2015 Hardware Images

PCOS and COR Strategic Technology Portfolio

For more information about these technologies visit our Technology Database (http://www.astrostrategictech.us)
Technology Development Module (TDM) containing three pairs of parabolic-hyperbolic X-ray mirror segments

**Significance:** World-class thin grazing-angle X-ray mirror technology; baselined for Lynx X-ray flagship mission concept

**Project Title:** High-Resolution and Light-weight X-ray Optics for the X-ray Surveyor

**PI:** Zhang, William (GSFC)
Large area (31x31 mm$^2$) gratings with two levels of support

**Detail of hierarchical support levels of X-ray Critical-Angle Transmission (CAT) gratings**

**Significance:** Highest-resolution X-ray grating technology; baselined for Lynx X-ray flagship mission concept

**Project Title:** Development of a CAT Grating Spectrometer

**PI:** Mark Schattenburg (MIT Kavli Institute for Astrophysics and Space Research)
Antenna-coupled Transition-Edge-Sensor (TES) Bolometers for Cosmic Microwave Background (CMB) Polarimetry; lithographed ‘Polarimeter on a Chip’ Enables Large Arrays

**Significance:** Developing antenna designs providing sensitivity, stability, and minimized particle susceptibility for bands required by the Inflation Probe, enabling identification of Inflation instants after the Big Bang

**Project Title:** Planar Antenna-Coupled Superconducting Detectors for CMB Polarimetry

**PI:** James Bock (JPL/Caltech)
Photo and Scanning Electron Microscope (SEM) image of two types of absorbers for hybrid Transition-Edge-Sensor (TES) arrays fabricated on single Si substrate

**Significance:** TES microcalorimeters offer energy resolution for the European ATHENA X-ray mission’s Integral Field Unit (X-IFU)

**Project Title:** Providing enabling and enhancing technologies for a demonstration model of the ATHENA X-IFU

**PI:** Caroline Kilbourne (GSFC)
Test mirror with piezo cells and integrated electronics

Significance: Adjustable X-ray optics are a backup technology for the Lynx large mission concept

Project Title: Development of 0.5-Arc-second Adjustable Grazing-Incidence X-ray Mirrors for the SMART-X Mission Concept

PI: Paul Reid (SAO)
Radiation test setup for Digital Micro-mirror Device (DMD)

**Significance**: Replacing windows of commercially available DMDs may enable far-UV multi-object spectrometry in future missions

**Project Title**: Development of DMDs for Far-UV Applications

**PI**: Zoran Ninkov (RIT)
Harris “deep-core” mirror successfully demonstrating 5-layer ‘stack & fuse’ technique

**Significance:** Deep-core manufacturing enables 4-m-class mirrors such as planned for the HabEx exoplanet observatory concept with significantly lower cost and risk

**Project Title:** Advanced Mirror Technology Development (AMTD) for Very Large Space Telescopes

**PI:** H. Philip Stahl (MSFC)
Multi-layer anti-reflection coatings for the FIREBall balloon payload’s Electron-Multiplied CCD (EMCCD) detectors; images show wafers before (left) and after (right) Atomic-Layer-Deposition (ALD) coating

**Significance:** Advanced coatings enable high-performance detectors

**Project Title:** Advanced FUV/UV/Visible Photon-Counting and Ultralow-Noise Detectors

**PI:** Shouleh Nikzad (JPL/Caltech)
96-mm cross-strip laboratory detector and readout electronics

**Significance:** Large-format low-noise detectors may enable future far-UV missions

**Project Title:** Development of 100×100 mm² photon-counting UV detectors

**PI:** John Vallerga (UC Berkeley)
50/220-GHz planar orthomode transducer (OMT) focal plane with feedhorns machined directly into Si-Al package for performing Cosmic Microwave Background (CMB) measurements

Significance: CMB measurements may enable identification of the “Inflation” cosmologists believe may have occurred instants after the Big Bang

Project Title: High Efficiency Feedhorn-Coupled TES-based Detectors for CMB Polarization

PI: Edward Wollack (GSFC)
Primary mirror for prototype Laser Interferometer Space Antenna (LISA) telescope

Significance: The LISA gravitational-wave (GW) observatory crucially depends on collecting laser light from a remote spacecraft, millions of km away

Project Title: Telescope for a Space-based GW Mission

PI: Jeffrey Livas (GSFC)
Fiber amplifier for lasers enabling the Laser Interferometer Space Antenna (LISA) gravitational-wave observatory

Significance: LISA crucially depends on lasers to allow interferometric measurement of the multi-million-km distance between the three spacecraft; technology readiness level (TRL) of 5 is needed for infusion into the mission

Project Title: Demonstration of a TRL-5 Laser System for LISA
PI: Jordan Camp (GSFC)
Engineering Model versions of GRACE Follow-On subsystems used to develop phasemeter for the Laser Interferometer Space Antenna (LISA) gravitational-wave (GW) observatory

**Significance:** LISA needs a phasemeter system to allow interferometric measurement of the multi-million-km distance between the three spacecraft

**Project Title:** Phase Measurement System Development for Interferometric GW Detectors

**PI:** William Klipstein (JPL)
1.9-THz mixer block developed for multi-pixel Local Oscillator (LO) and test setup

**Significance:** This high-resolution multi-pixel far-IR detector technology may enable or enhance future missions

**Project Title:** A Far-IR Heterodyne Array Receiver for C+ and OI Mapping

**PI:** Imran Mehdi (JPL)
X-ray reflection gratings at PANTER test beam line

**Significance:** X-ray reflection gratings enable high throughput, high spectral resolving power below 2 keV, a spectral band holding major astrophysics interest

**Project Title:** Reflection Grating Modules: Alignment and Testing

**PI:** Randall McEntaffer (PSU)
Multi-pressure Brewster cell with removable windows (left) and Immersed cell incorporating piezo actuators (right)

**Significance:** A highly stable laser simultaneously locked to a cavity and a molecular transition at a telecom wavelength can provide a highly coherent light source for future missions

**Project Title:** Laser Stabilization with CO

**PI:** John Lipa (Stanford University)