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XSD/Detectors Group Strategy and FY2019 Goals

Strategy

The mission of the XSD Detectors Group is to deliver cutting-edge detectors to APS beamlines. Our mission is accomplished in two ways. First, we introduce new, cutting-edge commercial detectors to the APS community via the Detector Pool. We accelerate and facilitate early access to new detectors that come on the market. We also provide technical detector advisory services in a variety of ways (e.g., market research, design reviews, etc.) to assist beamlines with detector purchases and best detector practices. Second, we develop new, cutting-edge detectors which are unlikely to be commercially available. The group is engaged in a number of detector R&D projects to meet the future needs of the APS. These projects were chosen to align with the major scientific thrusts of the APS, take advantage of the source, leverage strategic partnerships with US domestic detector groups and leverage unique Argonne facilities. We focus our detector R&D efforts in three areas: pixel array detectors, high-energy sensors, and emission detection. Our approach to the next generation of pixel array detectors is to contribute our DAQ electronics and system-level expertise to external detector groups. Currently, this includes the VIPIC detector for ultra-fast XPCS with BNL and FNAL and the MM-PAD detector with Cornell. For high-energy sensors, we are collaborating closely with the NSLS-2 detector group on the Germanium strip detector for high-energy spectroscopic applications. Finally, for emission detection, we are collaborating closely with NIST on transition edge sensors for high energy-resolution emission detection applications. At the APS, we are focused on developing application-specific TES sensors for hard X-ray applications. In particular, we are modelling, designing, fabricating and testing TES sensors optimized for XES, XRF, XAFS and Compton scattering experiments.

Five-year Goals

- Expand selection of integrating pixel array detector in the Detector Pool.
- Deploy 1 Megapixel VIPIC.
- Deploy a hard X-ray TES spectrometer.
- Identify new generation detector projects and collaborations aligned with the major scientific thrusts of the APS.

Detector Pool Goals – FY2019

- Deploy Lambda and Jungfrau detectors.
- Support detector/equipment loans from outside vendors.

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Detector R&D Goals – FY2019

- Germanium Strip Detector
  - Build the second high-energy GSD-192 system.
  - Complete EPICS areaDetector software driver.
- Superconducting Detectors
  - Deploy 128-pixel TES array to 1-BM (LDRD-funded) (Q3 FY2019).
  - Design, fabricate and test new TES pixels for XRF, XES and XAFS applications.
- VIPIC
  - Assist with VIPIC pilot run chip testing at FNAL.
  - Complete 2-chip DAQ electronics to test digital-tier of the VIPIC pilot run chips.
- MM-PAD
  - Assist with the testing of the small-scale ASIC submission with Cornell.
  - Begin development of the full-scale DAQ.