S1.05 Detector Technologies for UV, X-Ray, Gamma-Ray and Cosmic-Ray Instruments

Lead Center: GSFC

Participating Center(s): MSFC

This subtopic covers detector requirements for a broad range of wavelengths from UV through to gamma ray. As would be expected requirements across the board are for greater numbers of readout pixels, lower power, faster readout rates, greater quantum efficiency, and enhanced energy resolution. Typical semiconductor devices in this energy range are based on silicon or germanium. However, proposals for other detector materials are welcomed if a compelling case is made.

Proposals are specifically solicited for improvements in microchannel plate technology for UV focal plane use; for CCD and active pixel sensor development, both for UV and x-ray use; for technologies leading to very-large-area x-ray detectors for survey instruments; and for electronic systems capable of meeting the needs of Mega-to-Giga-channel detectors. The latter can include not just device development but also, for example, novel interconnect schemes enabling efficient packaging to aid in thermal control and to reduce system noise.

The proposed efforts must be directly linked to a requirement for a NASA mission. These include Explorers, Discovery, Origins, Beyond Einstein and Vision Missions. Details of these can be found at the following URL: http://science.hq.nasa.gov/missions/index.html.

Specific technologies are listed below. Highly desirable are developments that satisfy multiple requested parameters:

- Large-format focal plane detectors for use in UV and X-ray imaging and spectrometry:
- Microchannel-plate UV detectors: up to 109 readout channels; quantum efficiency up to 50%;

- UV-sensitive CCD and active pixel sensors with large formats: to 6k x 6k abuttable; extended UV response below 0.2 nm;

- X-ray-sensitive CCD and active pixel sensors: up to 4k x 4k formats, 4-side abuttable; power levels of 0.1 W / Megapixel; resolutions less than 120 eV; readout rates of at least 30 Hz; extended x-ray response above 6 keV.

- Very-large-area X-ray detectors for survey instruments: square-meter area capability; response from 3-30 keV; ultra-low power (10 microW/channel).

- Significant improvements in wide band gap materials, individual detectors, and detector arrays for UV and EUV applications. Specific examples include AlGaN and SiC based detector arrays and associated readout systems.

- Mega-to-Giga-Channel analogue electronic systems for very-large-area X- and gamma-ray detectors as follows: up to 108 channel capability; less than 10 microW/channel power requirement; less than 100 electron rms noise level with interconnects.