

Reproducibility and Reliability

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What is reproducibility and reliability about?

- Do I believe my data and my interpretation?
- Can others generate the same results?

- What needs to be known about my measuring instrument to interpret the data?

Formal and informal activities

What is happening?

- Joe Kline:

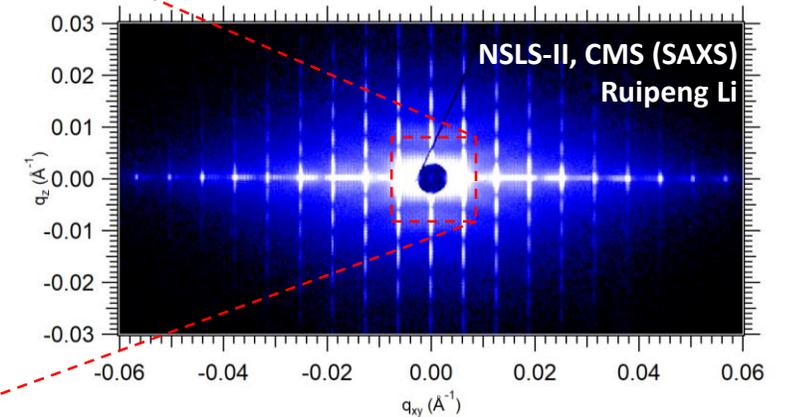
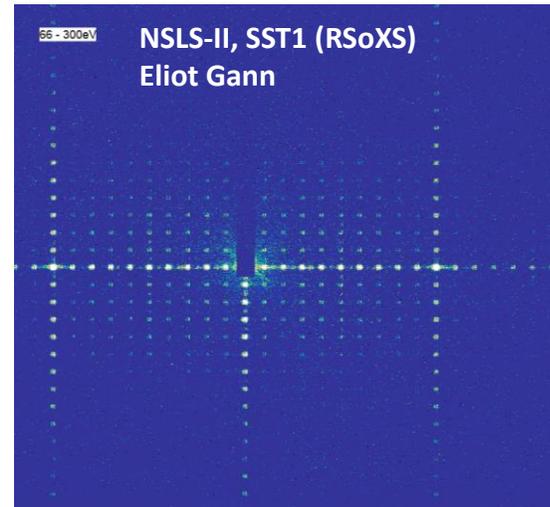
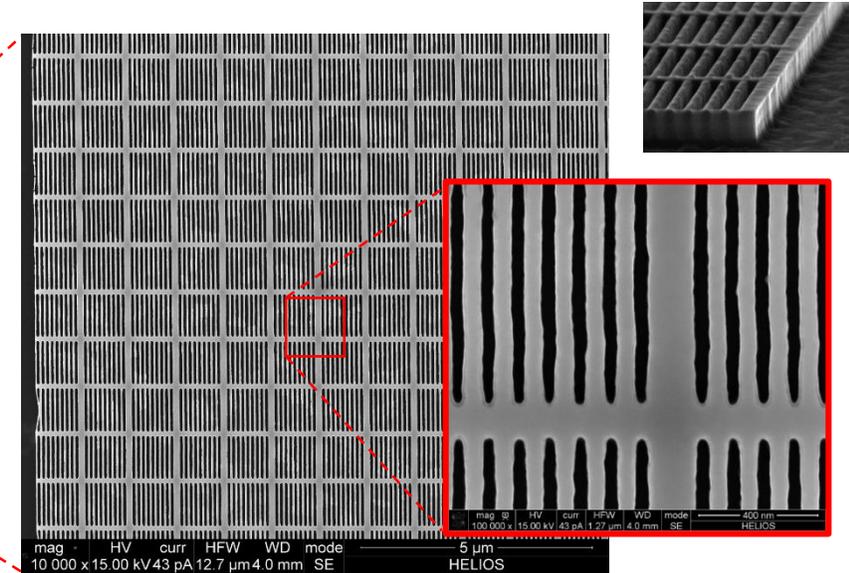
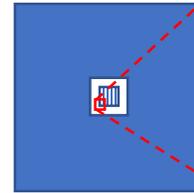
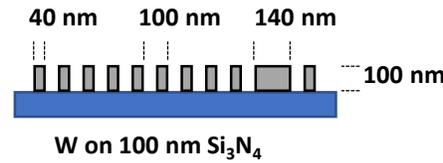
Round-robin with grating – potential 'Standard Reference Material'

- USAXS/USANS:

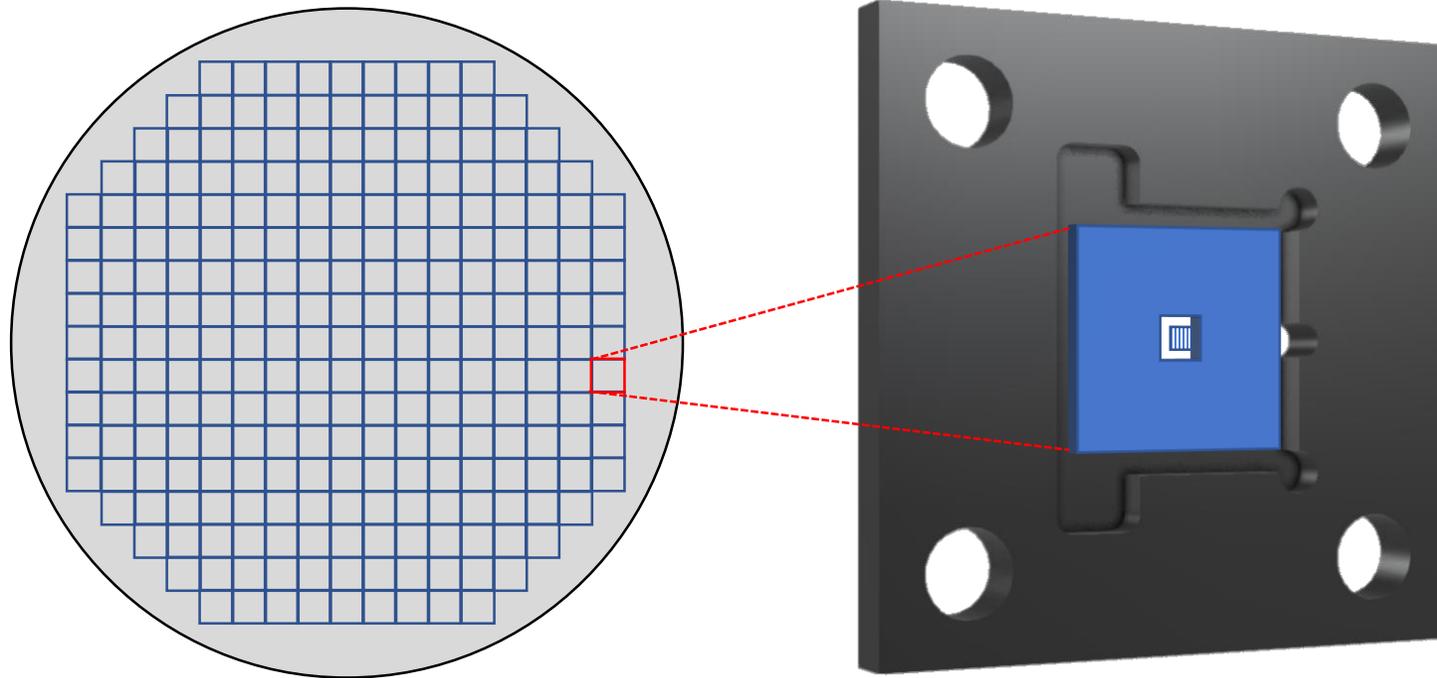
Discussion on samples for comparison – minerals? polymer composites? Issues with orientation, alignment, suitability for different instruments and techniques.

New SAXS Calibration Standard (SRM 3605)

- Developed new SAXS q-calibration standard
 - Structure optimized for energies from EUV to hard X-ray
 - Strong scattering (under 1 min on lab source)
 - Q-range from 0.0006 \AA^{-1} to 0.1 \AA^{-1}
 - Extensive pitch certification process with traceable SEM
 - Pitch goal $\sim 100.0 \pm 0.1 \text{ nm}$
- Mass produced at wafer scale
 - 145 artifacts/wafer

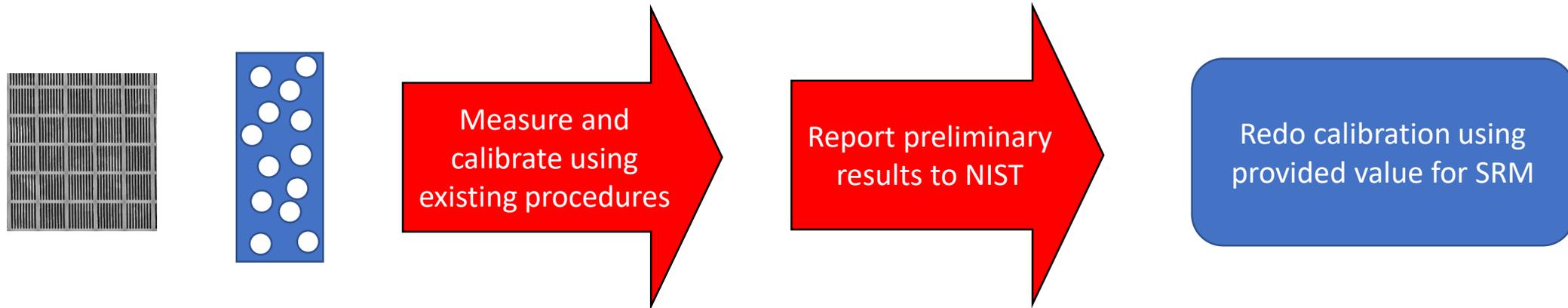


Reference Material Production and Mounting



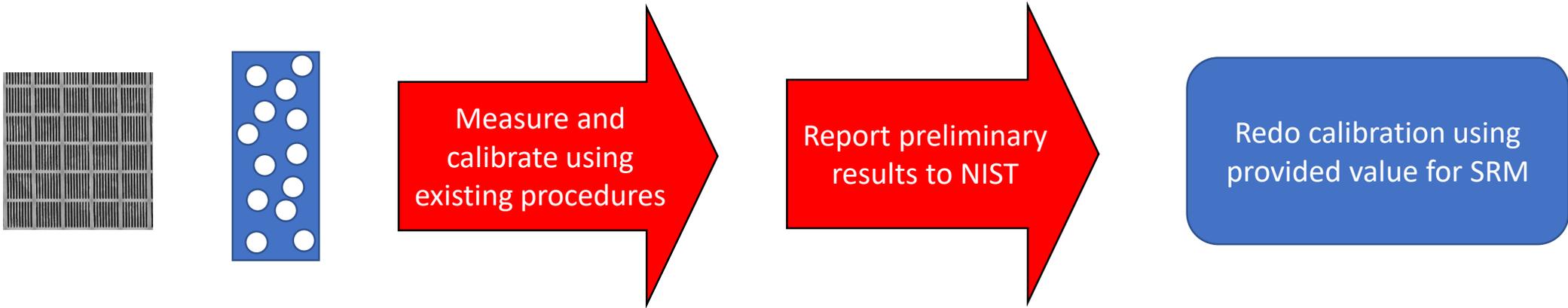
- Chips are mounted on 14 mm aluminum frame with 10 mm spaced m2 thru holes
 - Will also be available as bare 5 mm chip
- Production delays due to membrane stress and particle contamination
- Prototype chips available for round robin

Proposed Round Robin Study



- Conduct a blinded round robin study
- Participants will receive unlabeled SRM 3605 and an unknown, well-characterized test sample
- Participants will calibrate using their normal method and provide their calibrated results for the test sample and the estimated pitch for SRM 3605
- After receipt of initial data, we'll provide the certified calibration of the SRM 3605

Goals for Round Robin Study



- Provide measurement usage uncertainty from use of SRM 3605 in real conditions
- Results will fine tune the recommended procedures for usage of SRM 3605
- Anonymous evaluation of reproducibility and resolution across SAXS beamlines

- Test sample?
 - Nanoparticle, block copolymer, protein?
 - Needs to be stable and reproducible
- Several “identical” samples/reference standards in parallel
 - Would take too long to have a single sample travel between 10-15 facilities
 - Plan the sample travel based on beam availability
 - Samples would be well characterized and have some statistical oversampling

What else is wanted? What else is needed?
Who is willing to help?

Standards for resolution

Interaction with other working
groups

Further standards for intensity?

USAXS/USANS

Further standards for momentum
transfer?

Other?