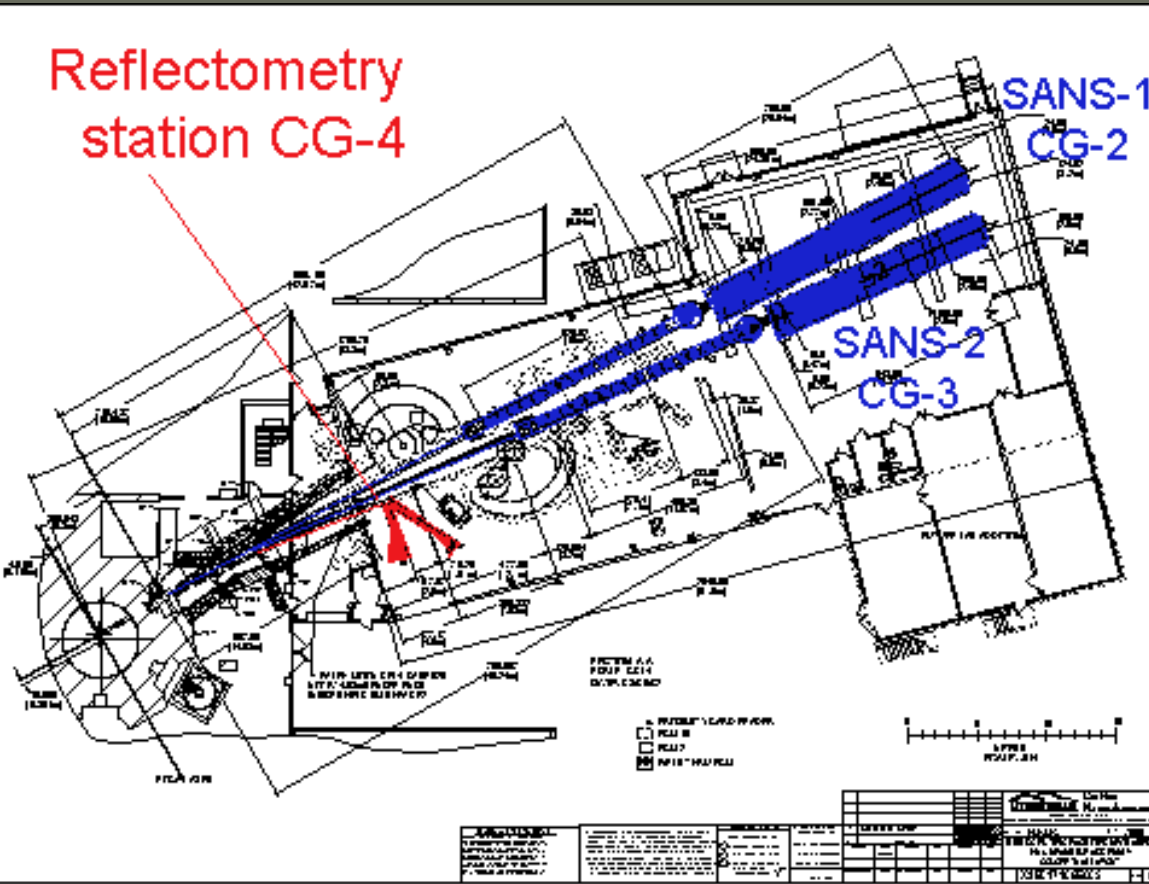
NS-SANS => $d\Sigma/d\Omega$ vs Q_S

Refraction,
Absorption
/sample volume,
Interface Transmissions,
Detector/instrument
resolution ...

Upgraded instrument(s) will provide users with state of the art NR measurements with data collection taking full advantage of NR "imaging" in new CNS/SPICE format

*Full Upgrades 2006 ...
Upgraded MIRROR to primary beam in Guide Hall (CG-4 #1)*

Reflectometry
station CG-4



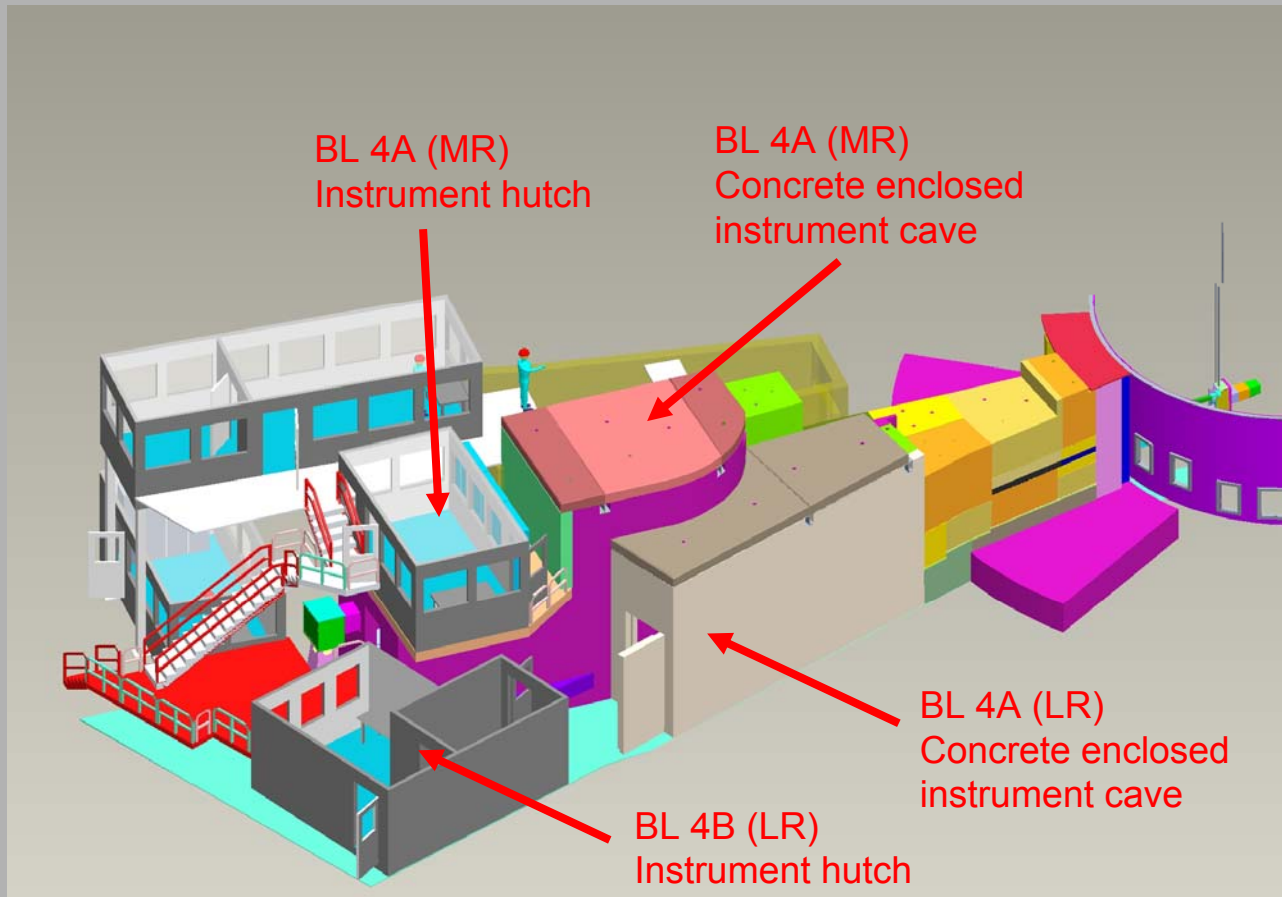
Effective FLUX $\times 10$
Background /10*

*SPEED $\times 10$
Sensitivity $\times 100$*

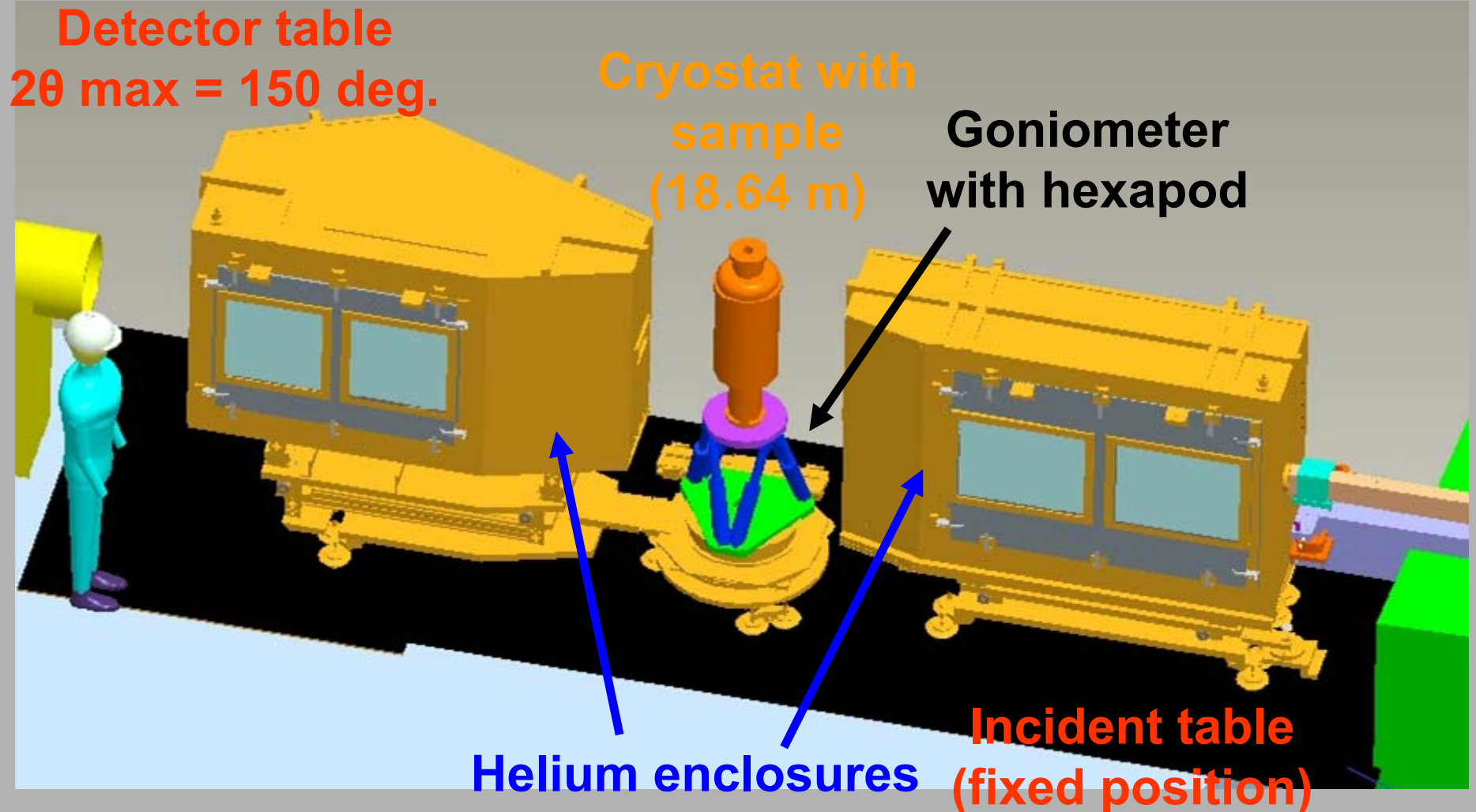
*Downstream on guide CG-4:
USANS/Interferometer (proposed)
US(Brookhaven)-JAPAN Cold 3X
NP Weak Interaction Station*

**Cold guide estimate ~same flux at 5Å as at 2.59Å in beam room (RMM)
Imaging NR: Shorter instrument for same resolution - Acceptance $\times 2$ and $(1/r^2) \times 4$*

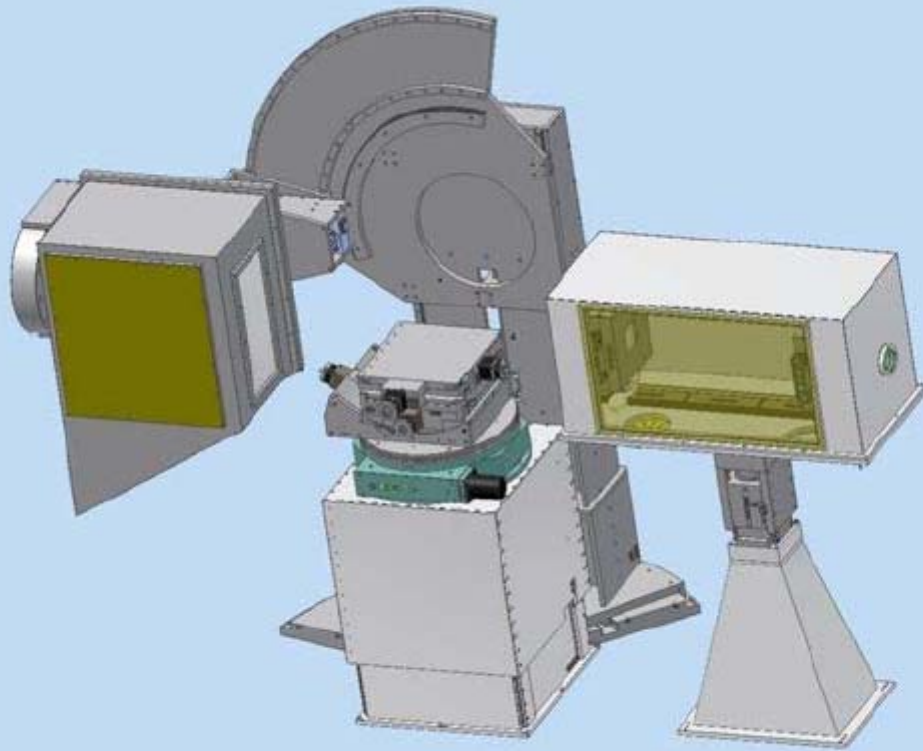
SNS Beamline 4



SNS magnetism reflectometer



SNS liquids reflectometer



[courtesy JJ X-Ray]

Hardware

$$2.5 \text{ \AA} \leq \lambda \leq 15 \text{ \AA}$$

$$\Delta \lambda = 3.5 \text{ \AA} @ 60 \text{ Hz}$$

$$60 \text{ Hz} \geq f \geq 6 \text{ Hz}$$

$$0 \leq \alpha_{\text{liquid}} \leq 5.5^\circ$$

$$0 \leq 2\alpha \leq 90^\circ$$

$$0 \leq 2\theta \leq 30^\circ$$

Software

Standard analysis tools
 Improved reduction tools
 Working on miracles