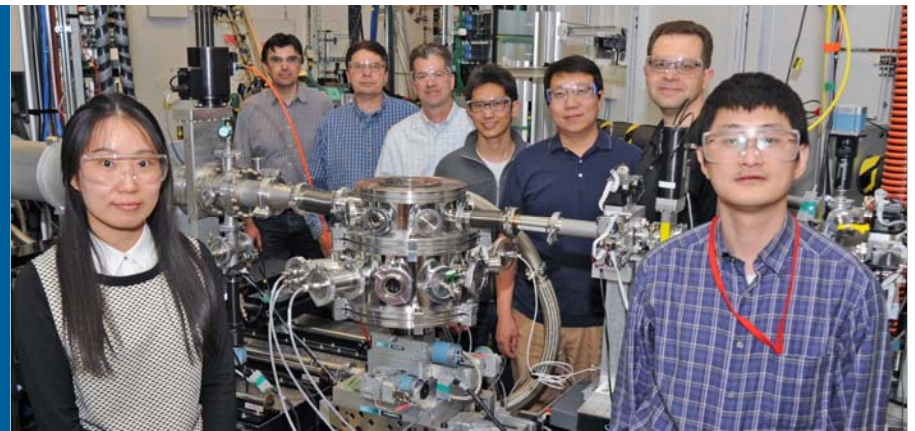


8-ID-E MULTI-SAMPLE GIXS VACUUM CHAMBER



JOE STRZALKA
XSD-Dynamics and Structure
strzalka@anl.gov
2-0283

ZHANG JIANG, JIN WANG
RAY ZIEGLER
XSD-DYS and XSD-TRR

MIKE FISHER
XSD-BI

WEI CHEN, PAUL NEALEY
ANL-MSD and CME

PUP 34174, 2013-2015

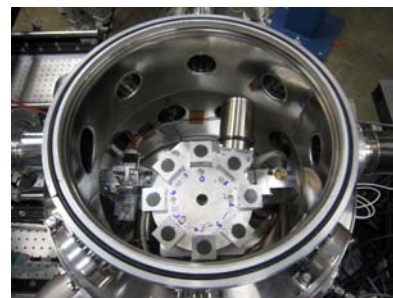
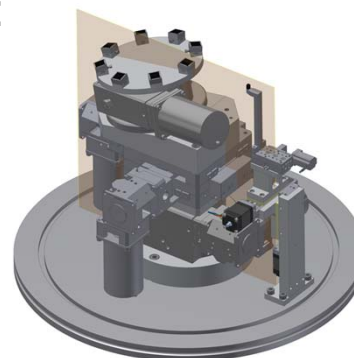
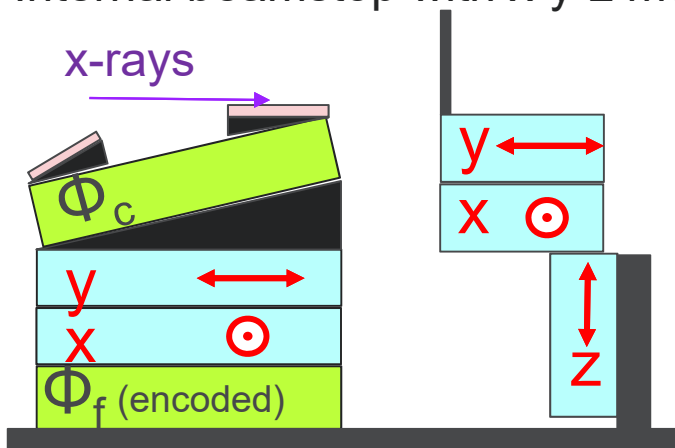


Argonne National Laboratory is a
U.S. Department of Energy laboratory
managed by UChicago Argonne, LLC.

MULTI-SAMPLE GIXS CHAMBER

Vacuum (10^{-3} torr) environment with azimuthal rotation for 8 samples

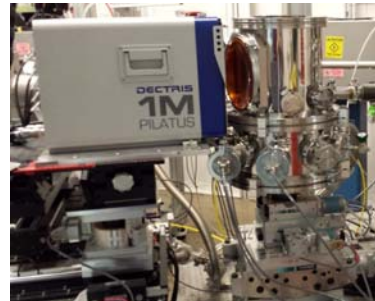
- Sample-selection rotation stage on wedge:
1 sample in beam
- Sample x-y motion and $> 90^\circ$ rotation
- Internal beamstop with x-y-z motion



MULTI-SAMPLE GIXS CHAMBER

Large, versatile vacuum environment(s) with top hat design

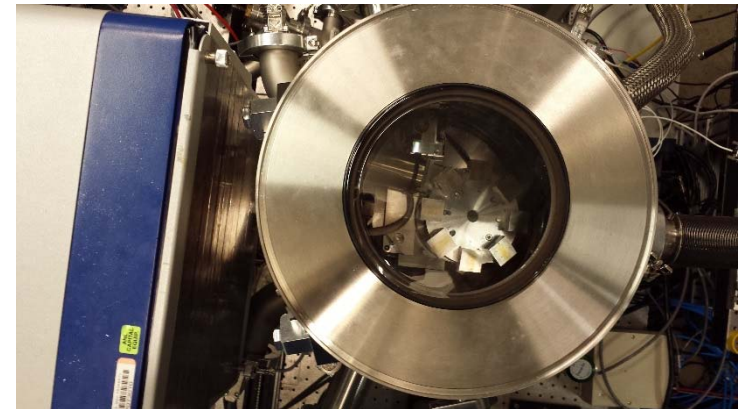
- Base chamber for all stages and feedthroughs
 - 12” flange base chamber, 10 x KF-50 flanges
- Top chambers for GISAXS/GIWAXS, more ports
 - 10” flange top chamber,
 - GISAXS: KF-50 exit, 7 x KF-40
 - GIWAXS: 8” flange exit, 6 x KF-40
- Can also operate with He, N₂
 - O₂ sensor (Qubit S101)
 - Pressure relief valve
 - (Accu Glass 113160)



MULTI-SAMPLE GIXS CHAMBER

Sample considerations

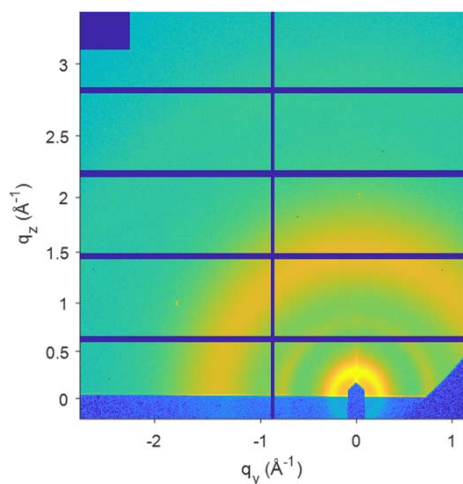
- Samples up to 24 mm x 24 mm
- Mounting samples with grease (Apiezon H/N)
- Glass viewport on lid/overhead webcam



MULTI-SAMPLE GIXS CHAMBER

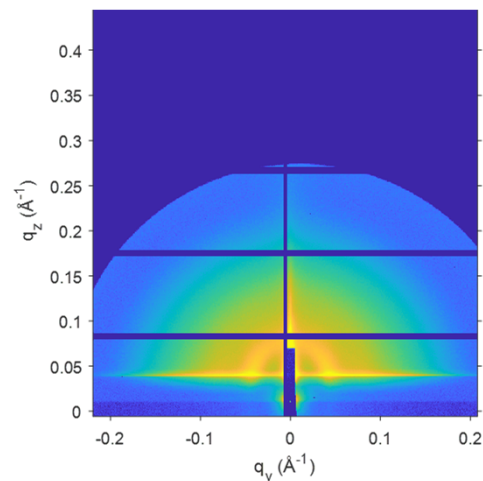
Accessible Q-ranges

■ GIWAXS



Sample-detector: 228 mm
 $3 \text{ \AA}^{-1} > q > 0.15 \text{ \AA}^{-1}$
 $2.1 \text{ \AA} < d < 42 \text{ \AA}$

■ GISAXS

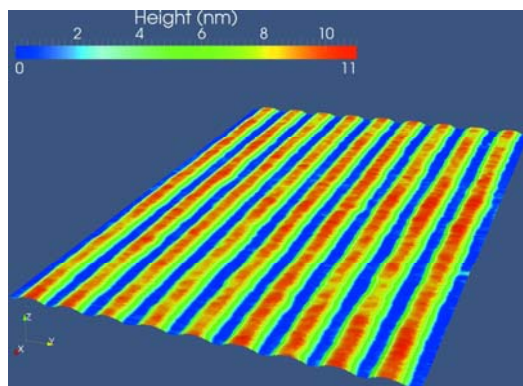


Sample-detector: 2185 mm
 $0.21 \text{ \AA}^{-1} > q > 0.005 \text{ \AA}^{-1}$
 $29.9 \text{ \AA} < d < 1260 \text{ \AA}$

MULTI-SAMPLE GIXS CHAMBER

Application: Nanolithography metrology

- Develop GISAXS as metrology tool for advanced nanolithographic technique: Directed self assembly



Suh, Chen, Rincon-Delgadillo, Jiang, Strzalka, Wang, Chen, Gronheid, de Pablo, Ferrier, Doxastakis, Nealey *J Appl Cryst* 49 823-834 (2016)

