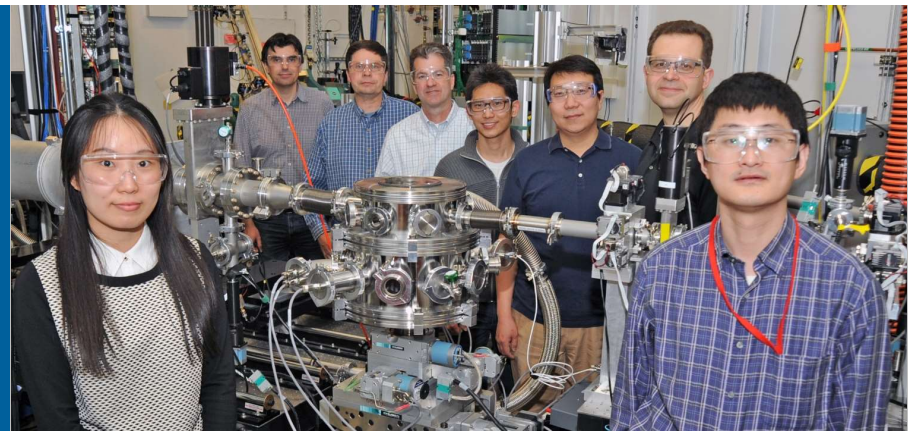


# 8-ID-E MULTI-SAMPLE GIXS VACUUM CHAMBER



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2-0283

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XSD-BI

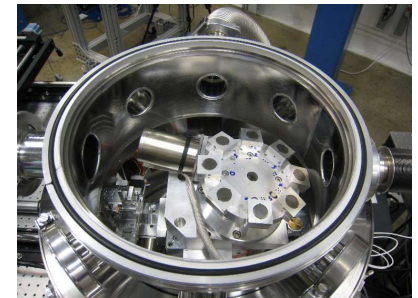
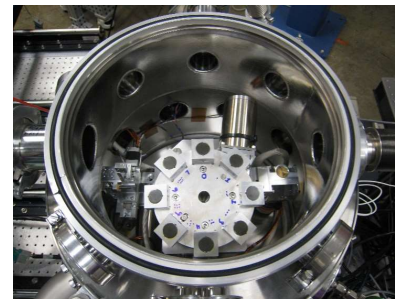
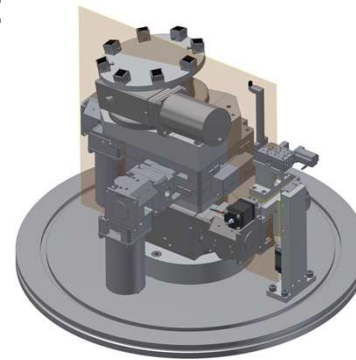
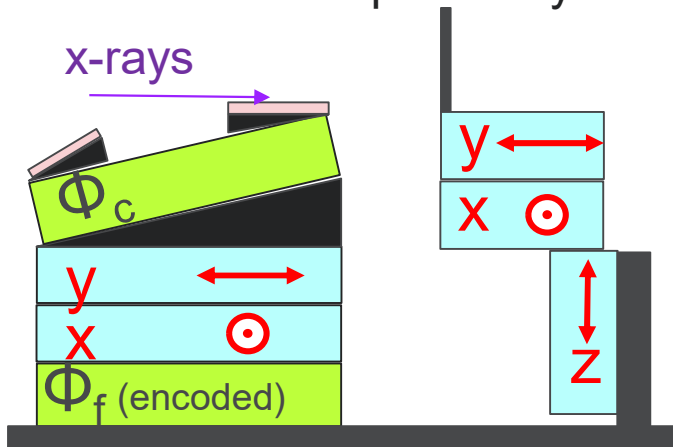
**WEI CHEN, PAUL NEALEY**  
ANL-MSD and CME

PUP 34174, 2013-2015

# MULTI-SAMPLE GIXS CHAMBER

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

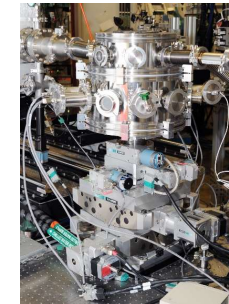
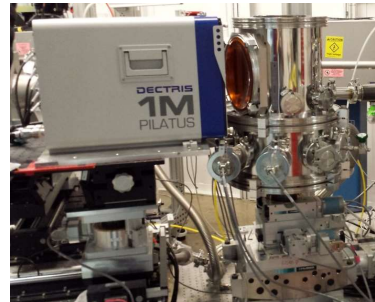
- Sample-selection rotation stage on wedge:  
1 sample in beam
- Sample x-y motion and  $> 90^\circ$  rotation
- Internal beamstop with x-y-z motion



# MULTI-SAMPLE GIXS CHAMBER

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

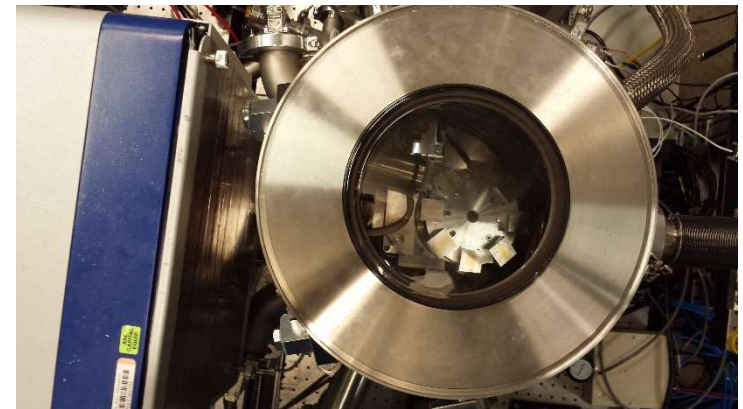
- Base chamber for all stages and feedthroughs
  - 12” flange base chamber, 10 x KF-50 flanges
- Top chambers for GISAXS/GIWAXS, more ports
  - 10” flange top chamber,
  - GISAXS: KF-50 exit, 7 x KF-40
  - GIWAXS: 8” flange exit, 6 x KF-40
- Can also operate with He, N<sub>2</sub>
  - O<sub>2</sub> sensor (Qubit S101)
  - Pressure relief valve
  - (Accu Glass 113160)



# MULTI-SAMPLE GIXS CHAMBER

## Sample considerations

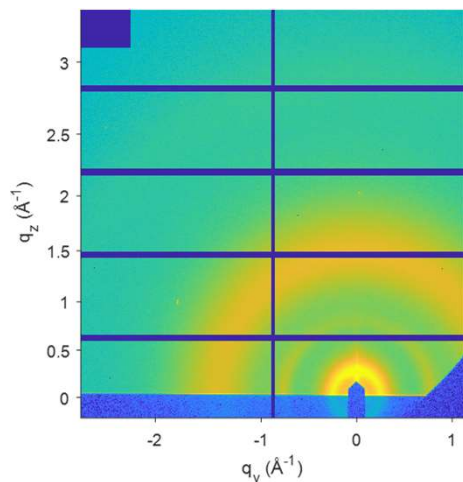
- Samples up to 24 mm x 24 mm
- Mounting samples with grease (Apiezon H/N)
- Glass viewport on lid/overhead webcam



# MULTI-SAMPLE GIXS CHAMBER

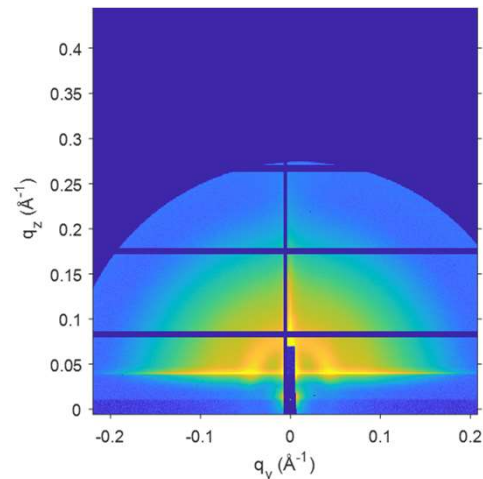
## Accessible Q-ranges

### ■ GIWAXS



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

### ■ GISAXS

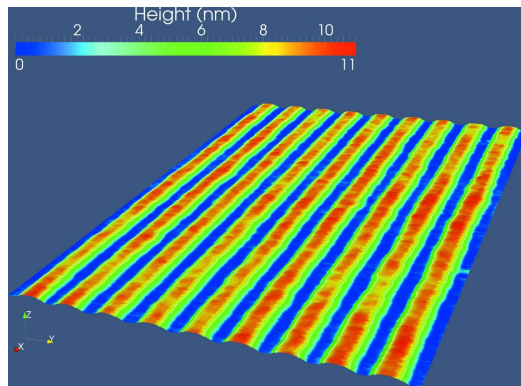


Sample-detector: 2185 mm  
 $0.21 \text{ \AA}^{-1} > q > 0.005 \text{ \AA}^{-1}$   
 $29.9 \text{ \AA} < d < 1260 \text{ \AA}$

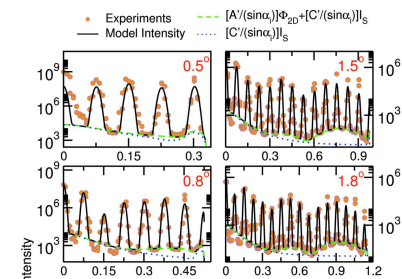
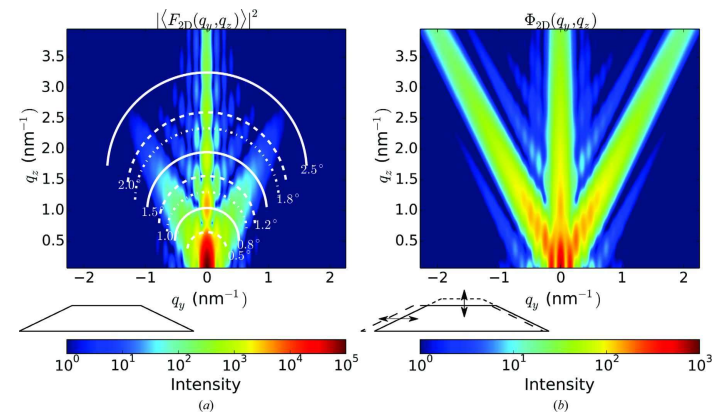
# MULTI-SAMPLE GIXS CHAMBER

## Application: Nanolithography metrology

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



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



# MULTI-SAMPLE GIXS DETAILS

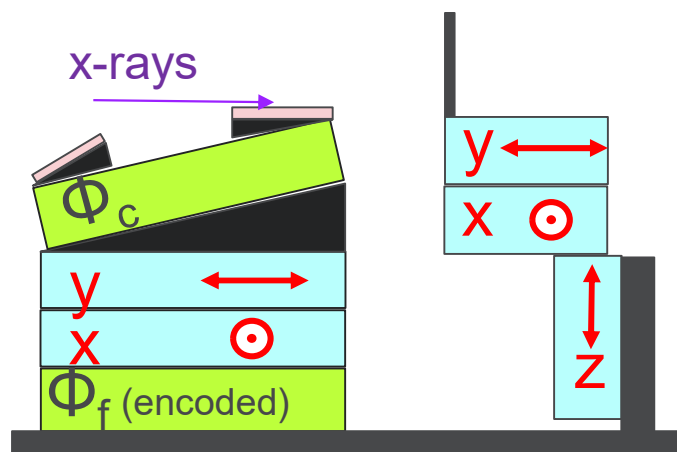
## Documentation for staff

Req. No. F3-239034

<https://anl.box.com/s/384kp1g2liz5a7z63xmoyi4rjnvamw0>

Most documentation here:

<https://anl.box.com/s/iywolkty0xnw5h16w6aiitgvilo9q4pj>



STAGE	ENCODER	MODEL	Motor	Driver	Reference
Vphif	Tonic TI0100A01A	Huber 408-XEW2.HV 2042.20-UHV (1-1:80 reducer) <a href="https://anl.box.com/s/9aeclqwar8dec00zi7az6vy5c6pnsba5">https://anl.box.com/s/9aeclqwar8dec00zi7az6vy5c6pnsba5</a>	PHYTRON VSS43.200-2.5-HV 200/400 steps/rev, bipolar	SINCO S	<a href="https://anl.box.com/s/384kp1g2liz5a7z63xmoyi4rjnvamw0">https://anl.box.com/s/384kp1g2liz5a7z63xmoyi4rjnvamw0</a>
vsamx/vsamy	N/A	Huber 5102.10 (1=1:20 reducer)	M.PH42.200.HV-30 Stepper motor Phytron VSS43.200-2.5-HV	SINCO S	Same as vphic
Vphic	N/A	Huber 408-X3W2.HV (no reducer) <a href="https://anl.box.com/s/9aeclqwar8dec00zi7az6vy5c6pnsba5">https://anl.box.com/s/9aeclqwar8dec00zi7az6vy5c6pnsba5</a>		SINCO S	
Bstopz	N/A	Micronix VT-12010 Same as (non UHV) Micos VT-21L	Integrated stepper, no encoder, hall-limit switches, 26 mm travel	SINCOS or SPD6B setting 0 (0.5A), half step	<a href="https://micronixusa.com/product/LvbanQ/linear-motion/translation-stage-vt-21/">https://micronixusa.com/product/LvbanQ/linear-motion/translation-stage-vt-21/</a>
bstopx	N/A	Micronix VT-12010		See next slide	Same as bstopz
bstopy	N/A	Micronix PPS-20-23016 (PPS-20-SM002)	Integrated stepper, no encoder, hall-limit switches, 26 mm travel	Micronix MMC-200-01110	<a href="https://anl.box.com/s/fdp378uig2e56vhlq4bbevlr1w1civb">https://anl.box.com/s/fdp378uig2e56vhlq4bbevlr1w1civb</a>

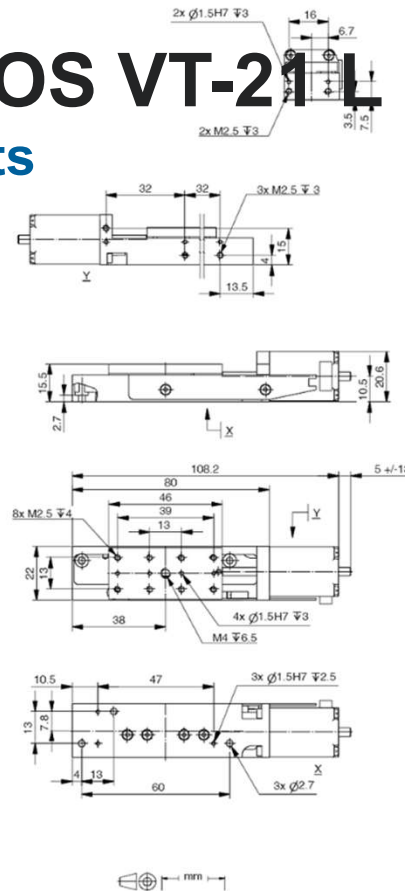
# BSTOPX,Z: MICOS VT-21L

## 26 mm travel, hall limits

See slide 2 of

<https://anl.box.com/s/ewngwsczt9d5h1s09a1abb90au486dol>

Micos VT-21Lstage



SPD6B  
Current:  
0 (0.5 A)  
Step:  
Half step

Total travel:  
26 mm

motorx\_setup.adl (8idg:w20) OMS VME58

Limits	High	Low
USED	24.500000	13.470000
NTR	3.500000	22.470000

Dynamics	Normal	Backlash	Calibration
Max. Speed (Rev/s)	0.000000		
Speed (Rev/s)	1.000000	1.000000	Cal Use Set
Base speed (Rev/s)	0.100000		OFF -18.970000
Accel time (s)	0.200000	0.200000	Frozen
Backlash dist. (mm)		-0.050000	Dir Pos Neg
Move fraction		1.000000	
Home Speed (mm/s)		3.000000	

Resolution, Readback		
Units:	mm	
Motor:	200	Steps/Rev. Readback delay (s)
Encoder:	0.250000	mm/Rev. 0.000000
Readback:	0.002500	mm/Step Use: No Yes
	0.000000	mm/Unit Use: No Yes
RBV inLink:		

Retry	Info.
Deadband 0.010000	Code version 6.42
Max. retries 10	VME card# 2
	Precision 5
	NTH NO YES
	NTH Factor 2

More V1.9