

Optics and detectors for soft x-rays at NSLS and NSLS-II

• Soft x-ray beamlines : using Elliptically Polarizing Undulator (EPU) as a source

- fast switching circularly polarization Flux : 10^{13} ph/s
- 0.2 keV – 2 keV energy range
- phase sensitive detection

Demand for experiments: **simultaneous detection:** photon yield and electron yield;
overcome detectors' geometric limitations

Demand for Detectors:

General statement: all of the properties/requirements/requests of hard x-ray detectors, but **vacuum compatible with "flexible cooling" to reduce the noise level**

- multiple element/pixels arrays for detection (to increase the signal level or to cover a certain angular range); photon counting
- Fluorescence: greater need for soft x-rays because of the small signal; collecting mirror needed
- 2D vacuum compatible area detectors, pixel size $\sim 20\mu\text{m} \times 20\mu\text{m}$ – FAST READ OUT
- With 10^{13} ph/s on sample, point detectors with large/wide dynamic range are req'd

Optics and detectors for soft x-rays at NSLS and NSLS-II

- Demand for Optics : figure of error and roughness has to be improved in mirrors gratings and polarizers
- Refocusing optics (zone plates, and bendable mirrors)
- Distortion free mirror cooling
- High density gratings for high energy resolution,
- High efficiency monochromator optics (gratings/xtals) for 2000 to 4000 eV
- Polarimeters = polarization analyzers soft x-rays and “tender” x-rays (200- 4000 eV)
- Quarter wave plates (2000 to 4000 eV)