

Layered EPICS User Gap Control Interface for NSLS Mini-gap Undulators

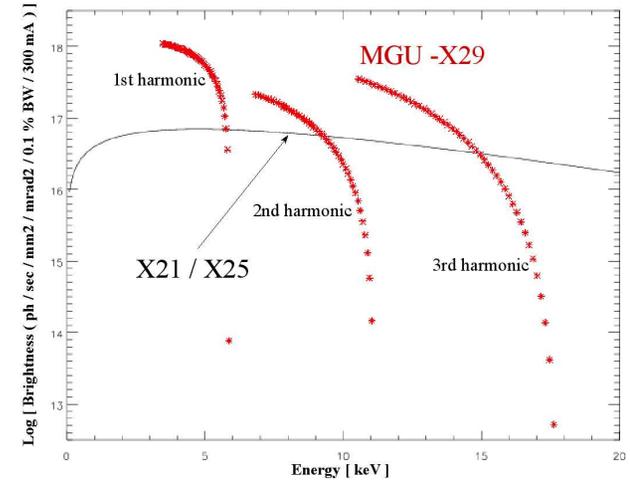
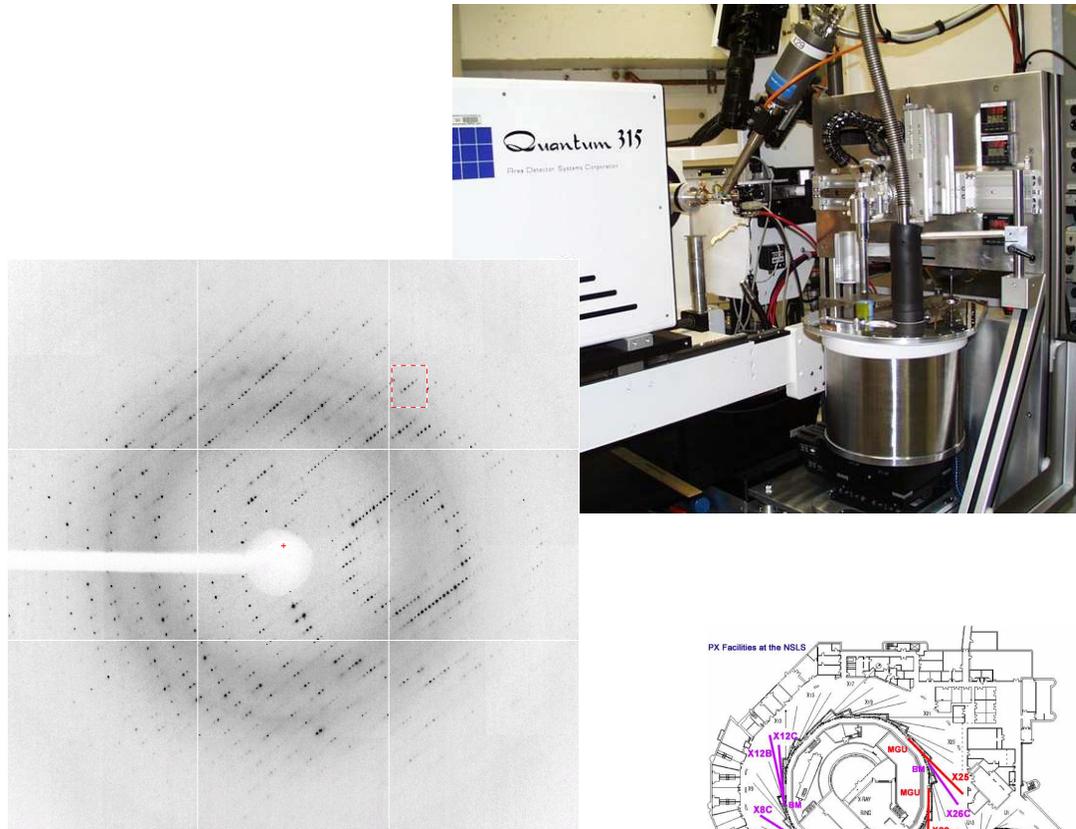
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EPICS Collaboration Meeting
June 12 -16, 2006



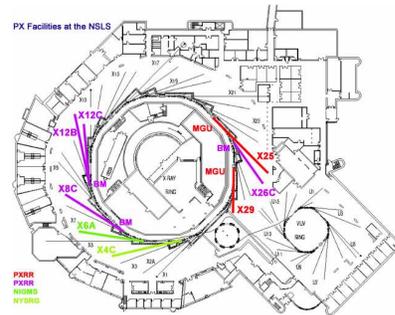
Undulators provide brilliant beams for PX at the NSLS



The brilliant undulator beams are essential for efficient macromolecular structure determination using small crystals with large unit cells.

The PXRR method:

- Screen on BM facility
- Collect on ID facility

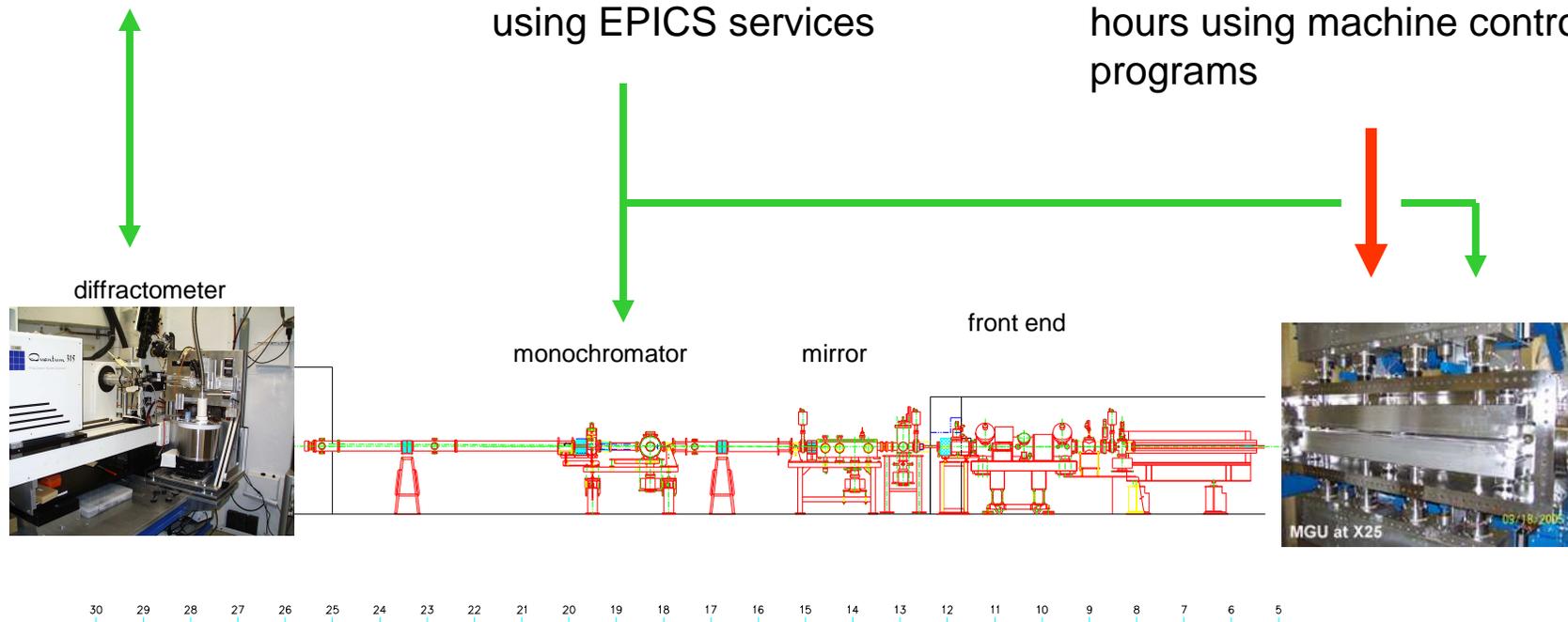


The Undulator Control Challenge

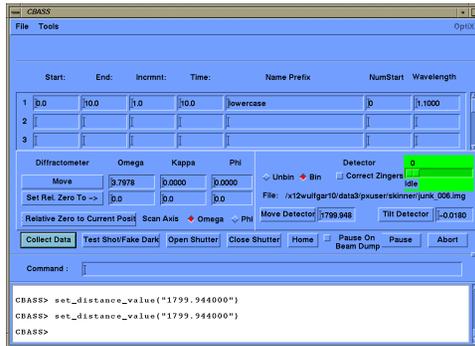
User application
programs control
diffractometer and
detector every few s

User selects wavelength by
setting monochromator and
gap about every 15 minutes
using EPICS services

Synchrotron operator
requisitions undulator control
for ring fills about every 12
hours using machine control
programs

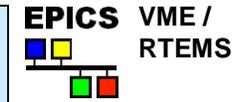


Layered MGU Controls



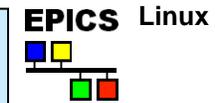
PXRR EPICS Beamline-IOC

Executes wavelength change requests from CBASS
 Determines MGU harmonic and gap target



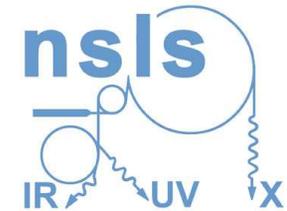
PXRR EPICS MGU-IOC

Downloads gap target whenever possible
 Continuously receives MGU status and gap setting



NSLS MGU Micro

Carries out gap requests from MGU-IOC
 as well as overriding NSLS gap commands

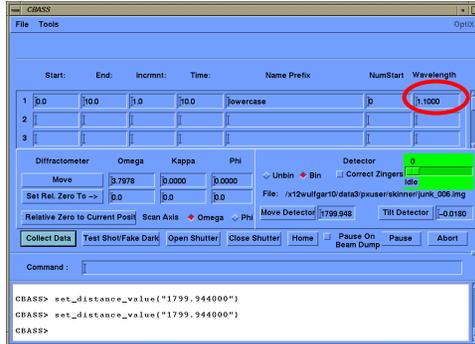


↕
MGU

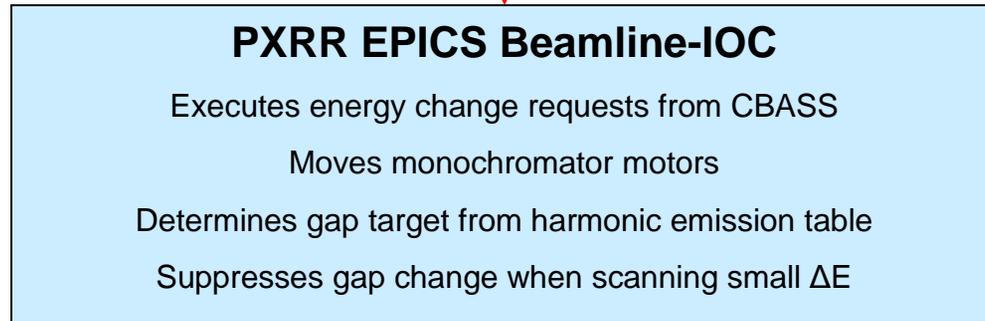


MGU Control: Application and User Layer

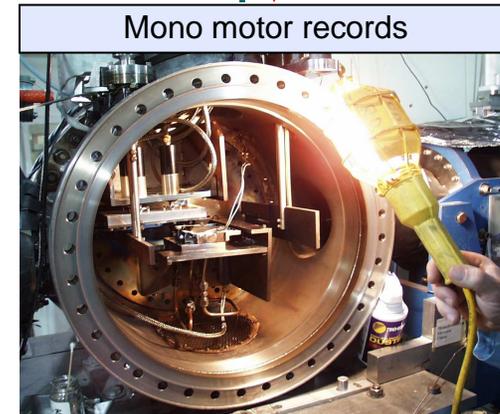
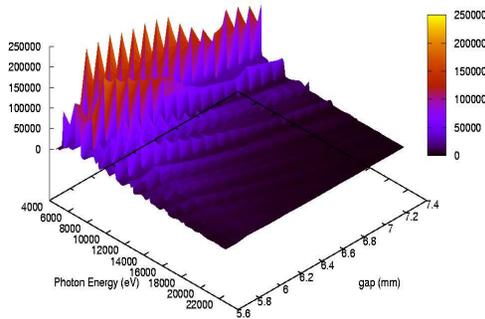
CBASS Application Program



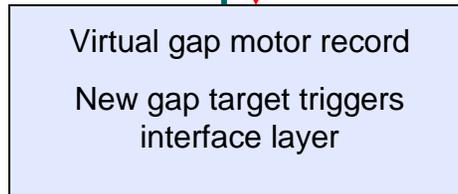
Single Process Variable Request: E or λ



MGU Harmonic Emission

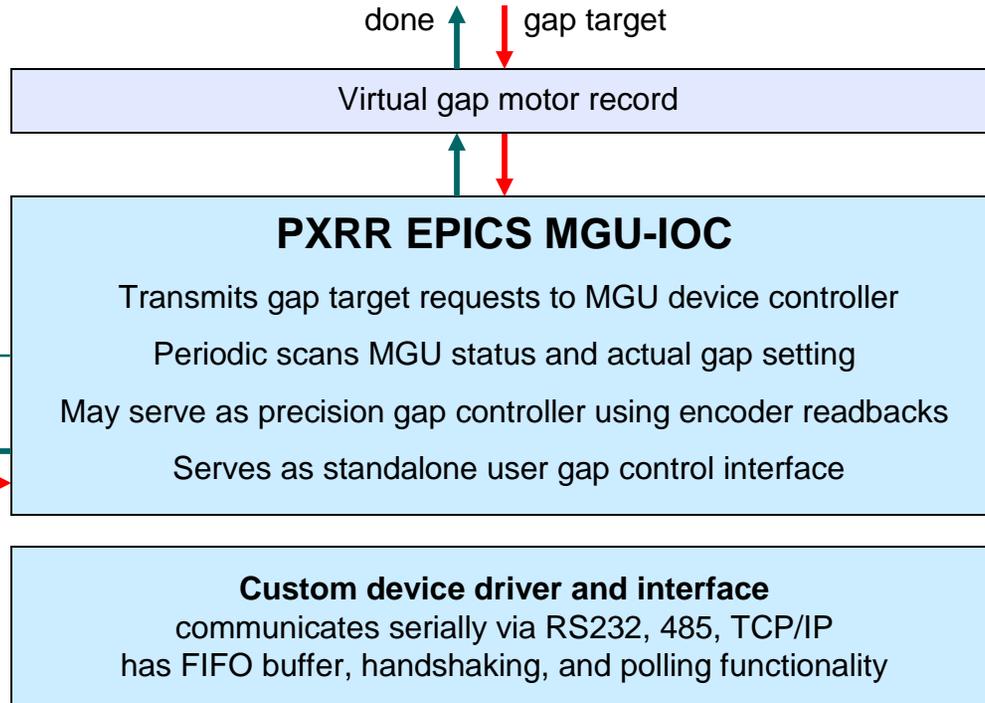


New E



MGU Control: Interface Layer

MGU Status Info for User



- Incoming information:**
- Control room user enable flag
 - Gap drive status
 - Current gap drive setting
 - Stored gap set point for user ops
 - Average of 4 gap encoder readings
 - Optical gap readings at MGU ends
 - MGU device driver error status
 - Actuator post heater status

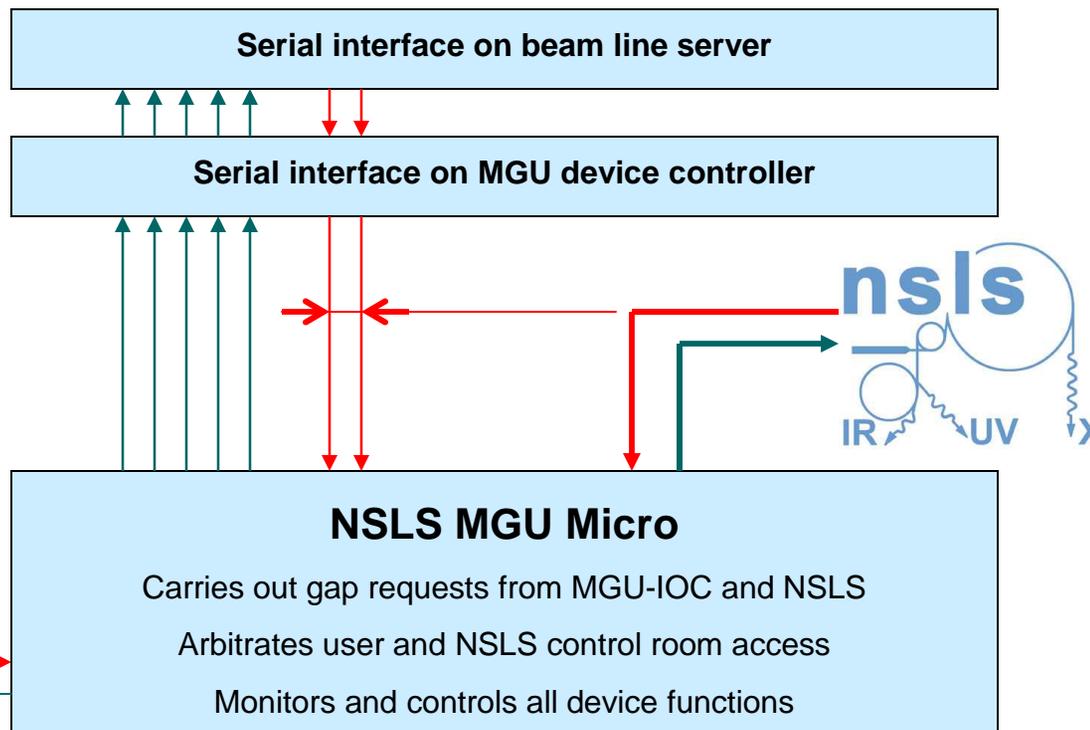
- Outgoing commands:**
- Gap target request
 - Request for status info

MGU Control: Device Layer

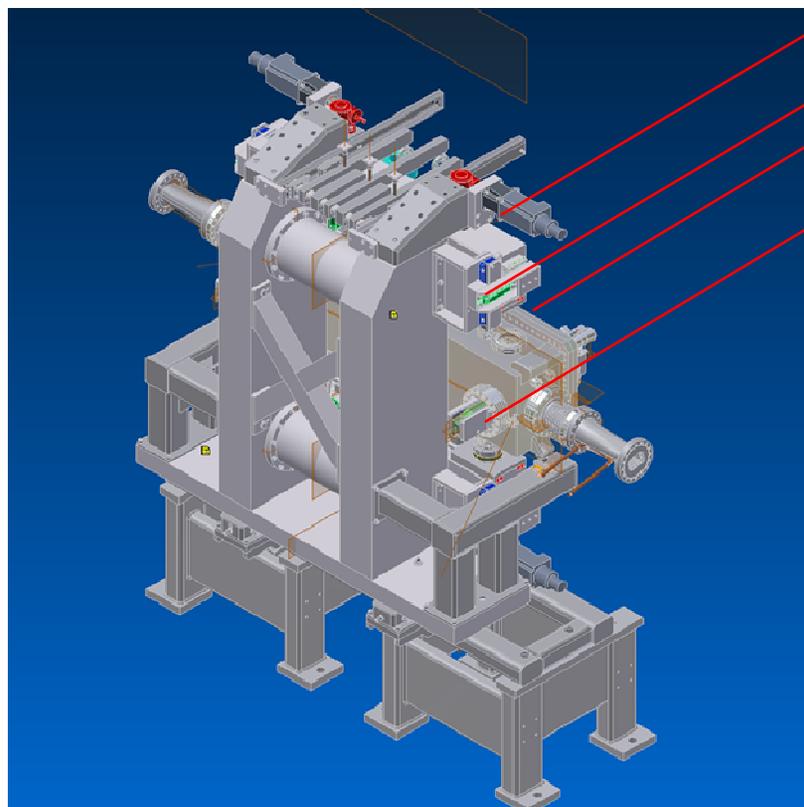
NSLS MGU Micro Setup



Standalone MGU controller



Gap Measurement on the X25 MGU



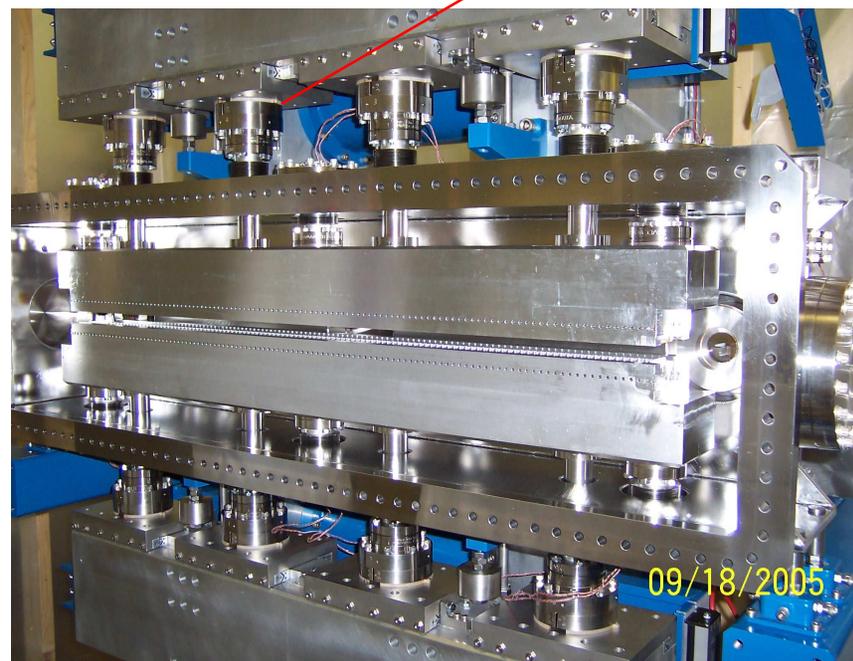
Stepper Motor Drive (4x)

Linear Resistive Encoder (4x)

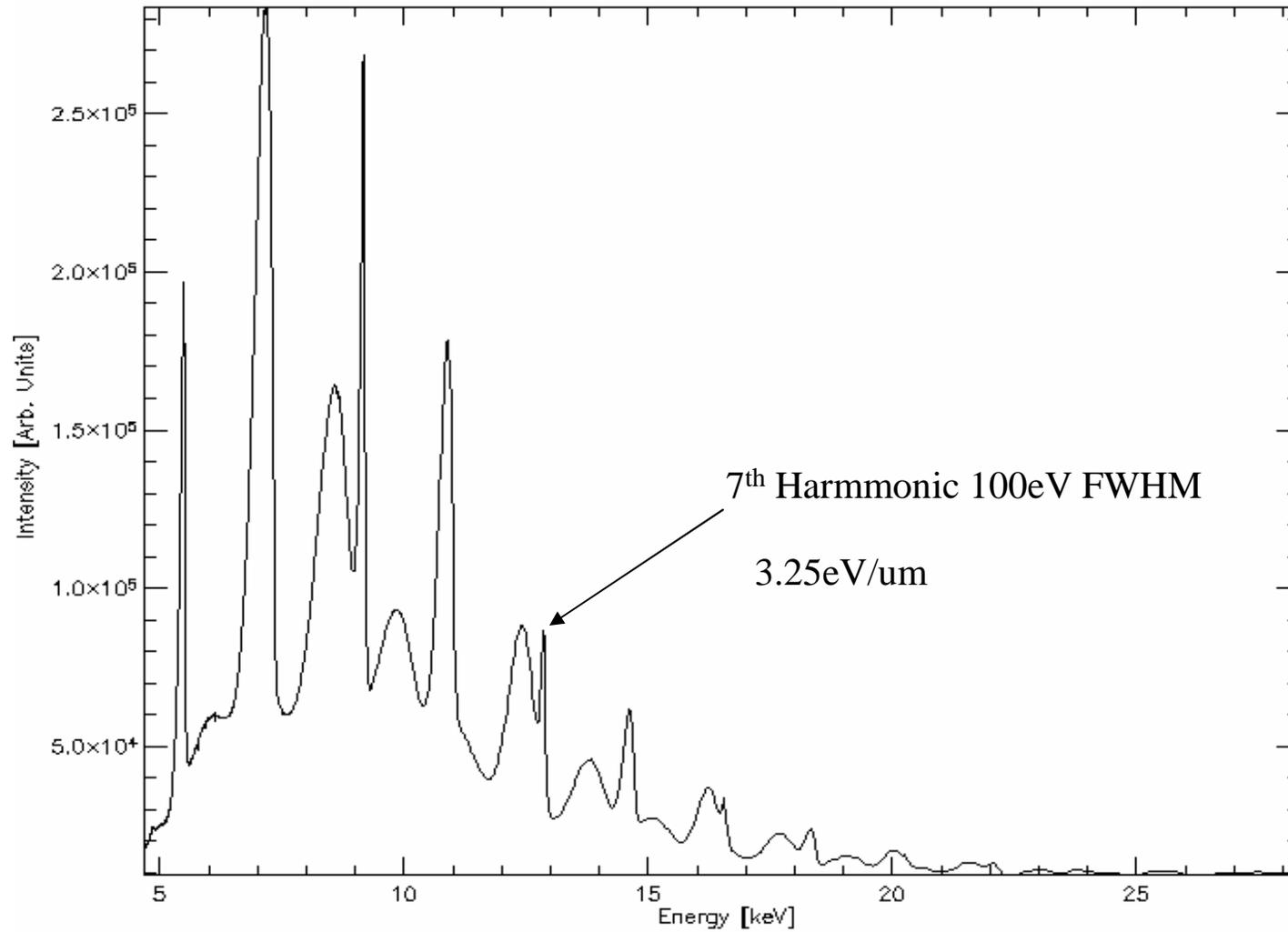
Limit Switches

Optical Micrometer (2x; 2 μ m)

Post Heaters (8x)



Need For Gap Stability at Submicron level



Summary: Layers are safe and robust control method

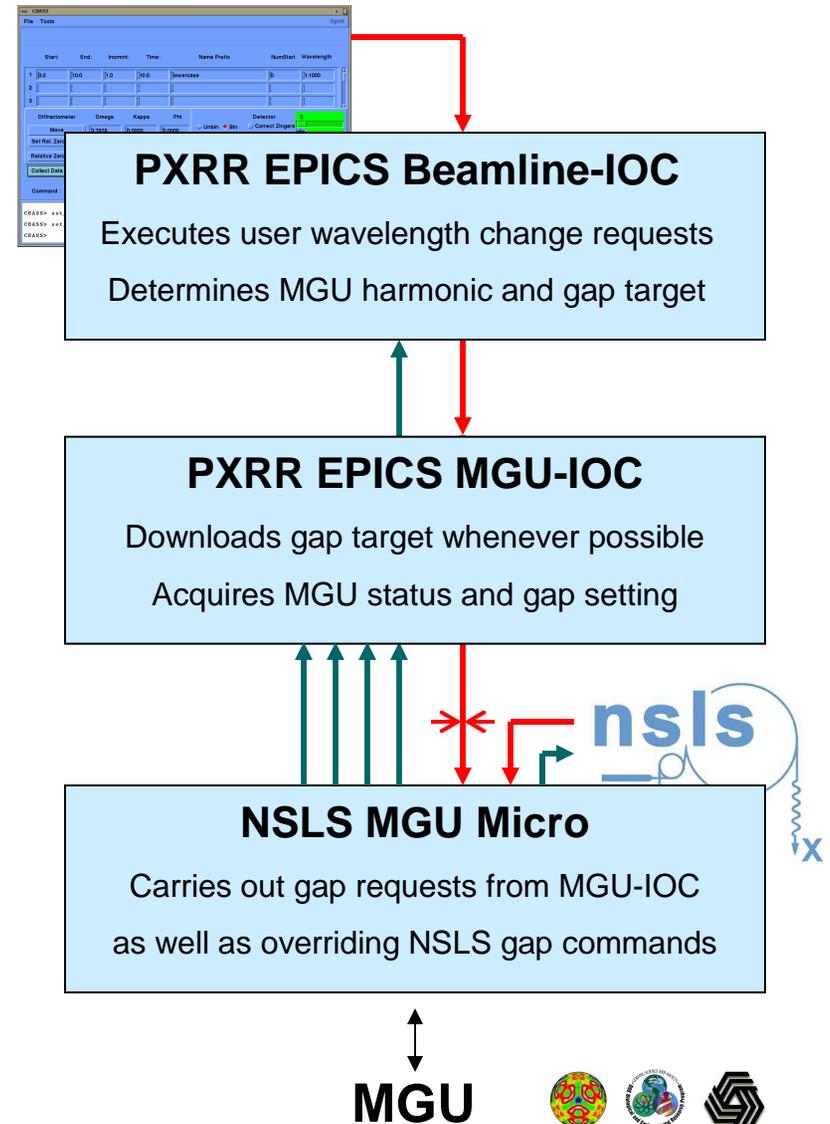
A safe and robust method to perform frequent MGU control in an open user environment

Ready for remote user operation

Simple way to extract essential control functions from full device control set

Efficient method to bridge EPICS – custom device control interface

Expandable to precision gap control based on true gap readings -cryo ops



Acknowledgements:

Lonny Berman

Susila Ramamoorthy

John Skinner

