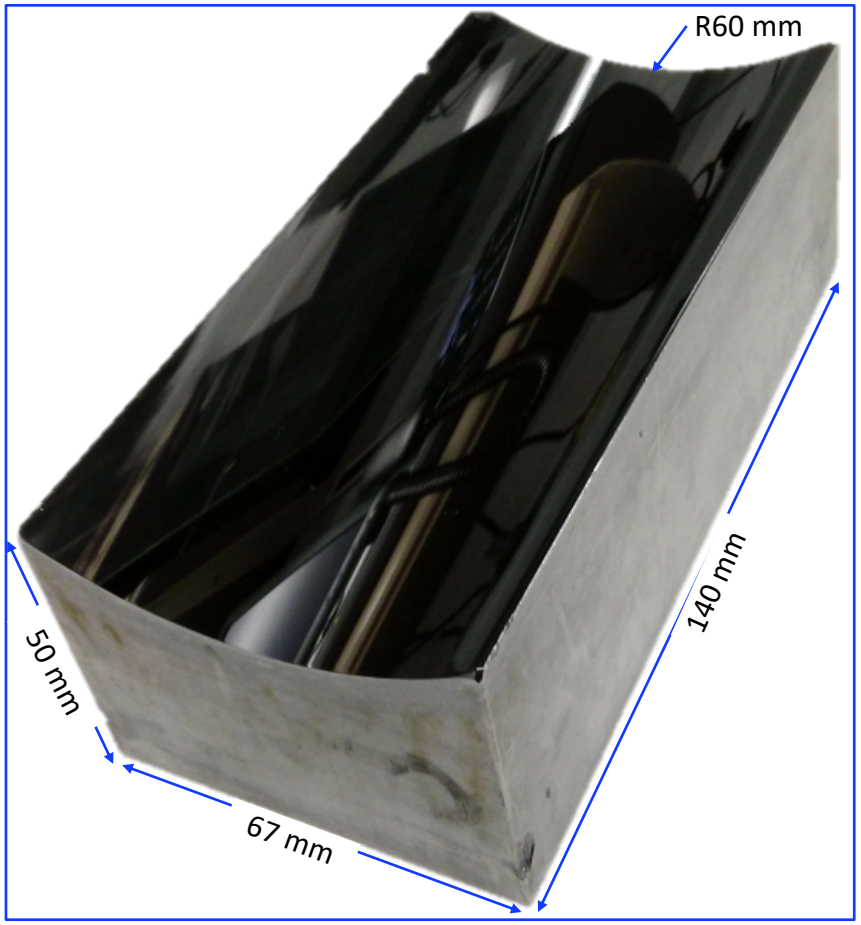
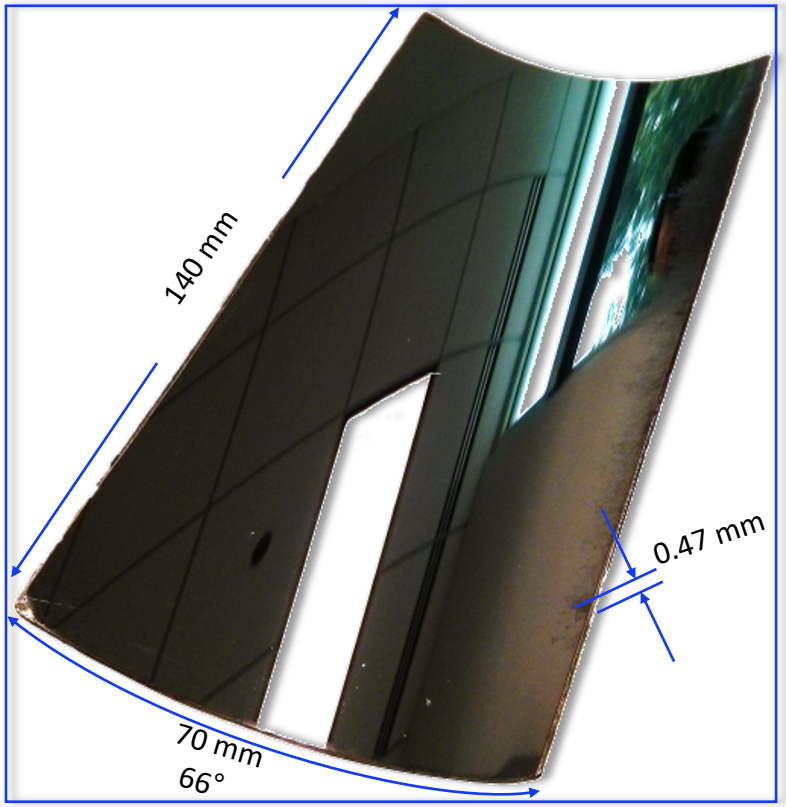
2014 Hardware Images

PCOS and COR Strategic Technology Portfolio

For more information about these technologies visit our Technology Database (http://www.astrostrategictech.us)



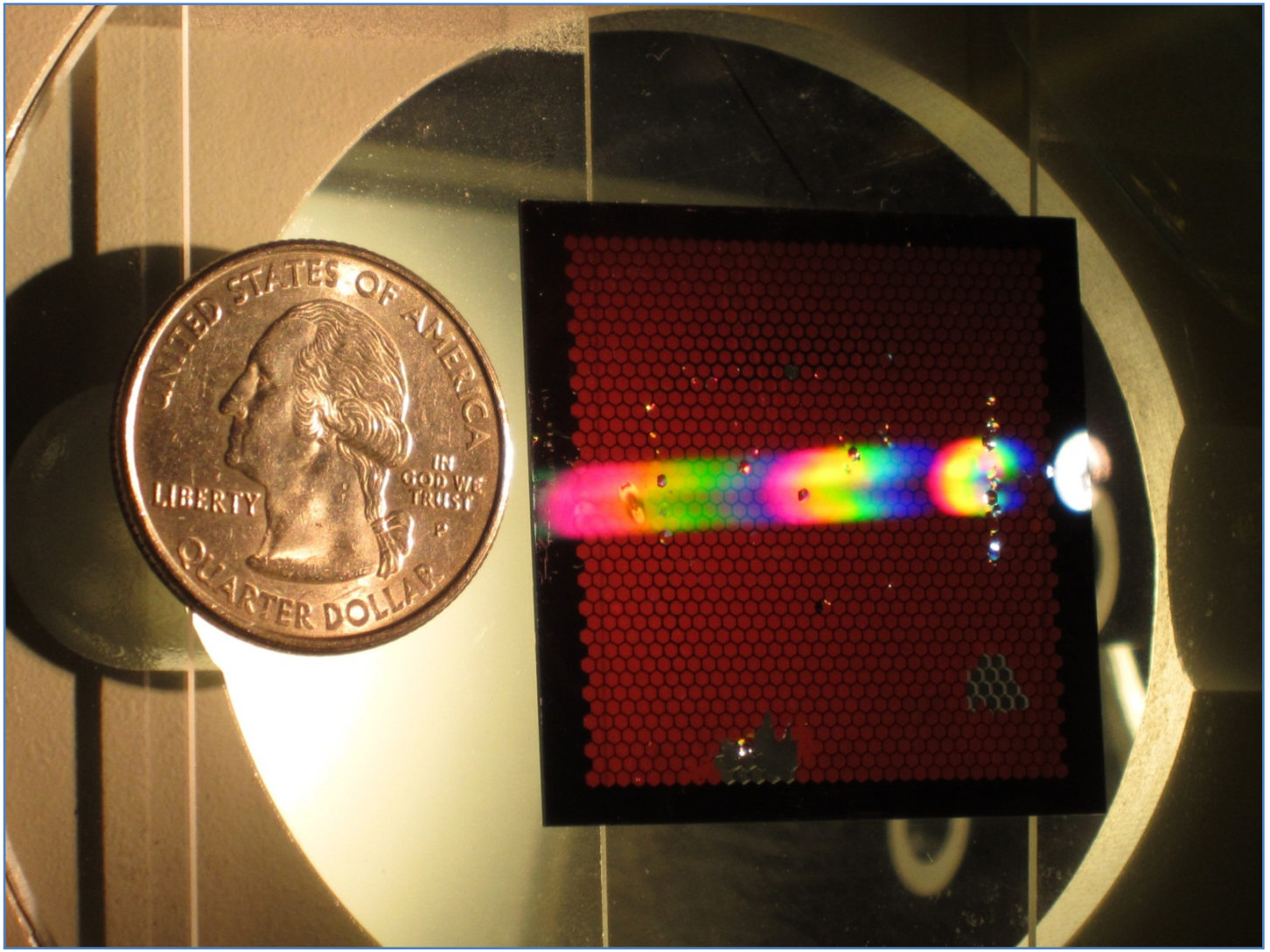


Silicon block with polished cylindrical surface (left) and lightweight silicon X-ray mirror substrate

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

Project Title: High-Resolution and Lightweight X-ray Optics for the X-ray Surveyor

PI: Zhang, William (GSFC)



Prototype X-ray Critical-Angle Transmission (CAT) grating with quarter coin for scale

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

Project Title: Development of a CAT Grating Spectrometer

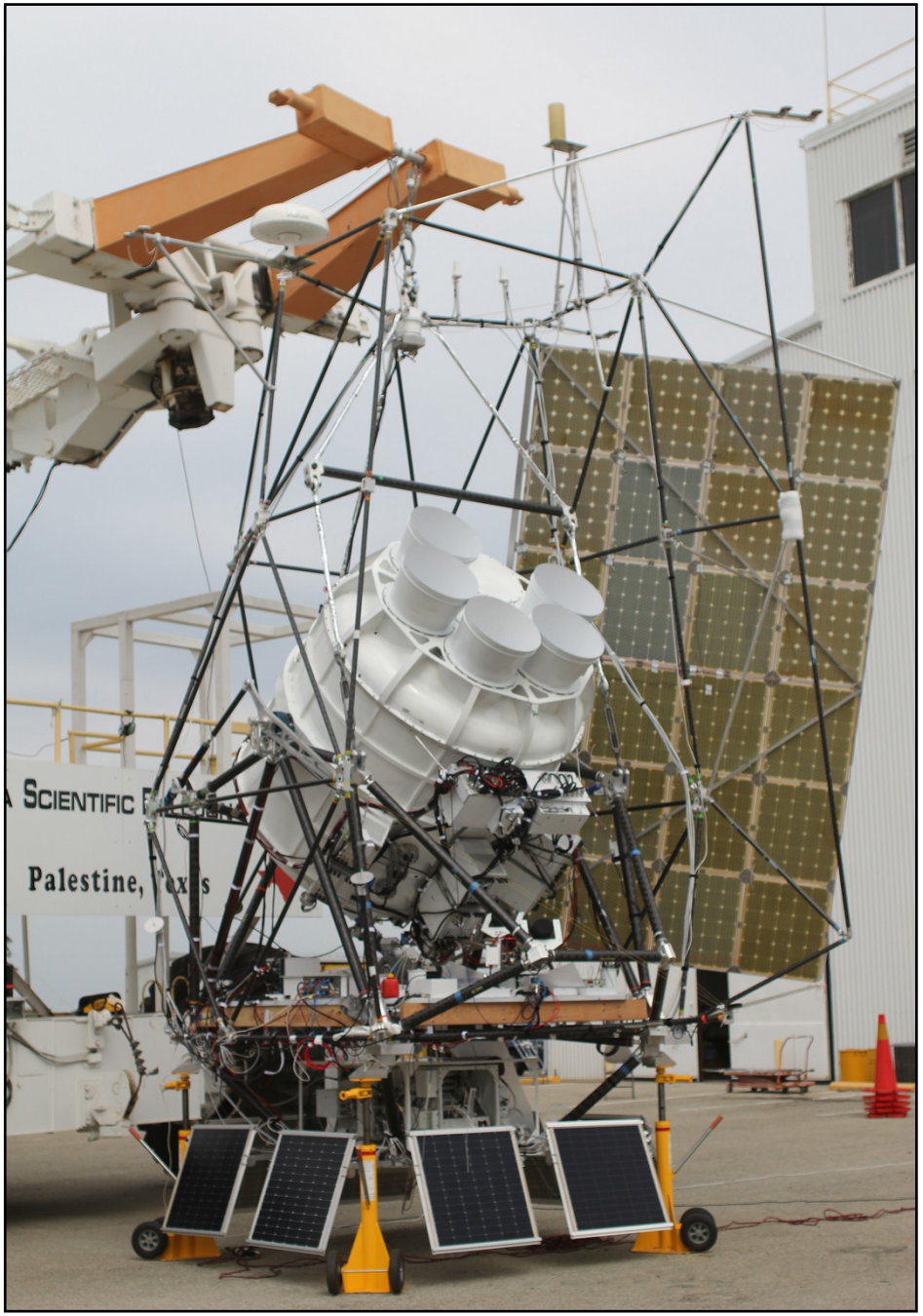
PI: Mark Schattenburg (MIT Kavli Institute for Astrophysics and Space Research)

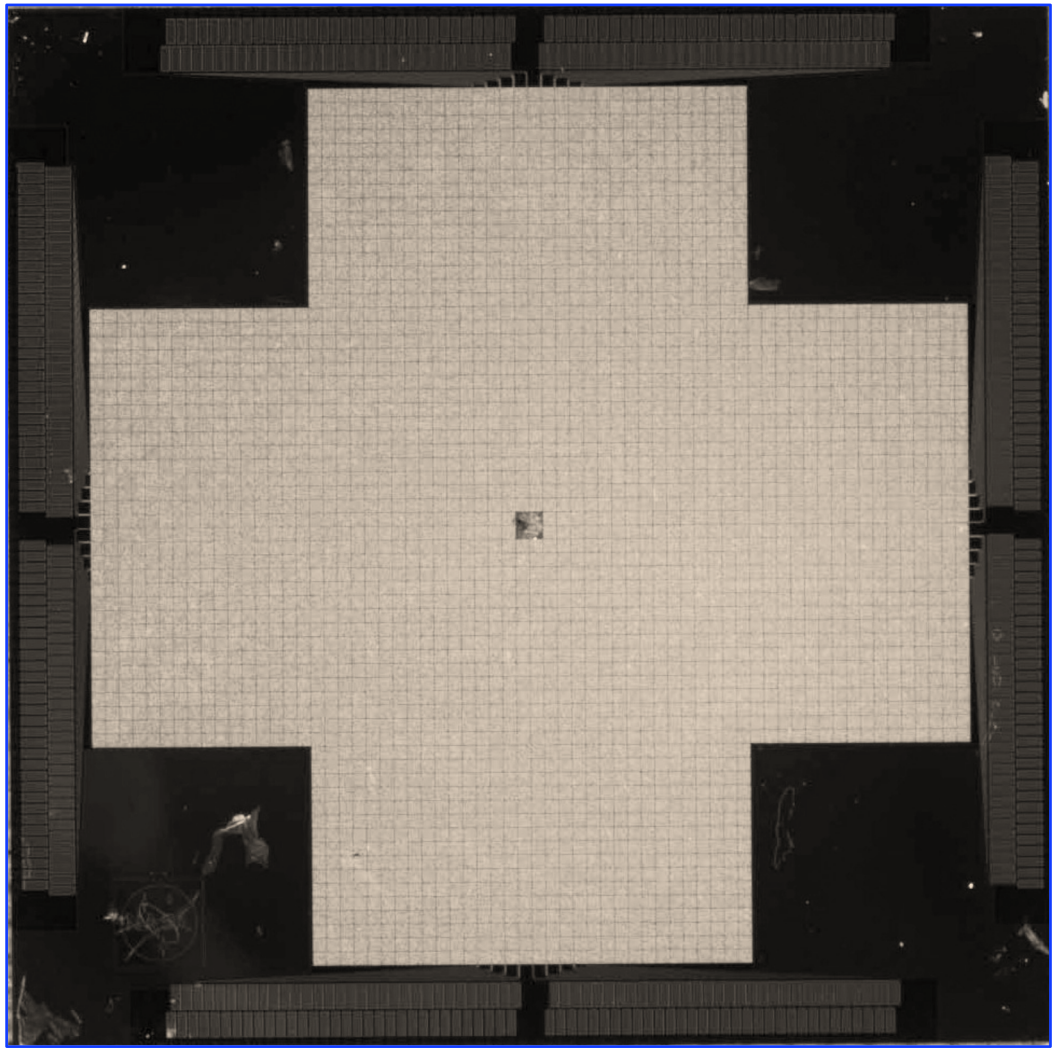
SPIDER payload with bolometer arrays for Cosmic Microwave Background (CMB) polarimetry undergoing integration and test at Palestine, Texas

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)



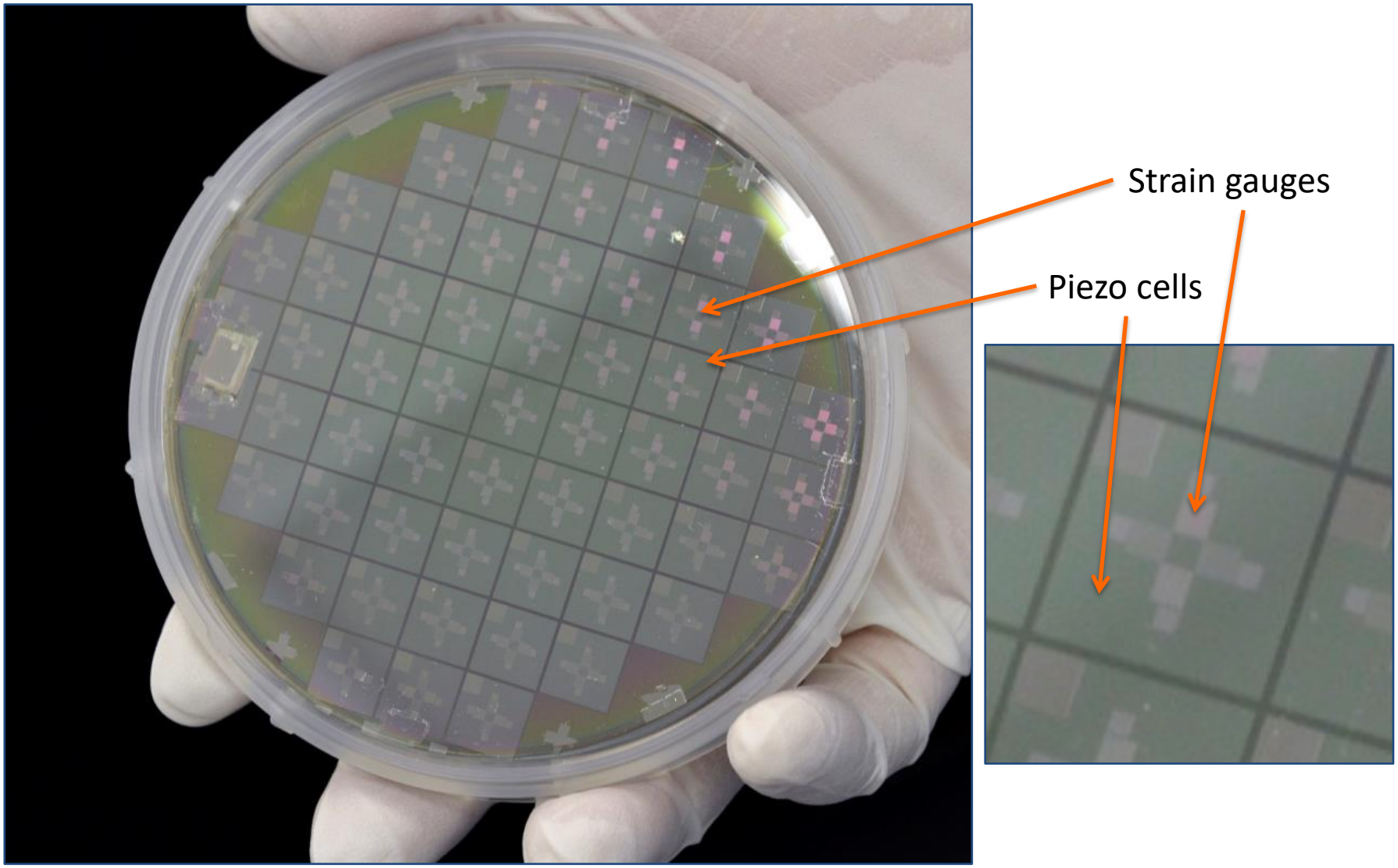


ATHENA-scale Transition-Edge-Sensor (TES) 64×64 array with 16×16-pixel corners removed

Significance: TES microcalorimeters offer energy resolution for the European ATHENA mission

Project Title: Providing enabling and enhancing technologies for a demonstration model of the ATHENA X-ray Integral Field Unit (X-IFU)

PI: Caroline Kilbourne (GSFC)

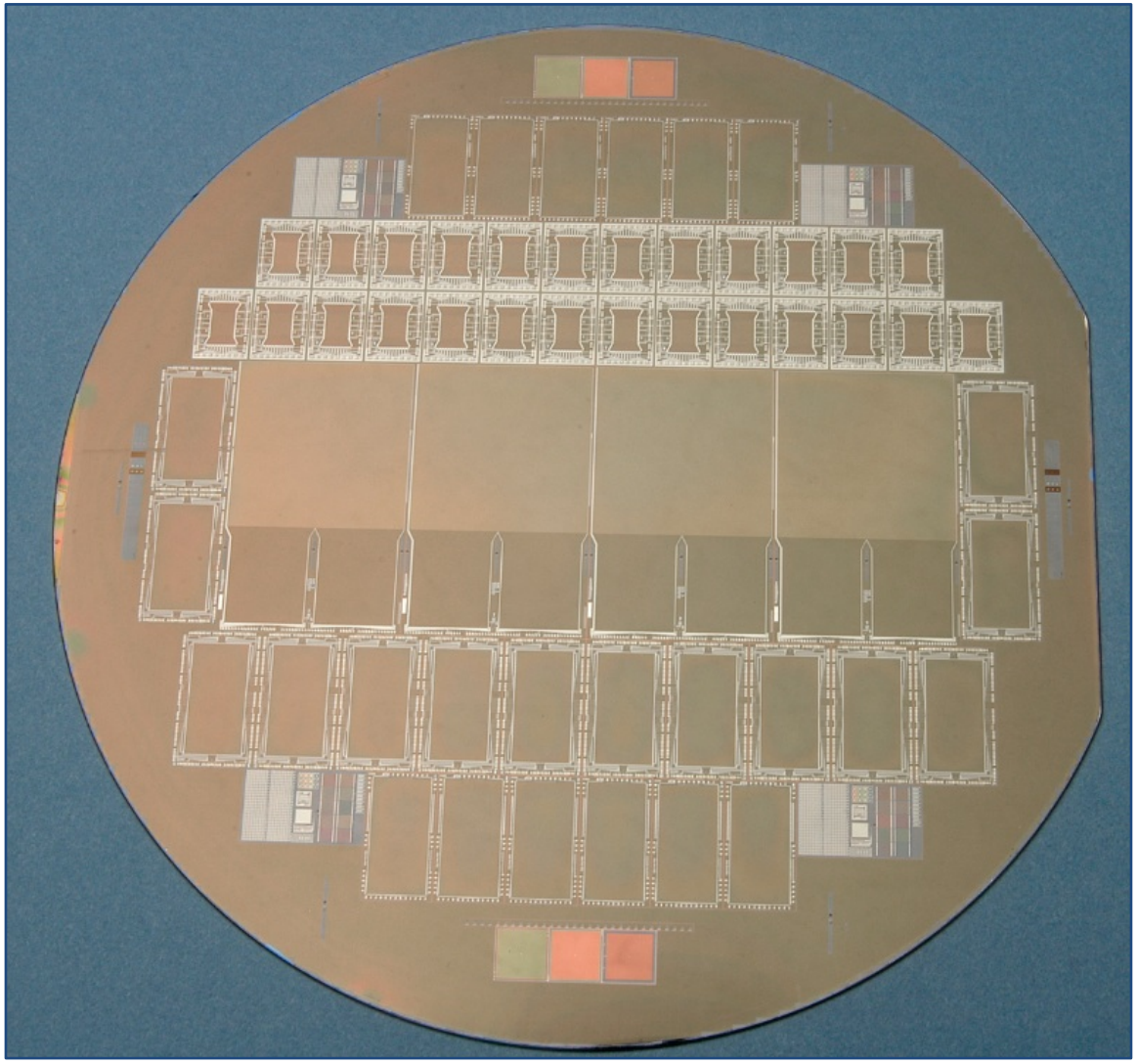


Strain gauges mounted to piezo cells to allow figure adjustment of thin X-ray mirrors

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

Project Title: Adjustable X-ray Optics with Sub-Arcsecond Imaging

PI: Paul Reid (SAO)



150-mm wafer containing four CCID41 (CCD) X-ray detectors

Significance: X-ray detectors operate far better when filters allow X-ray photons through and block longer wavelength light

Project Title: Directly-Deposited Blocking Filters for X-ray Imaging Detectors

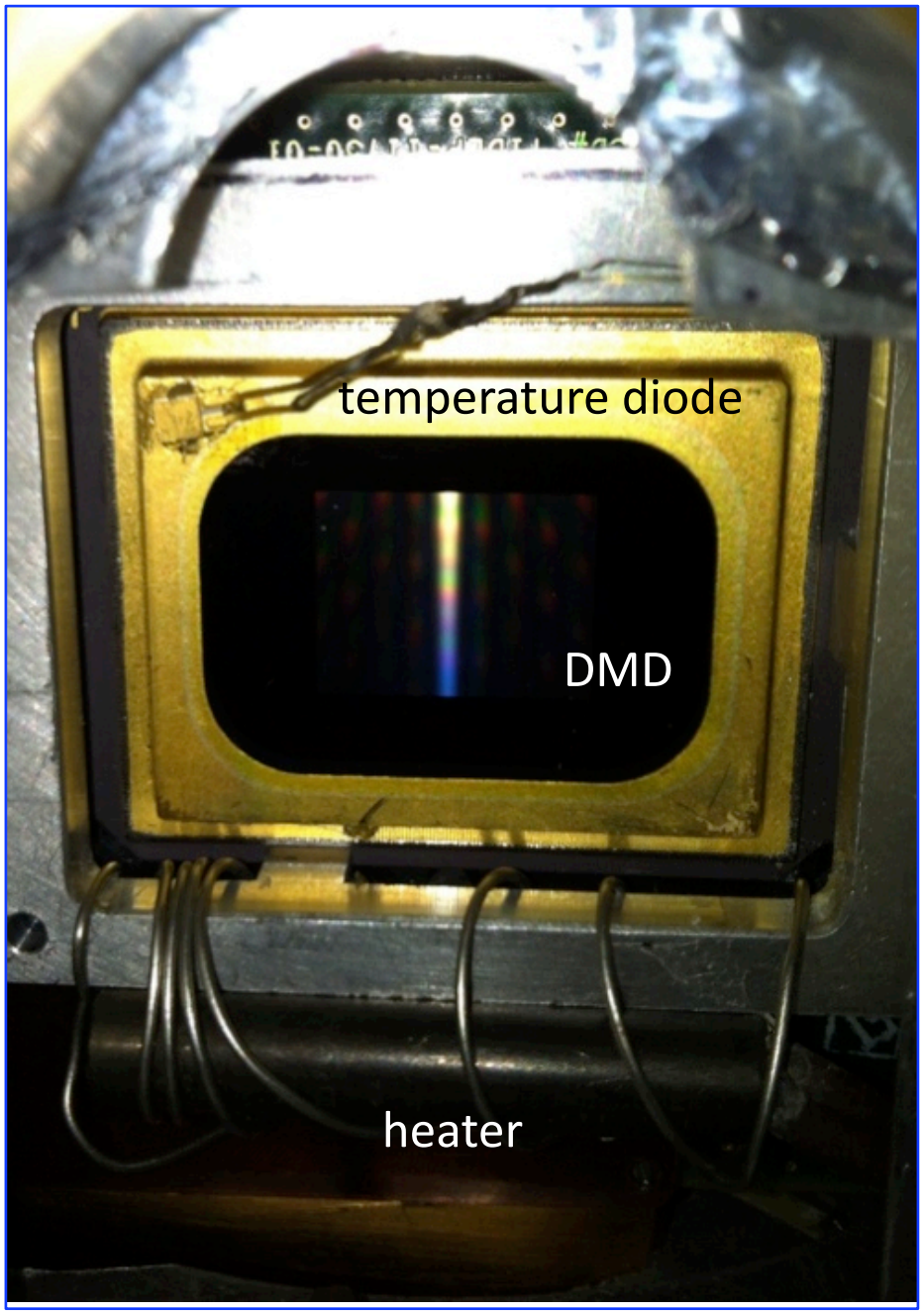
PI: Mark Bautz (MIT Kavli Institute for Astrophysics and Space Research)

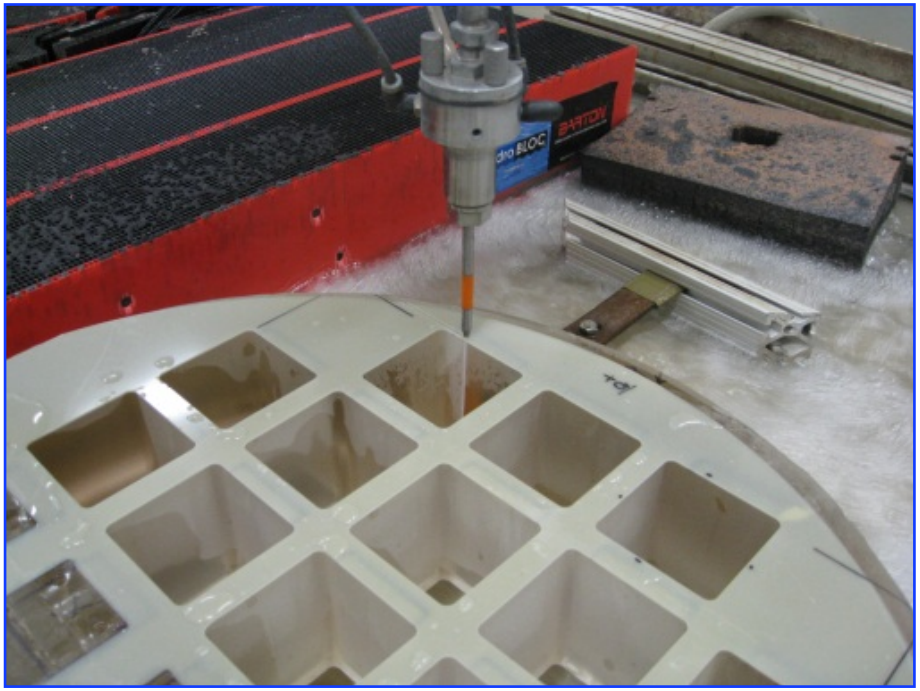
Low-temperature testing of Digital Micro-mirror Device (DMD) done as part of flight qualification

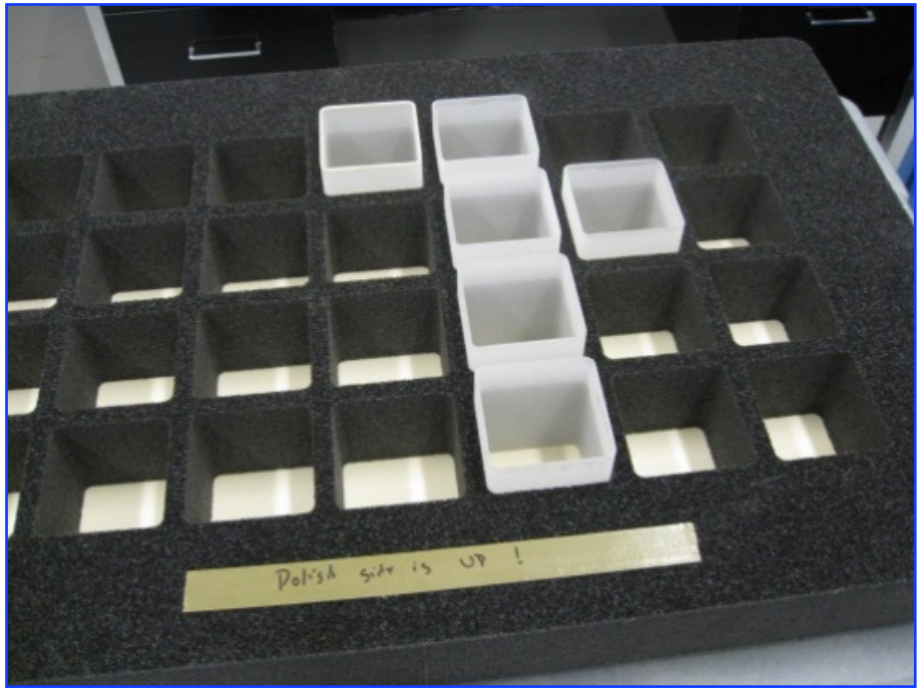
Significance: Replacing windows of commercially available DMDs may enable far-UV multi-object spectrometry in future missions

Project Title: Development of DMDs for Far-UV Applications

PI: Zoran Ninkov (RIT)





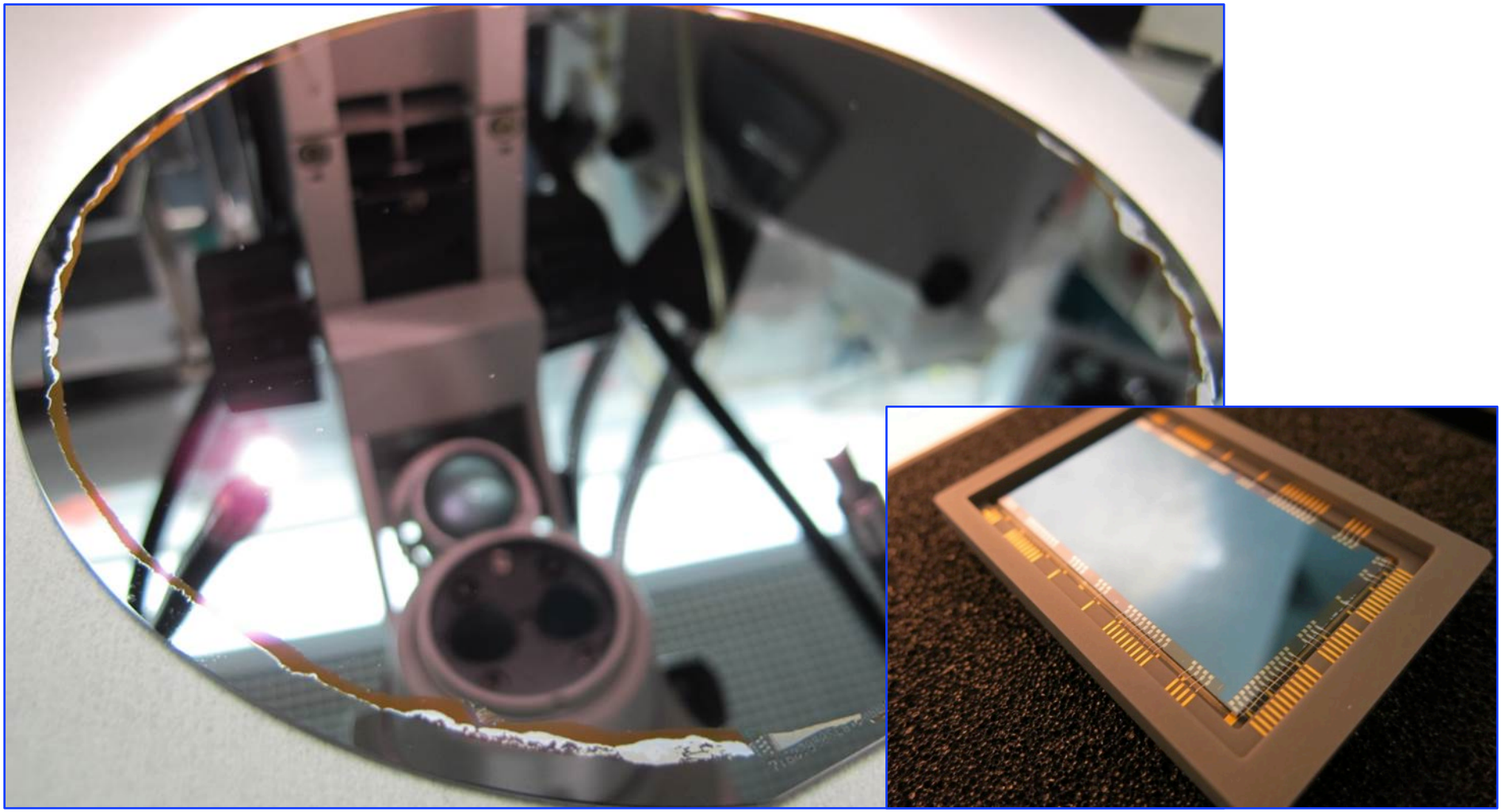


Modulus-of-Rupture (MOR) boxes cut out of glass boule using abrasive water jet (left) and placed in storage fixture (right) for future low-temperature-fusion (LTF) assembly

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)

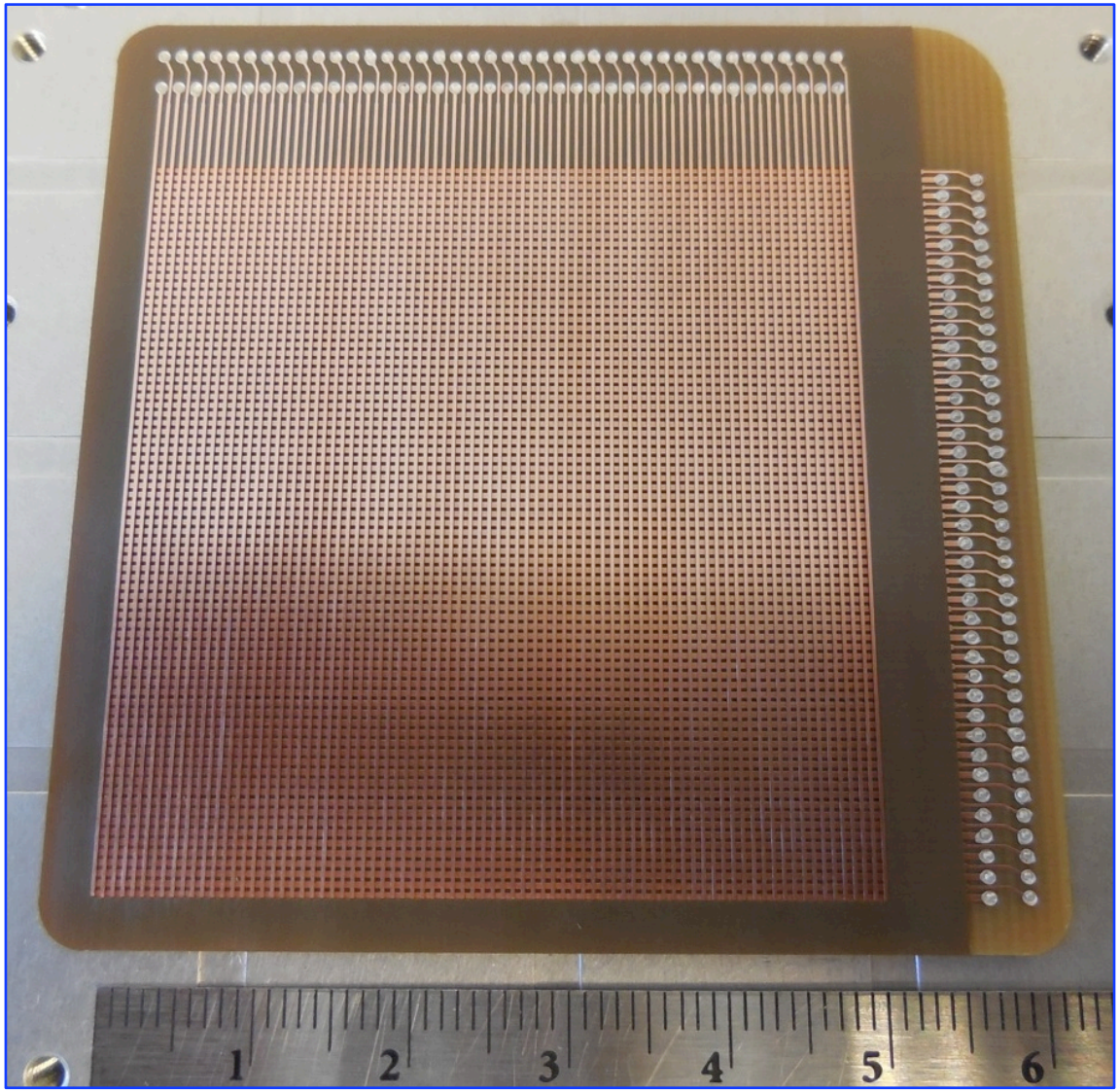


2-Megapixel delta-doped CCD detectors on wafer (left) and as packaged die (right)

Significance: Advanced detectors developed by this team are baselined by SHIELDS, HabEx, LUVOIR, and ground facilities

Project Title: High-Efficiency Detectors in Photon Counting and Large Focal Plane Arrays for Astrophysics Missions

PI: Shouleh Nikzad (JPL/Caltech)



50 mm polyimide cross-strip anode used for 50×50 mm^2 Multi-Channel Plate (MCP) detector

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

Project Title: High-Performance Cross-Strip MCP Detectors

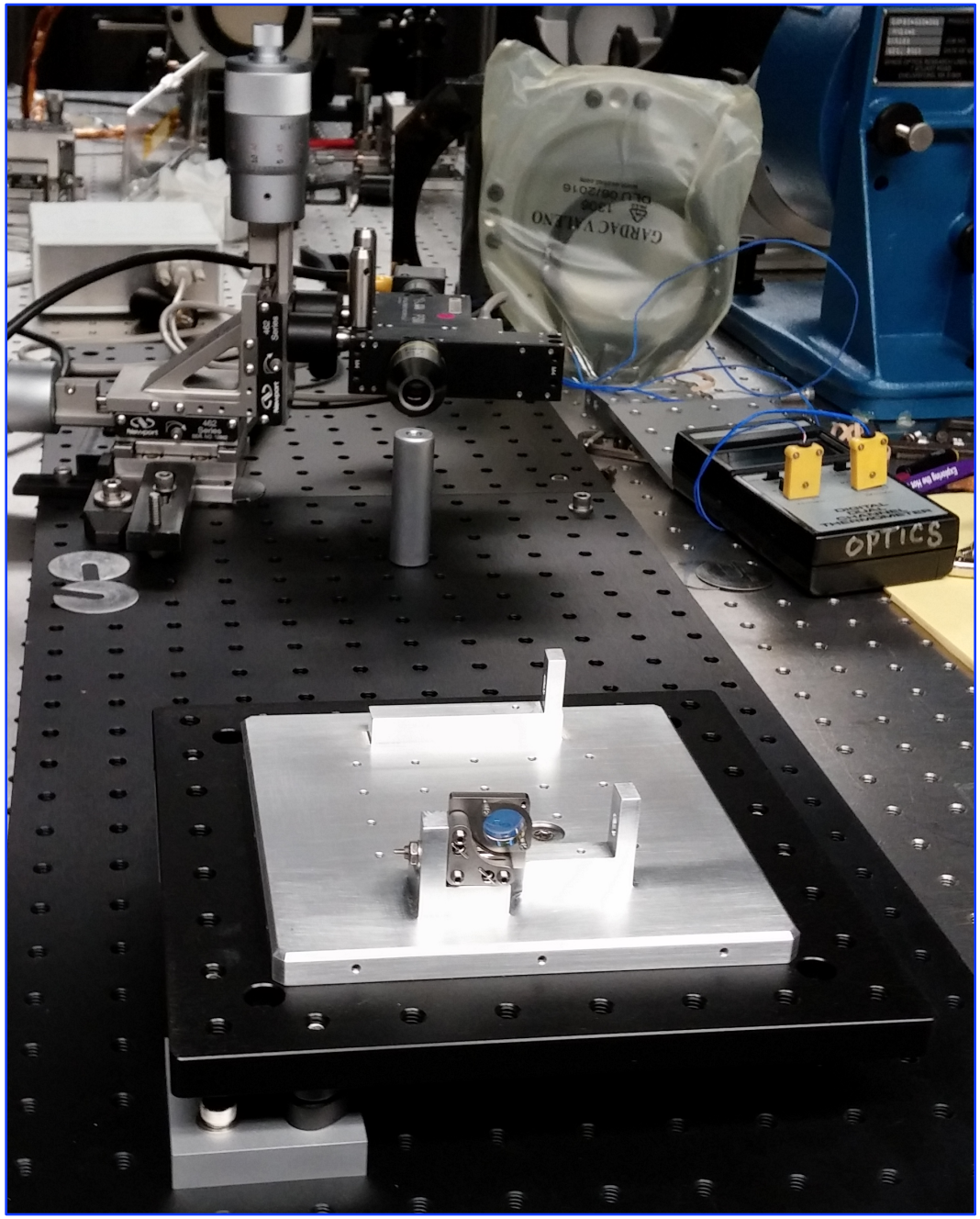
PI: John Vallerga (UC Berkeley)

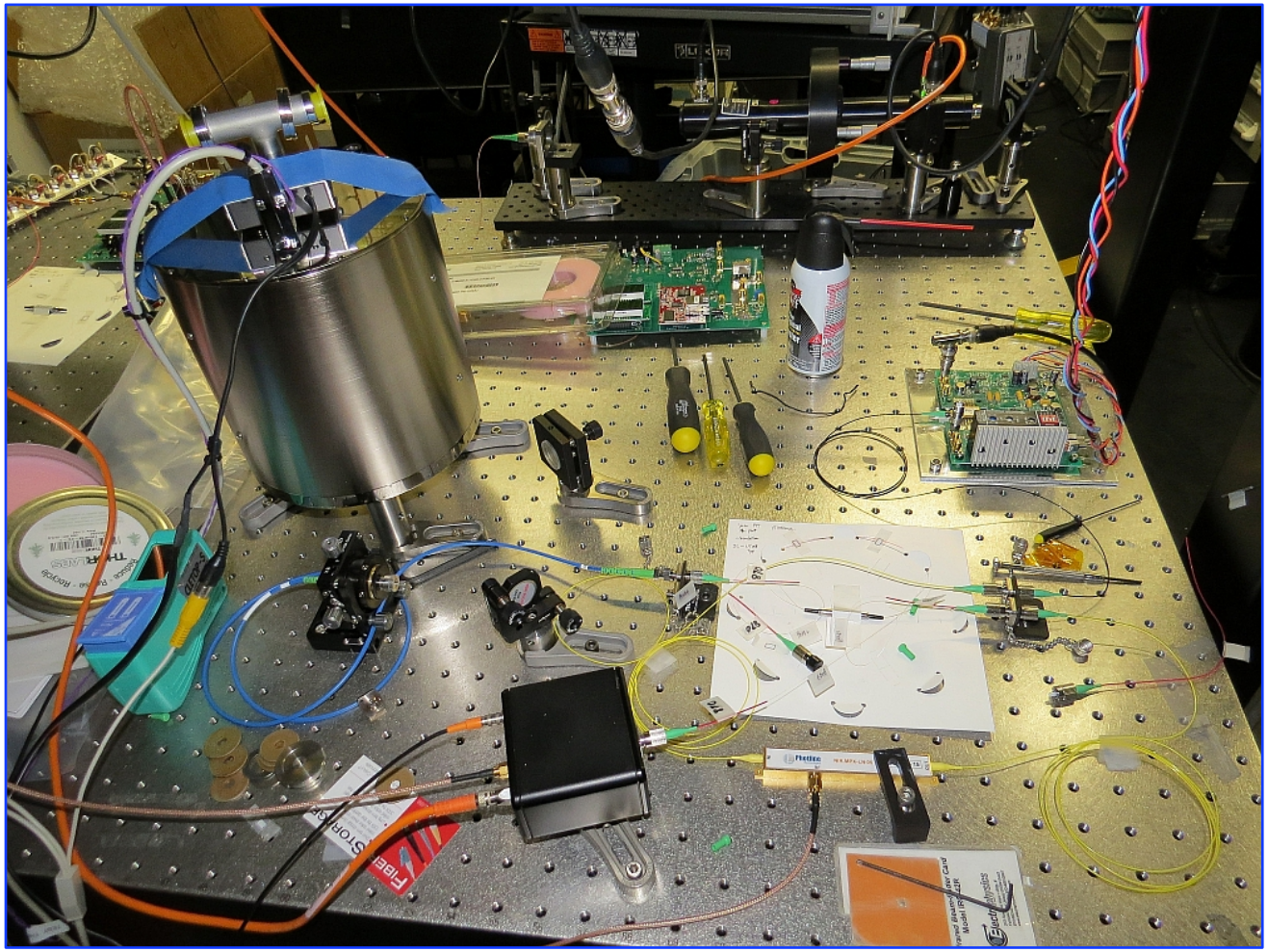
Testbed for measuring scattered light in prototype Laser Interferometer Space Antenna (LISA) telescope

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

Project Title: Telescope for a Space-Based Gravitational Wave Mission

PI: Jeffrey Livas (GSFC)



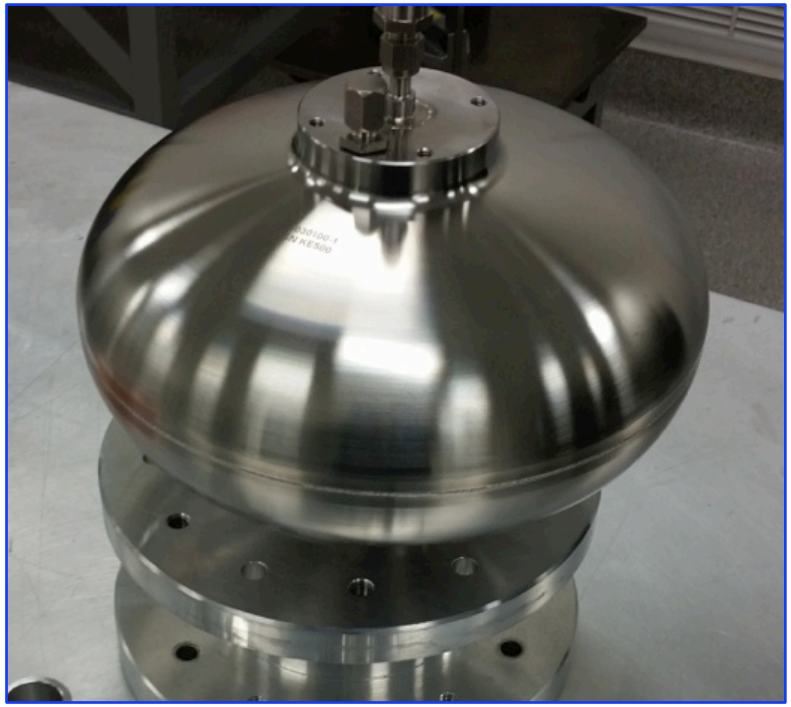


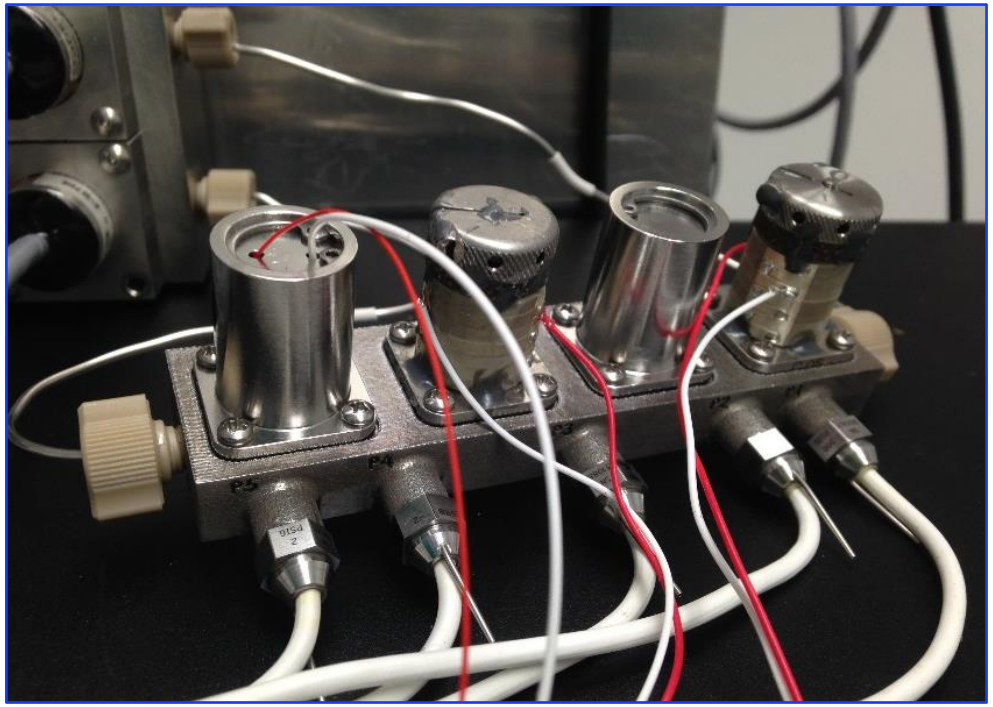
Installation of frequency-reference cavity for oscillator tests used in developing a prototype laser for the Laser Interferometer Space Antenna (LISA) gravitational-wave observatory

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)



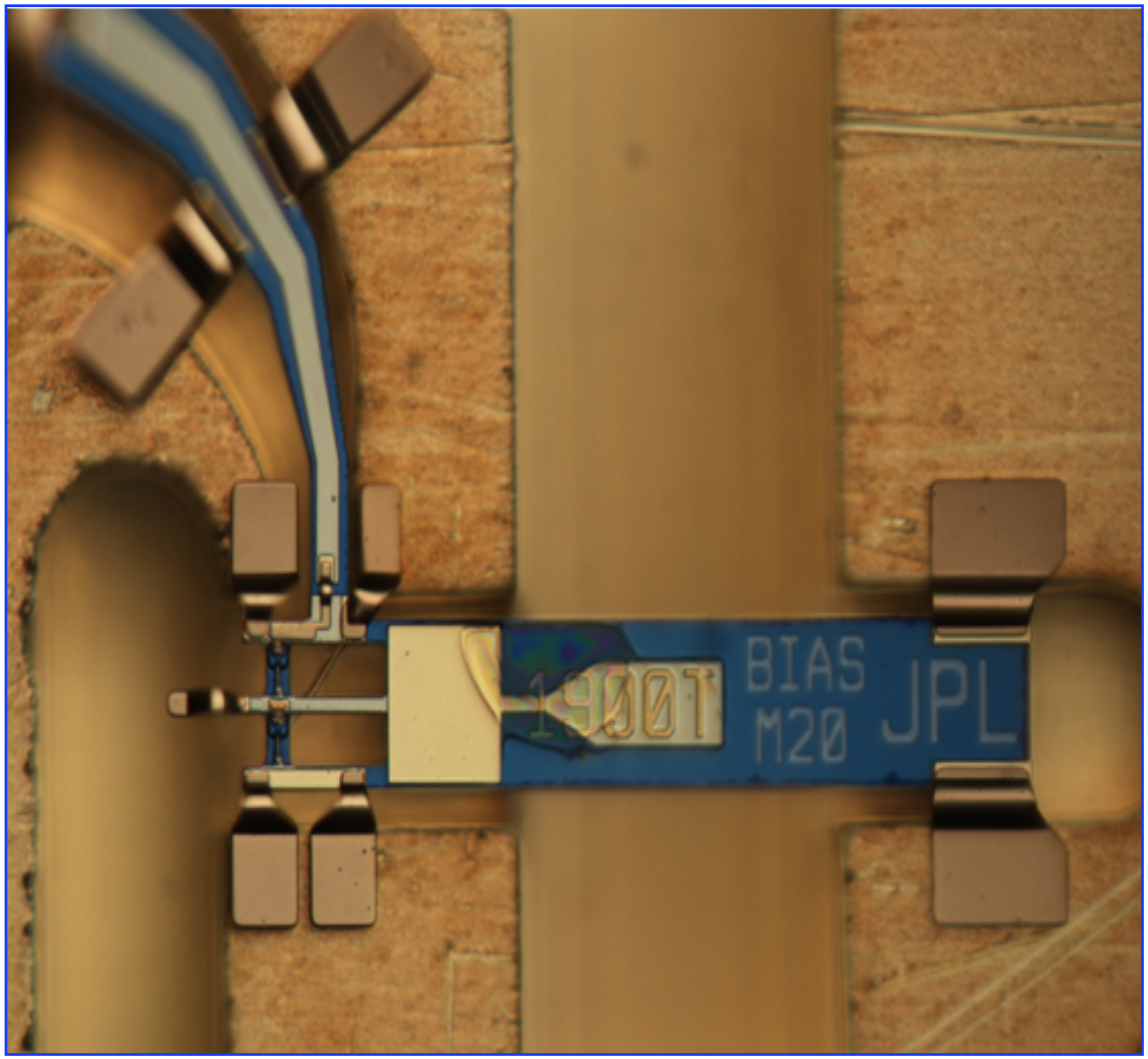


Colloid microthruster propellant tank and controls developed to allow a gravitational-wave (GW) observatory in space

Significance: LISA crucially depends on microthrusters to keep its three spacecraft floating around the free-falling test masses within each, to allow interferometric measurement of the multi-million-km distance between each pair of spacecraft

Project Title: Colloid Microthruster Propellant Feed System for GW Astrophysics Missions

PI: John Ziemer (JPL)

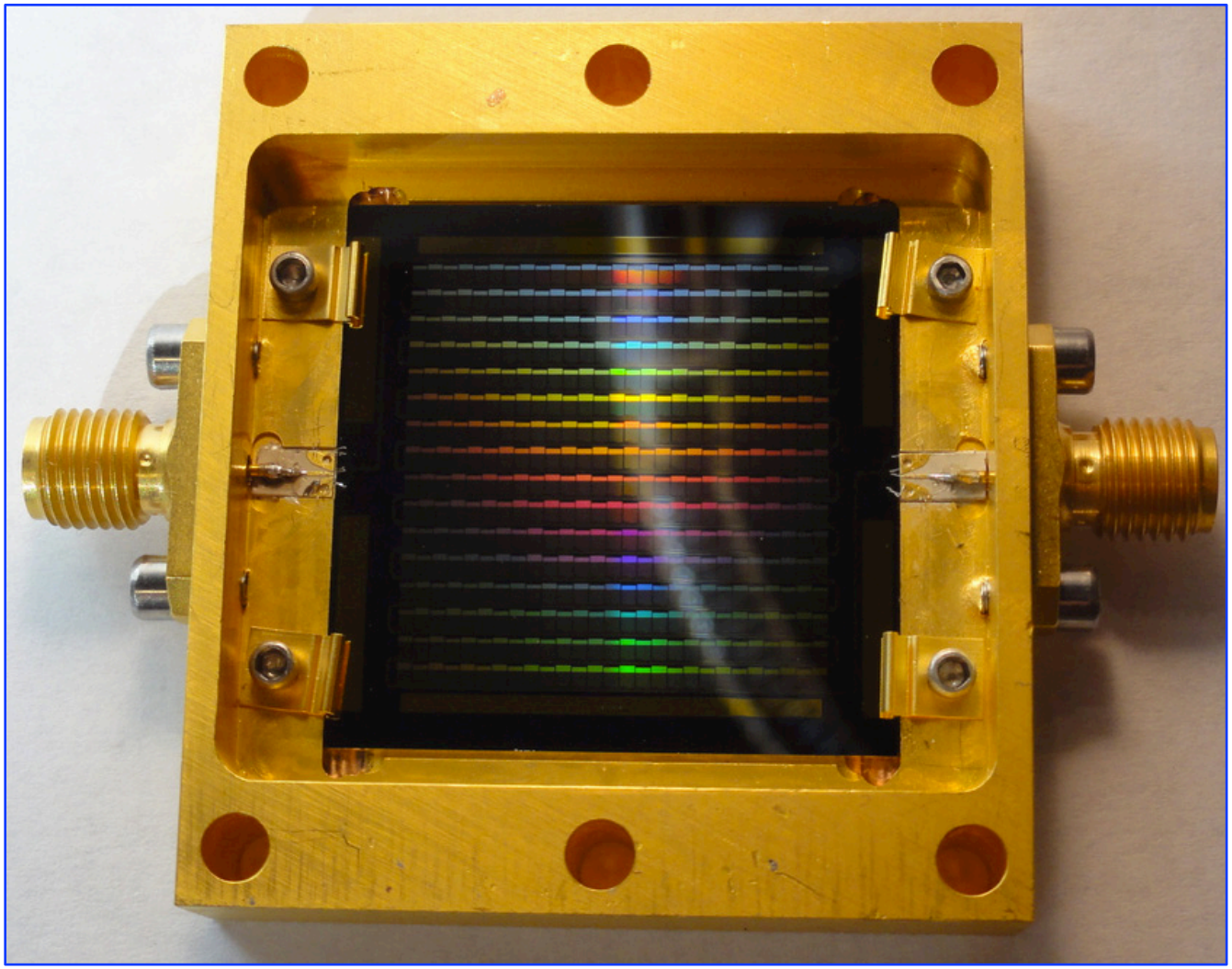


Magnified image of last-stage tripler for controlling pixel power in an array receiver

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 CII and OI Mapping

PI: Imran Mehdi (JPL)

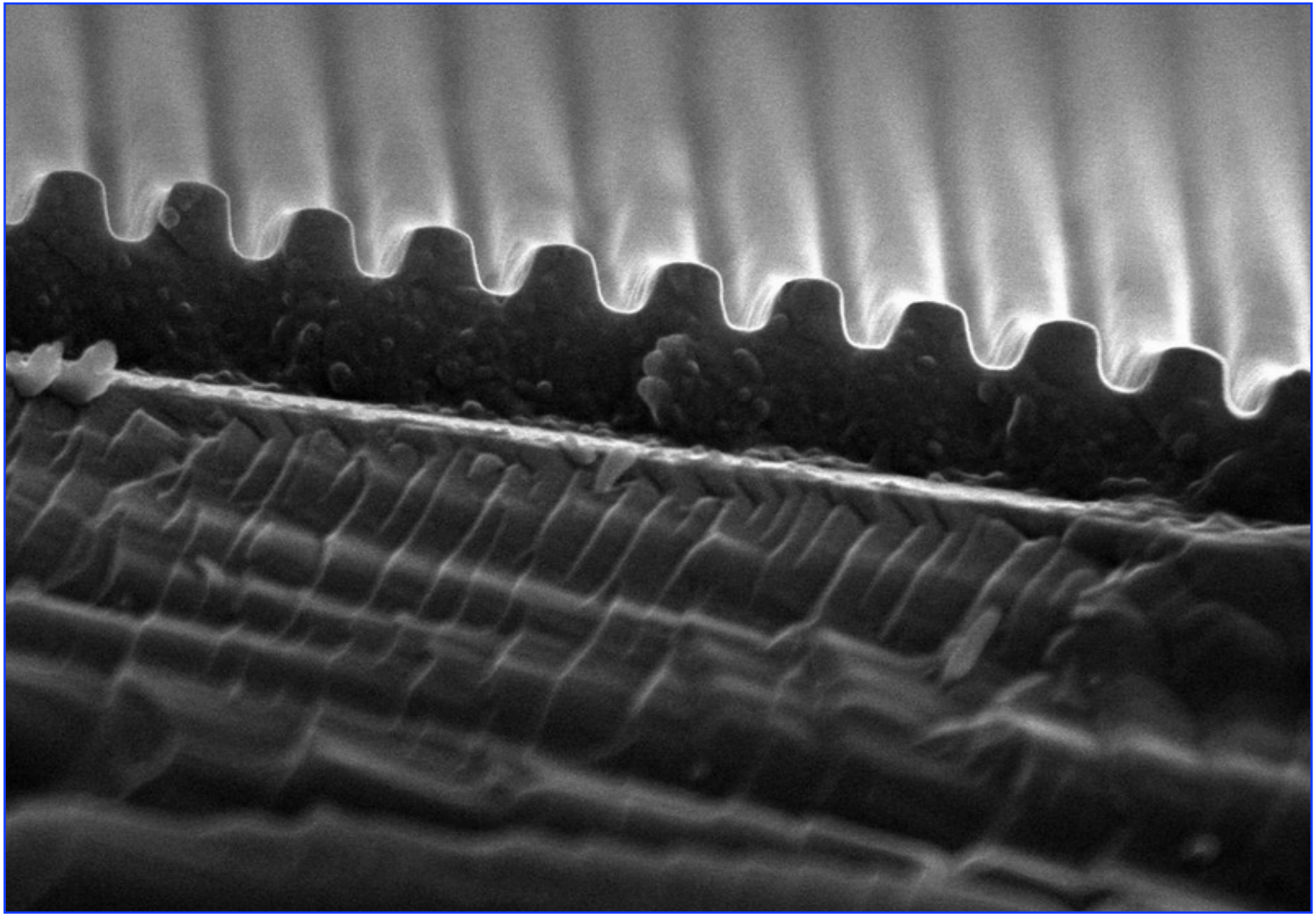


27×16-pixel ground-based Kinetic Inductance Detector (KID) array

Significance: Polarization-sensitive arrays in the far-IR can provide critical information on the role of magnetic fields in galaxy formation and evolution, and star formation in our galaxy and nearby galaxies

Project Title: KID Imaging Arrays for Far-IR Astrophysics

PI: Jonas Zmuidzinas (JPL)

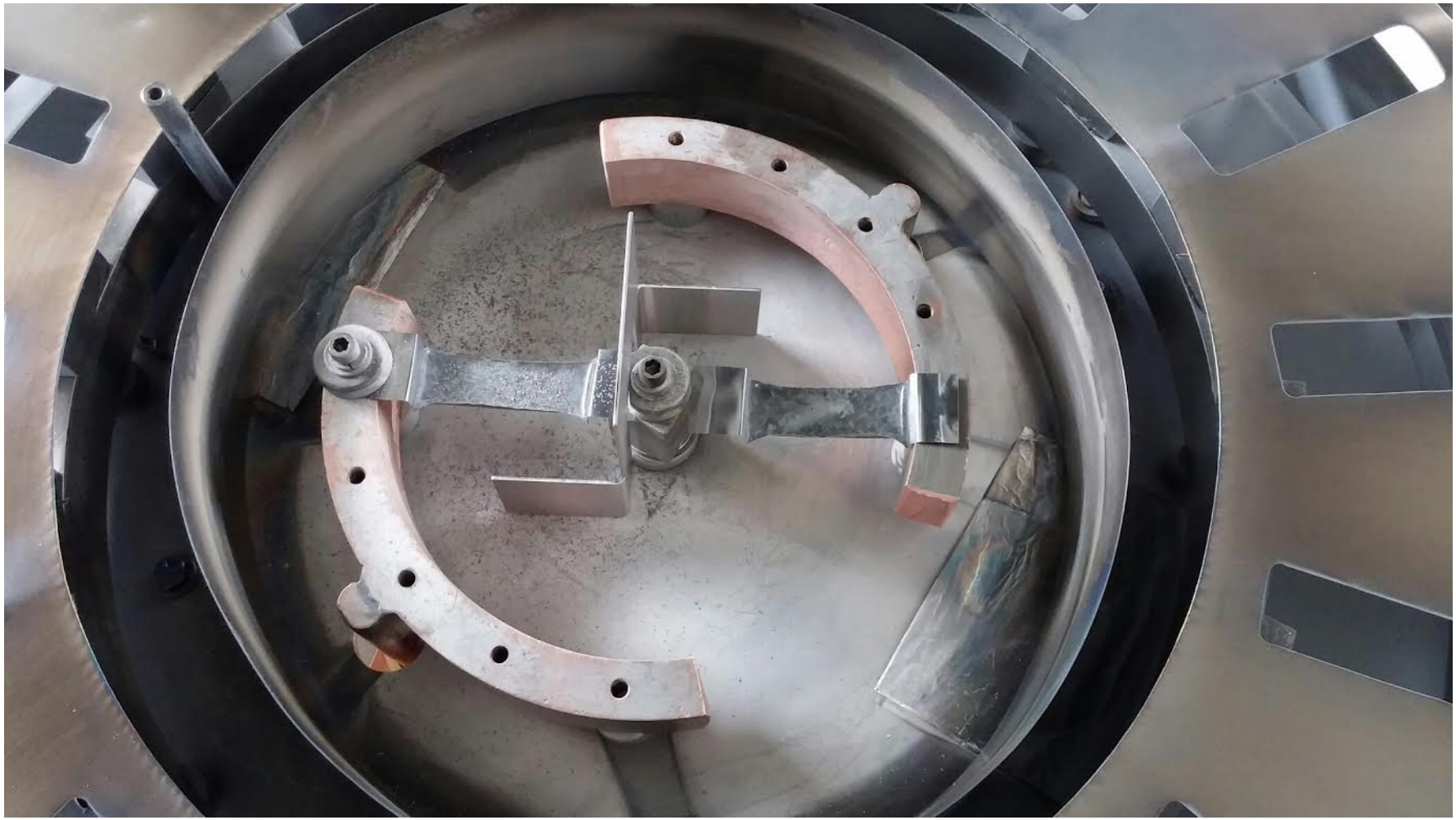


Scanning Electron Microscope (SEM) image of grooved surface for X-ray reflection grating

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)

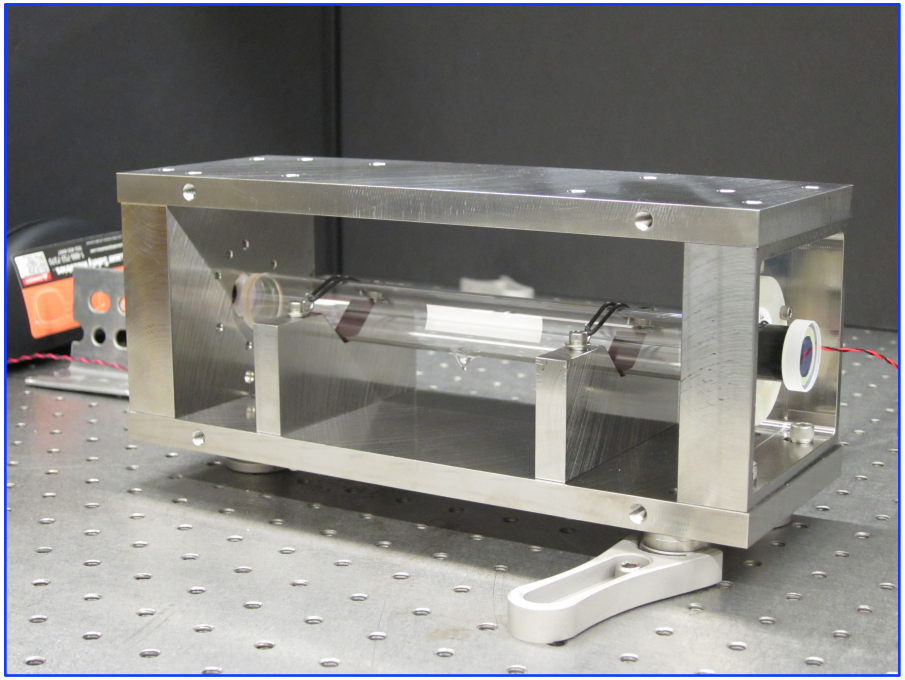


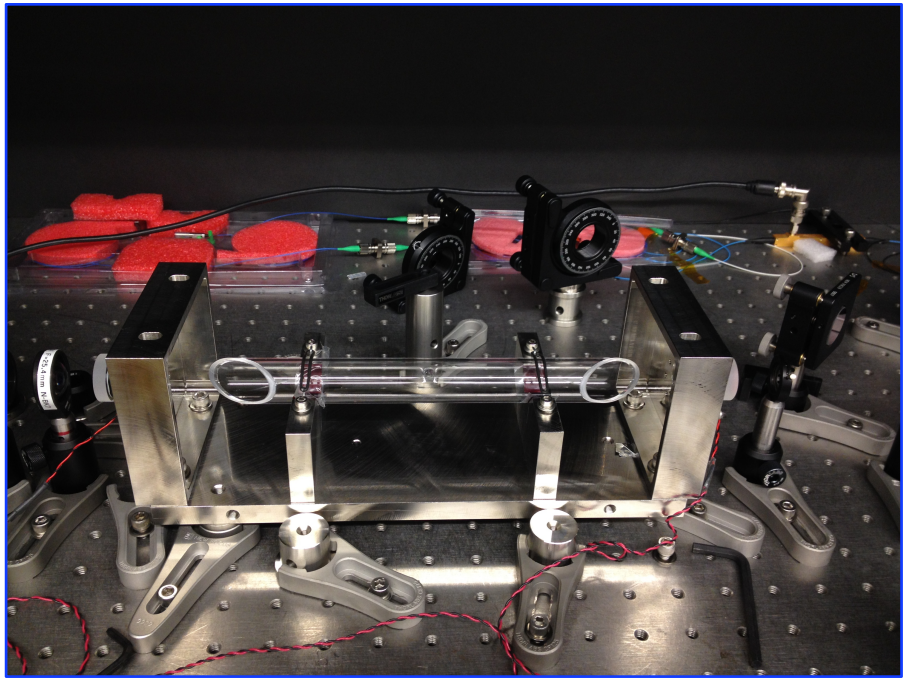
Coating fixture enabling dual-dielectric deposition in 2-m coating chamber

Significance: Advanced coatings with high reflectivity in the far UV enable future astrophysics missions by greatly enhancing system throughput in photon-starved far-UV observations

Project Title: Enhanced Al Mirrors for Far-UV Space Astronomy

PI: Manuel Quijada (GSFC)





Gas cell test assembly (left) and same cell with Brewster windows (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)