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Early Science Capabilities & Sample Environments

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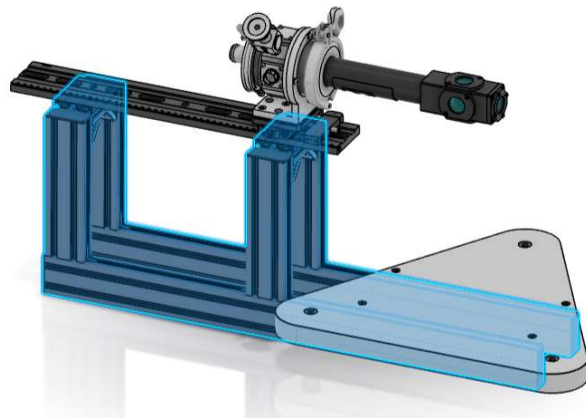
Sample Environments

Low Temperature



LHe Flow Cryostat

- 2 K (up to 420 K)
- Fast cooldown – 15 min to 5 K
- 50 mK temperature stability
- Multi / transport sample stages



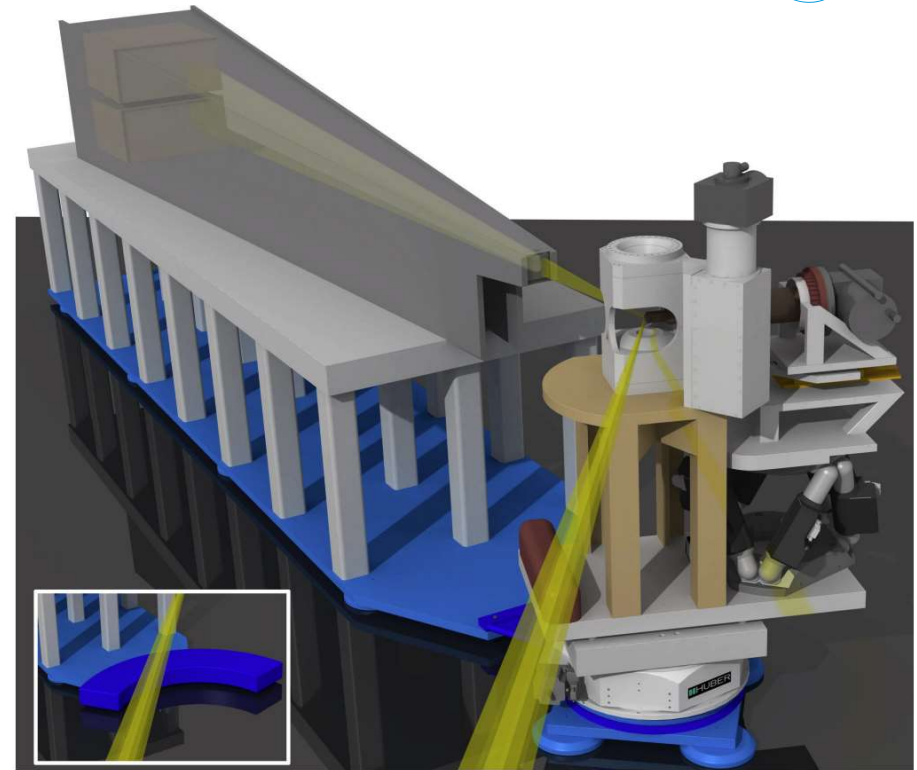
Sample Environments

High Magnetic Field



Open Bore Cryomagnet

- 2.1 T vertical field
- Vertical / Horizontal access (80 mm gap, 150° opening angle)
- <5 min ramp time to 2.1 T
- Compatible with cryostat & polarisation



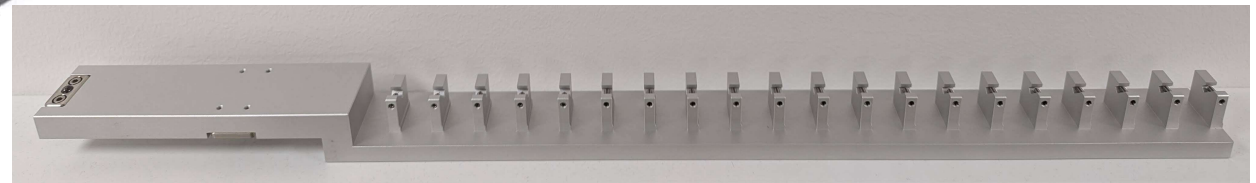
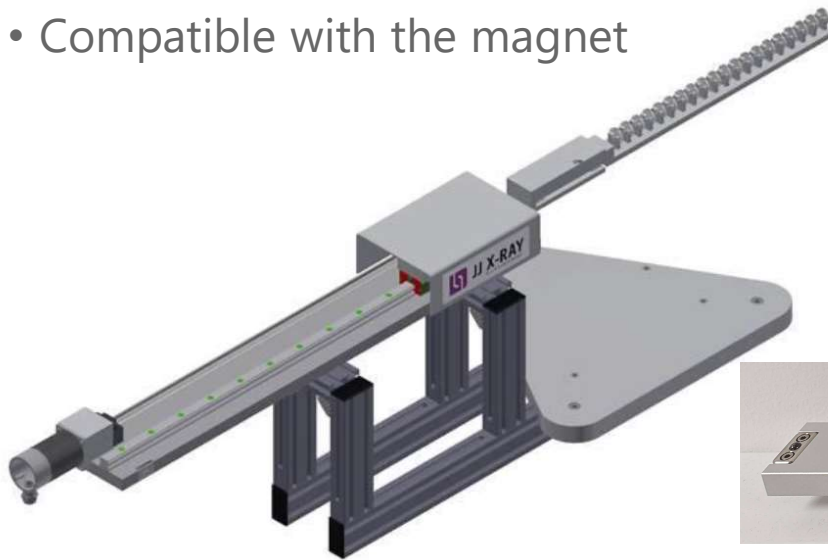
Sample Environments

High Throughput



Room-Temperature Sample Changer

- 20-position sample changer
- Max sample size: 20 x 20 x (0.3 to 2.0) mm
- Automated, linear translation stage
- Compatible with the magnet

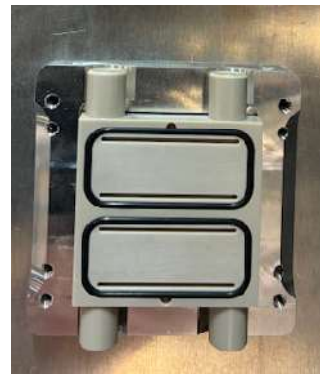


Sample Environments

Solid-Liquid Interfaces

Solid-Liquid Sample Changer

- 7-position (5 x 5 cm)
- 14-position (2 x 5 cm)
- Exchange volume (1.7 mL)
- Density dependent filling directions
- Temperature controlled. Automated switching.

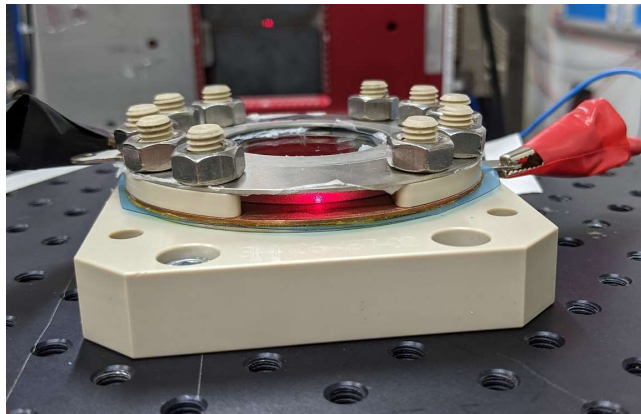


Sample Environments

Planned

Battery Cell

- Operando studies of battery systems
- Li-ion transport, SEI stability, & electrode/electrolyte interactions



Early Science Battery Postdoc to be advertised early 2026 in collaboration with Oxford (Weatherup Group)

Vacuum Mount

- Heavy or large samples
- Irregular-shaped or thick substrates
- Compatible with the magnet

Expected Performance

2 MW



10 x 10 mm² footprint

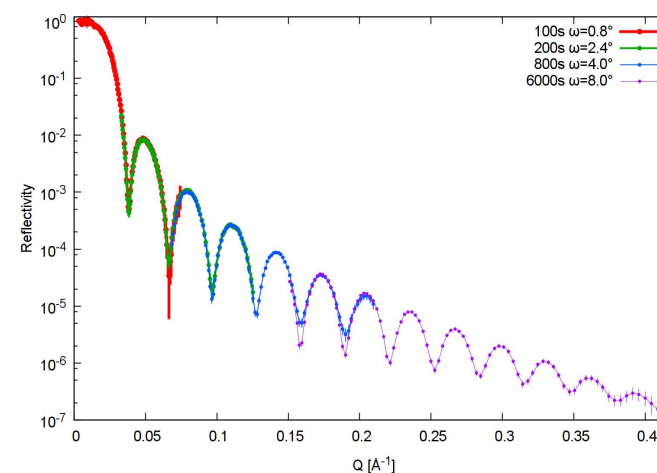
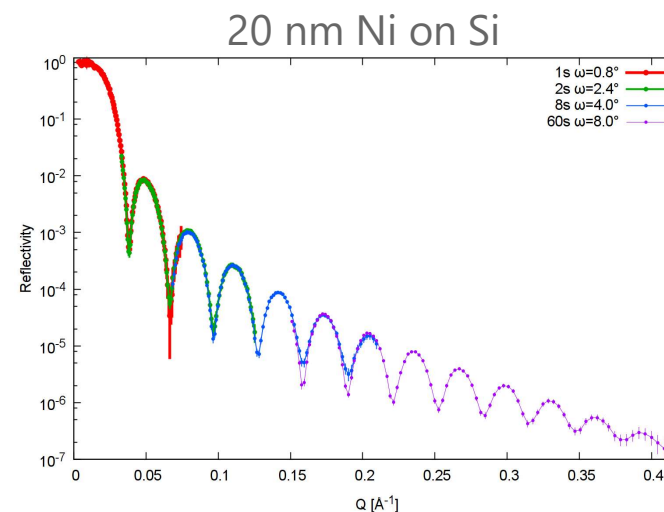
- High intensity mode (full divergence)
- Full reflectivity (to 0.4 Å⁻¹)
- Unpolarised

Measurement time: 71 seconds

1 x 1 mm² footprint

- High intensity mode (full divergence)
- Full reflectivity (to 0.4 Å⁻¹)
- Unpolarised

Measurement time: 7,100 seconds



Expected Performance

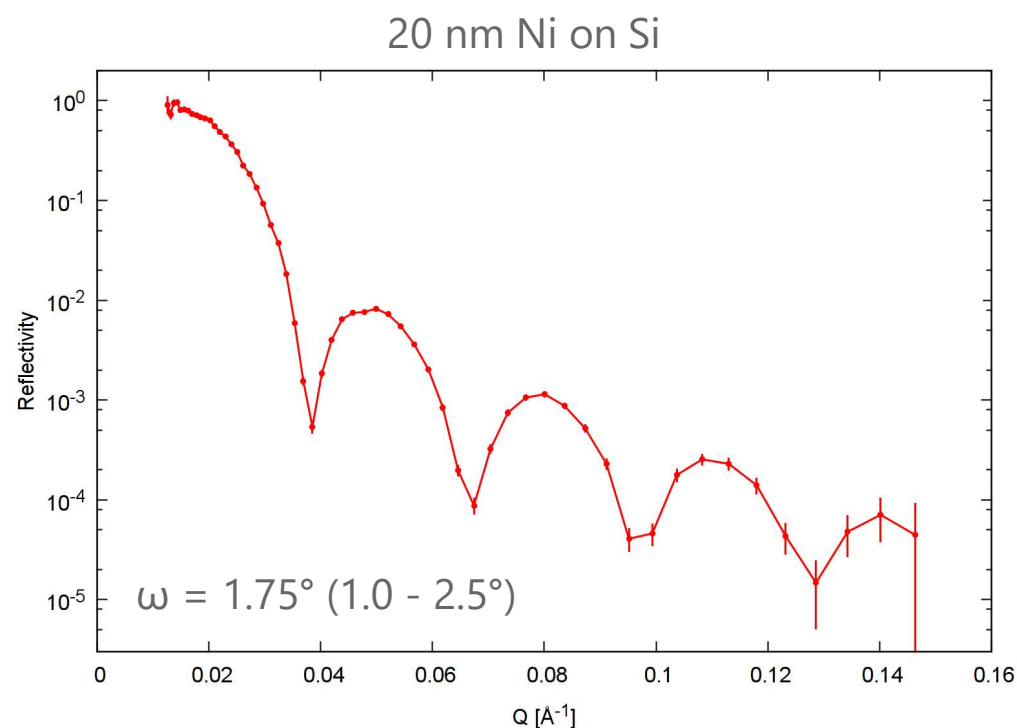
2 MW



Time-resolved measurements

- High intensity mode (full divergence)
- 2-pulse skipping (4.7 Hz)
- Extended bandwidth (21 Å)
- 10 x 10 mm² sample
- Unpolarised

Measurement time: single pulse



Summary

ESTIA Early Science Capabilities and SE



Sample Environment:

- Cryostat (2 - 420 K), Magnet (2.5 T), 20-sample RT sample changer, 14-sample S-L sample changer, battery cell, large-sample vacuum mount.

Performance (2 MW):

- Full PNR curves within 5 minutes ($10 \times 10 \text{ mm}^2$, high-intensity mode)
- Time-resolved processes (low Q, single pulse)
- At 500 kW, scale counting times up by a factor of ~ 4

Questions?