

PCOS Program Technology Capability Gap Input Form

<u>Technology Capability Gap Name:</u> Fast, low-noise, megapixel X-ray imaging arrays with moderate spectral resolution		<u>Date Submitted:</u> 6/30/2016	
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PATR Prioritization Information (instructions on next page)			
<p><u>Brief Description of the Technology Capability Needed (100 – 150 words):</u> Strategic X-ray missions such as X-ray Surveyor require X-ray imaging arrays covering wide fields of view with excellent spatial resolution, i.e., megapixel or higher, and moderate spectral resolution.</p> <p>Much of the science for X-ray Surveyor emphasizes soft X-ray band, so detector arrays (including optical blocking filters) should have high efficiency and good spectral resolution down to E~0.2 keV.</p> <p>Fast readout time is needed to minimize event pileup and dead time, and radiation hardness must be sufficient to survive likely mission duration and environment.</p>			
<u>Assessment of the Current State-of-the-Art (SOTA) (100 – 150 words):</u> Silicon active pixel sensors (APS) currently satisfy some of the requirements, but further work is needed to meet all requirements simultaneously. APS with 36 µm pixels are at TRL 6, but noise levels are still too high, and sensitivity to soft X rays needs to improve. Sparsified readout, limited to pixels with signals, allows fast frame rates and is at TRL 3.		<u>Current TRL of SOTA:</u>	
		<u>Current TRL of Full Solution:</u>	
<p><u>Target Goals and Objectives to Fill the Capability Gap:</u></p> <ul style="list-style-type: none"> X-ray surveyor requires large format X-ray detectors with sufficient spatial resolution so as not to compromise the imaging performance of the X-ray Surveyor optics (notionally with 0.5" half power diameter). Multi-chip abutability to build detector surface approximating the best focal surface for the mirrors. Fano-limited spectral resolution in the 0.2-10 keV energy band Frame rates >100 frames/s; Optical blocking filters with minimal X-ray absorption above 0.2 keV Radiation hardness should be sufficient to support > 5 years of science operations at the Chandra-like or L2 orbit. 			
<p><u>Scientific, Engineering, and/or Programmatic Benefits (100 – 150 words):</u> Enables X-ray imaging of wide fields with high spatial resolution and sufficient spectral resolution to meet science goals of strategic X-ray missions.</p>			

<u>Applications and Potential Relevant Missions for PCOS, COR, and ExEP:</u> X-ray Surveyor.	
<u>Time to Anticipated Need (time to anticipated or estimated launch date for enabled/enhanced missions):</u> 2020 US Decadal Survey	
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