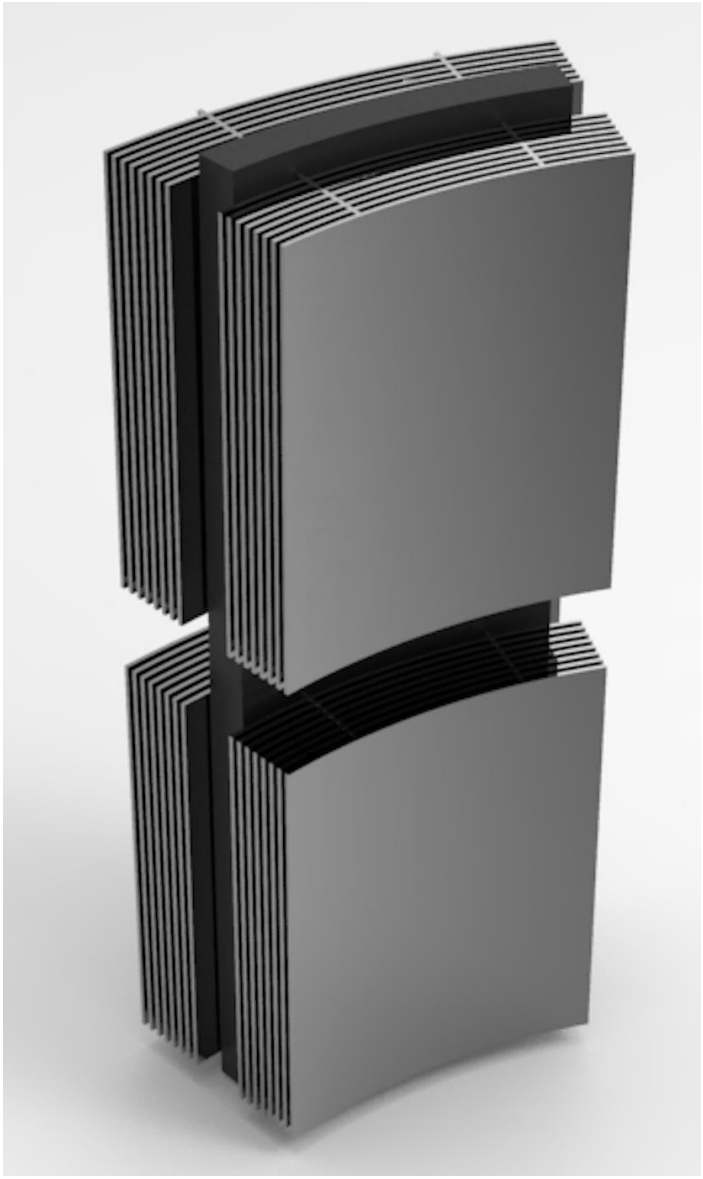
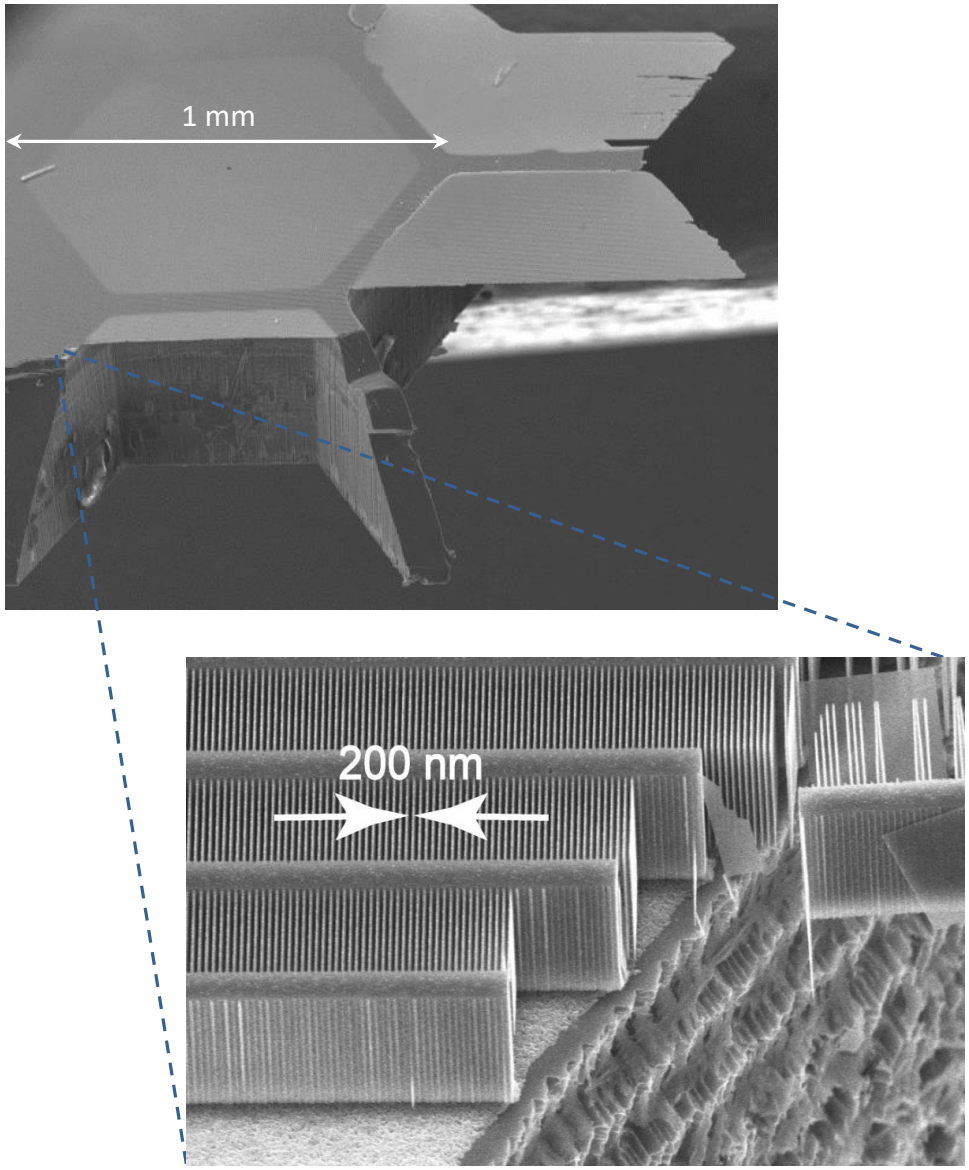
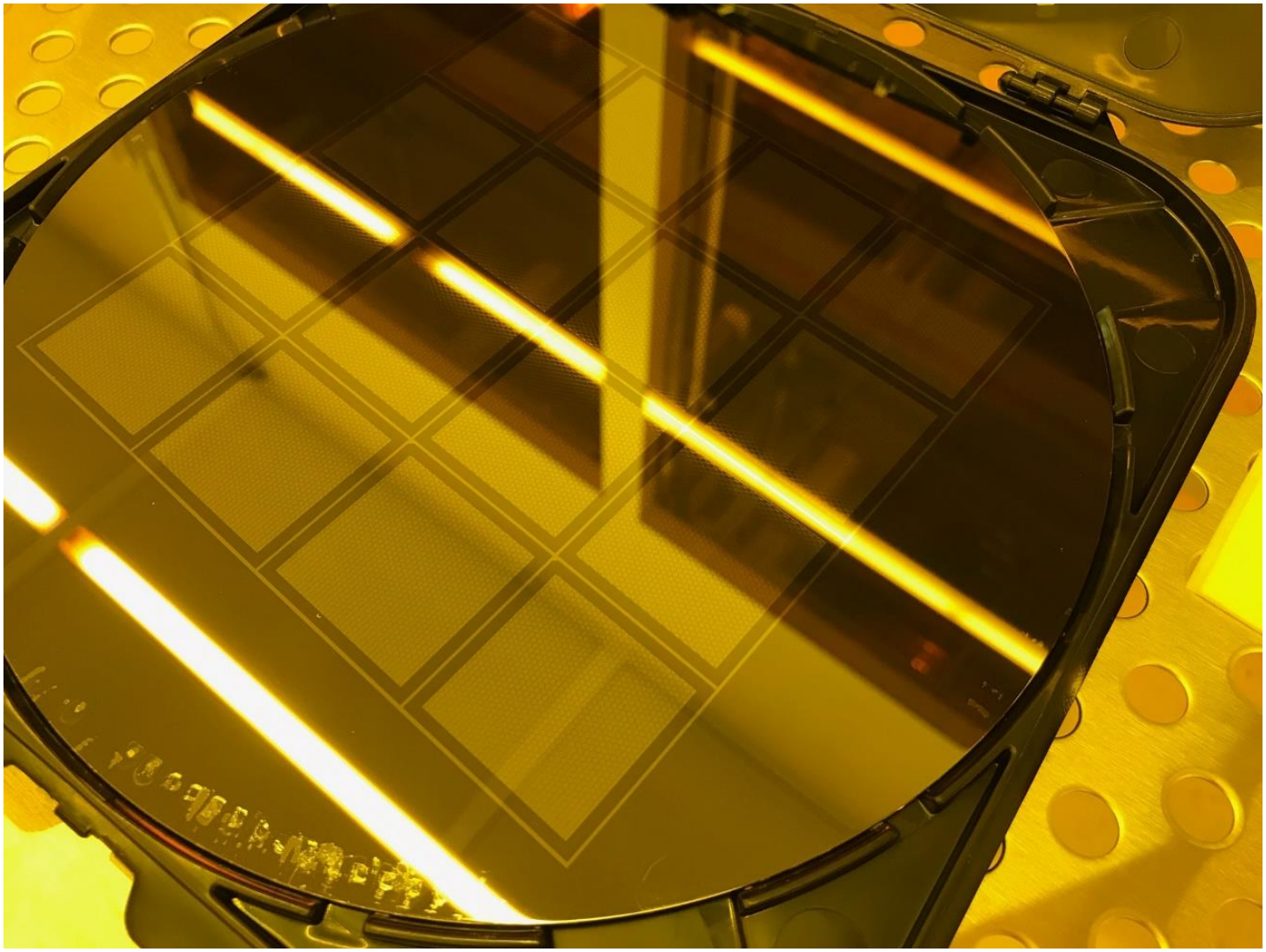


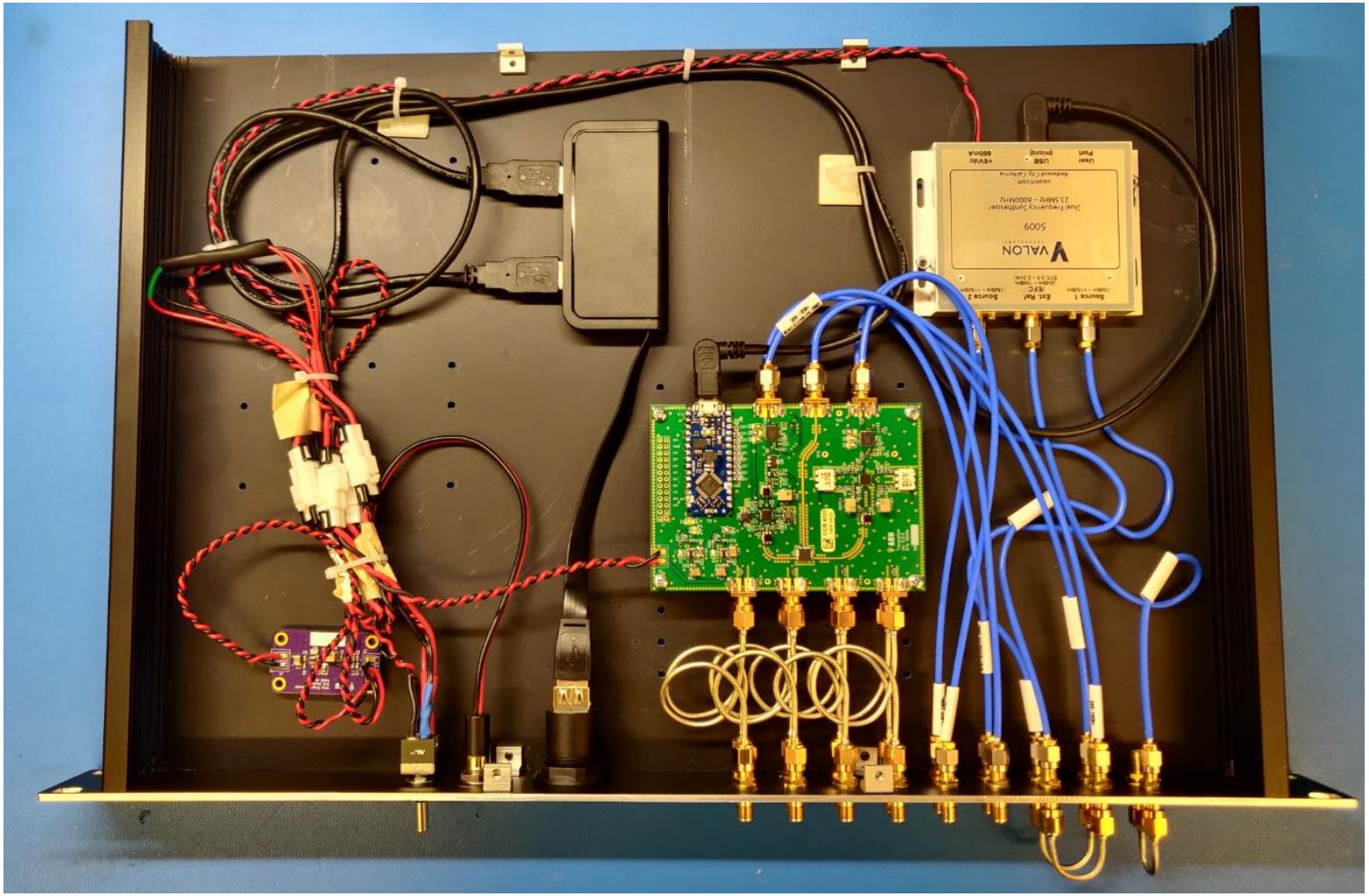
PI: Zhang, William (GSFC)
Project Title: Next Generation X-ray Optics: High Resolution, Light Weight, and Low Cost
Significance: Baselined for Lynx grazing X-ray optics
Image Caption: Single mirror segment plus stacked segments with support panel



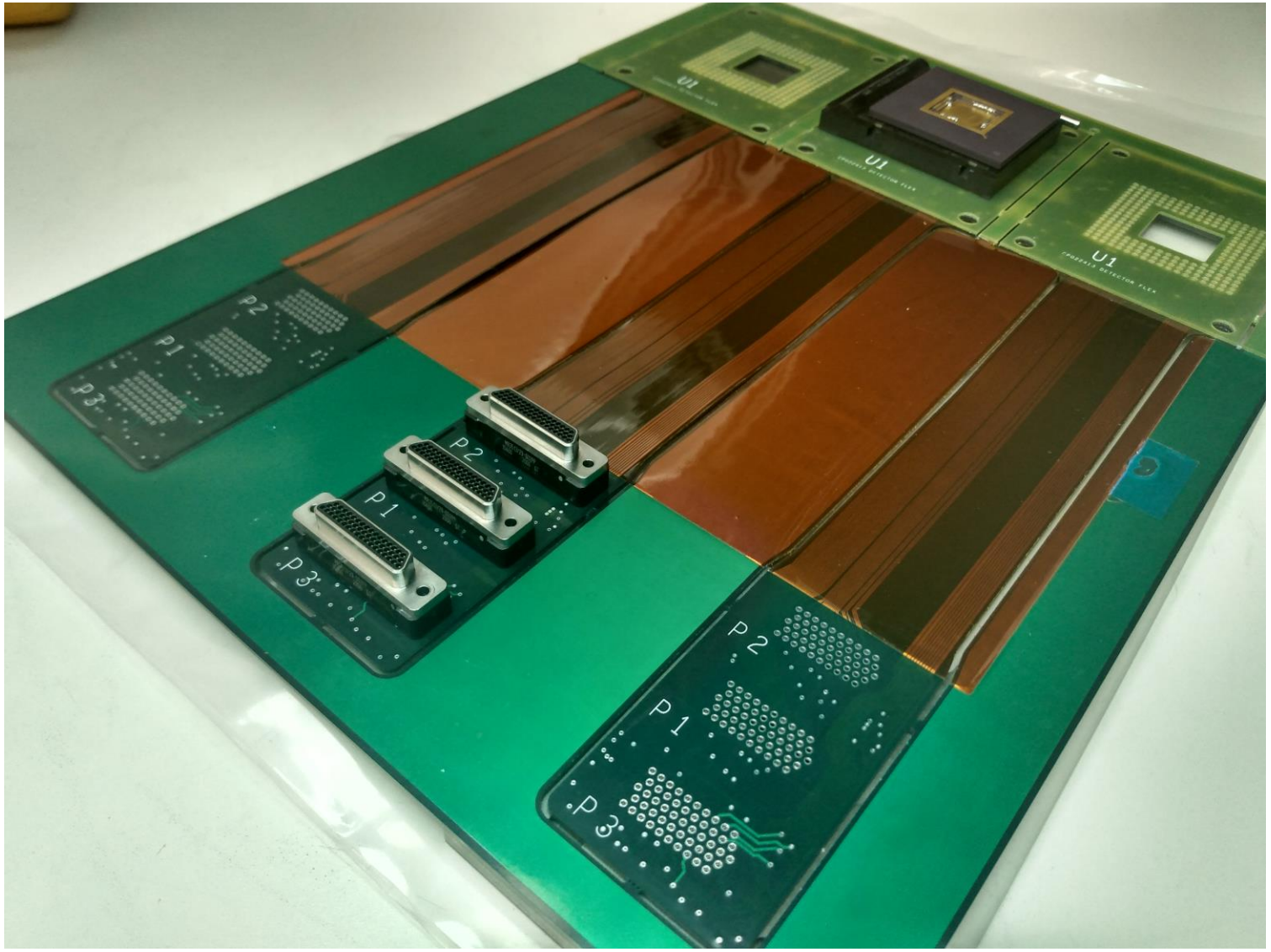
PI: Mark Schattenburg (MIT Kavli Institute for Astrophysics and Space Research)
Project Title: High Resolution and High Efficiency X-ray Transmission Grating Spectrometer
Significance: Baselined for Lynx X-ray gratings
Image Caption: SEM images of cleaved freestanding Critical-Angle Transmission (CAT) grating



PI: Randall Smith (SAO) & Alexander Bruccoleri (Izentis, LLC)
Project Title: Readying X-ray Gratings and Optics for Space Applications: Manufacturability & Alignment
Significance: Baselined for Lynx X-ray gratings
Image Caption: 200-mm wafer patterned with 16 ARCUS-style CAT gratings

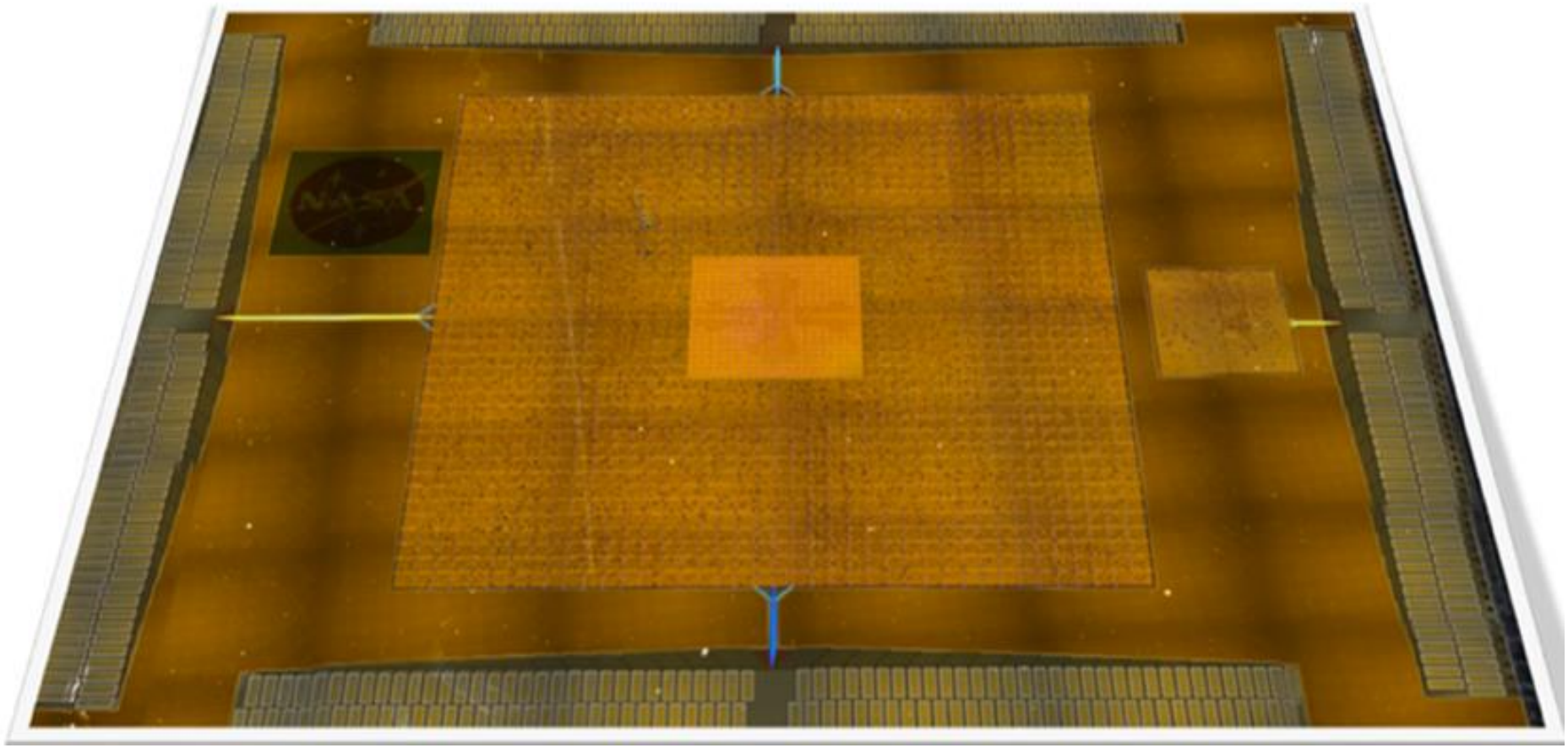


PI: Philip Mauskopf (ASU)
Project Title: Development of Low-Power FPGA-based Readout Electronics for Superconducting Detector Arrays
Significance: Fast readouts are crucial for large focal plane arrays in future missions
Image Caption: Auxiliary IF boards for reading out superconducting resonators with resonant frequencies from 0.1 – 8 GHz, implemented for ground-based Toltec experiment

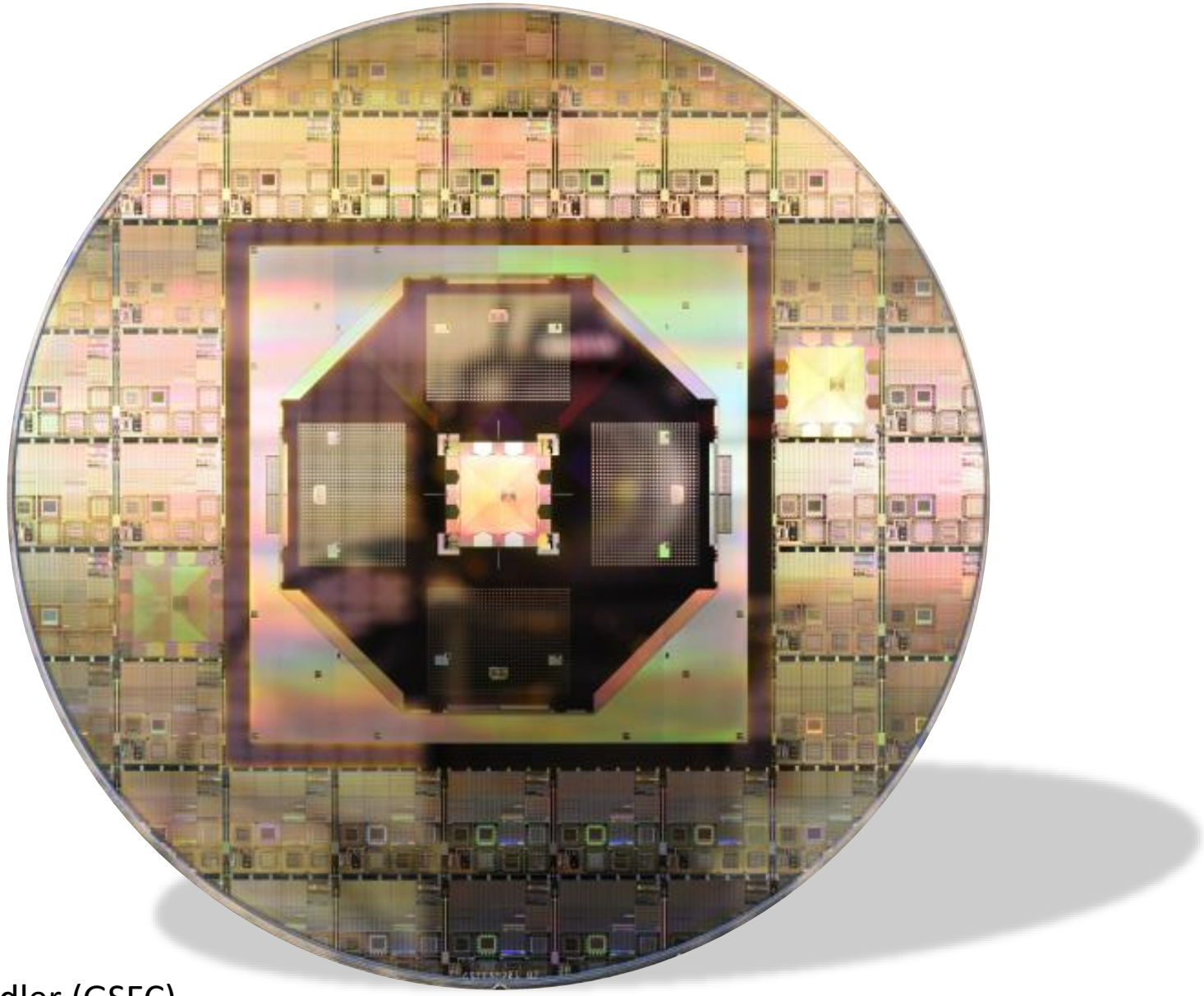


PI: Don Figer (RIT)
Project Title: A Single-Photon-Sensing and Photon-Number-Resolving Detector for NASA Missions
Significance: Low-noise detectors are crucial for future missions
Image Caption: One of three assembled detector boards in a panel

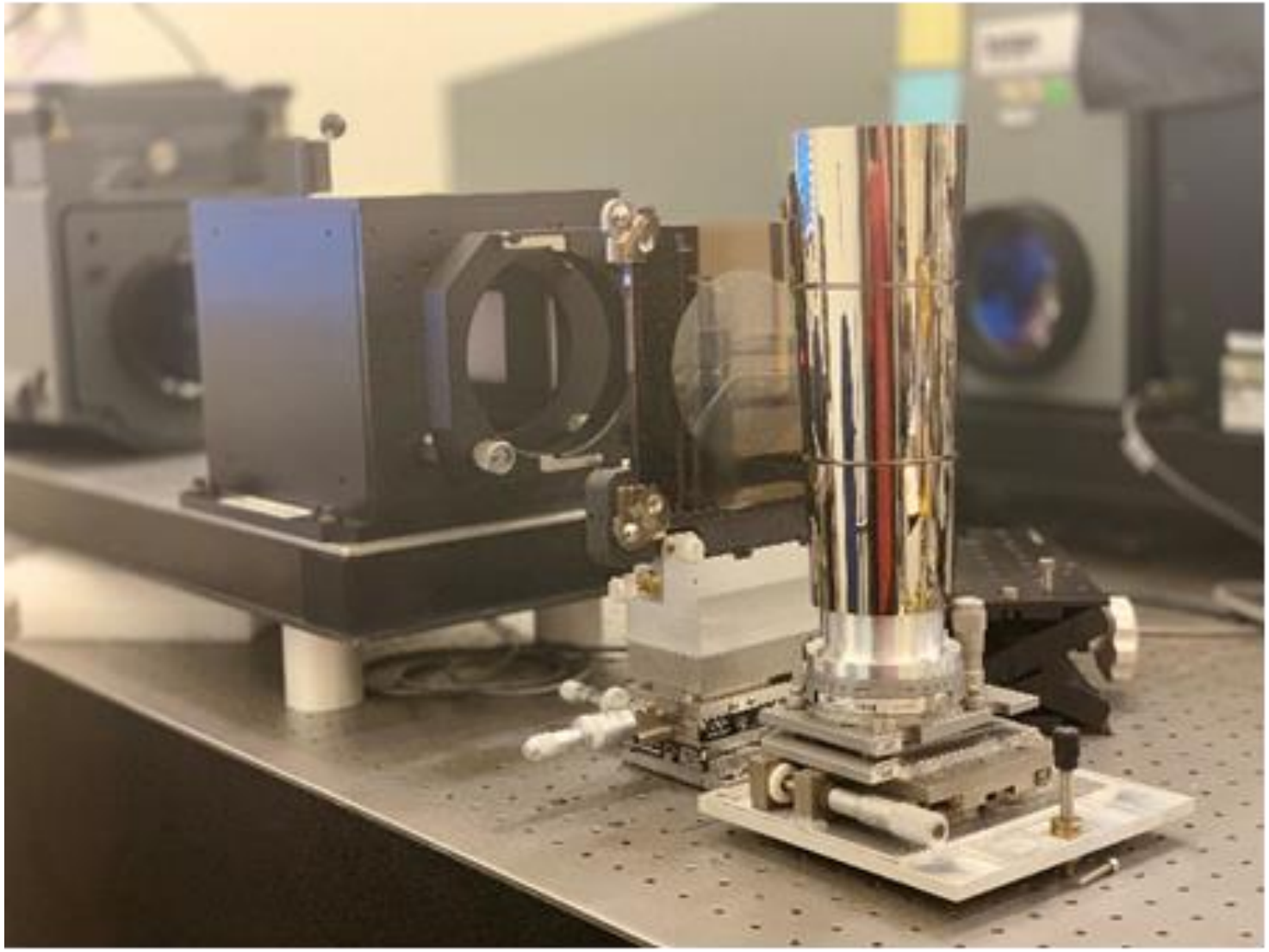
PI: Roger O'Brient (JPL/Caltech)
Project Title: Superconducting Detectors for CMB Polarimetry in PICO
Significance: CMB polarimetry is crucial for identifying echoes of the Big Bang
Image Caption: Field-testing detectors in BICEP (Antarctica)



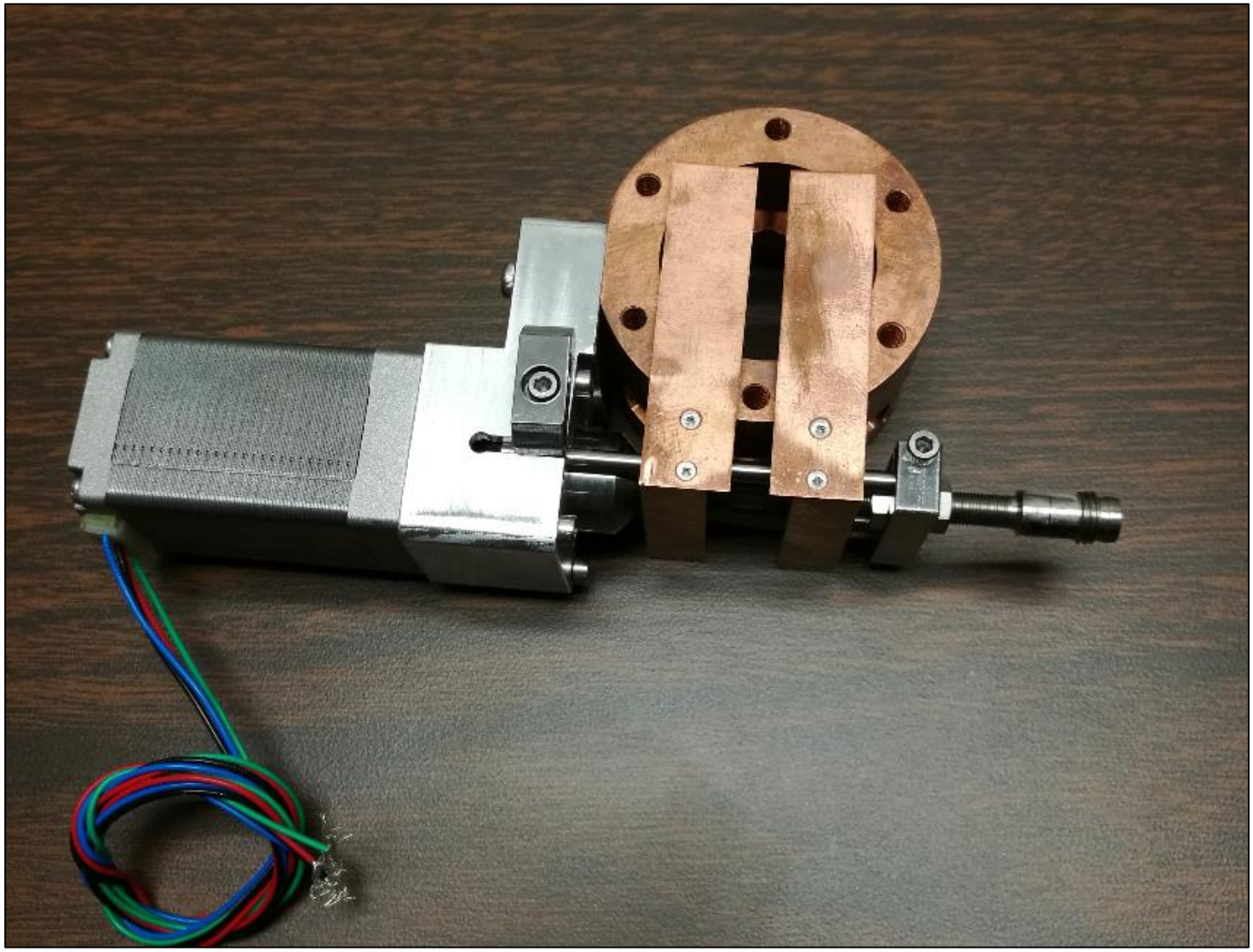
PI: Caroline Kilbourne (GSFC)
Project Title: Advanced X-ray Microcalorimeters: TES Microcalorimeters
Significance: TES microcalorimeters may enable future X-ray missions such as Lynx
Image Caption: First prototype Lynx TES arrays with 25 absorbers



PI: Simon Bandler (GSFC)
Project Title: Magnetically-Coupled Microcalorimeter Arrays for X-ray Astrophysics
Significance: MMCs may enable future X-ray missions such as Lynx
Image Caption: 8” wafer with 4” MMC core



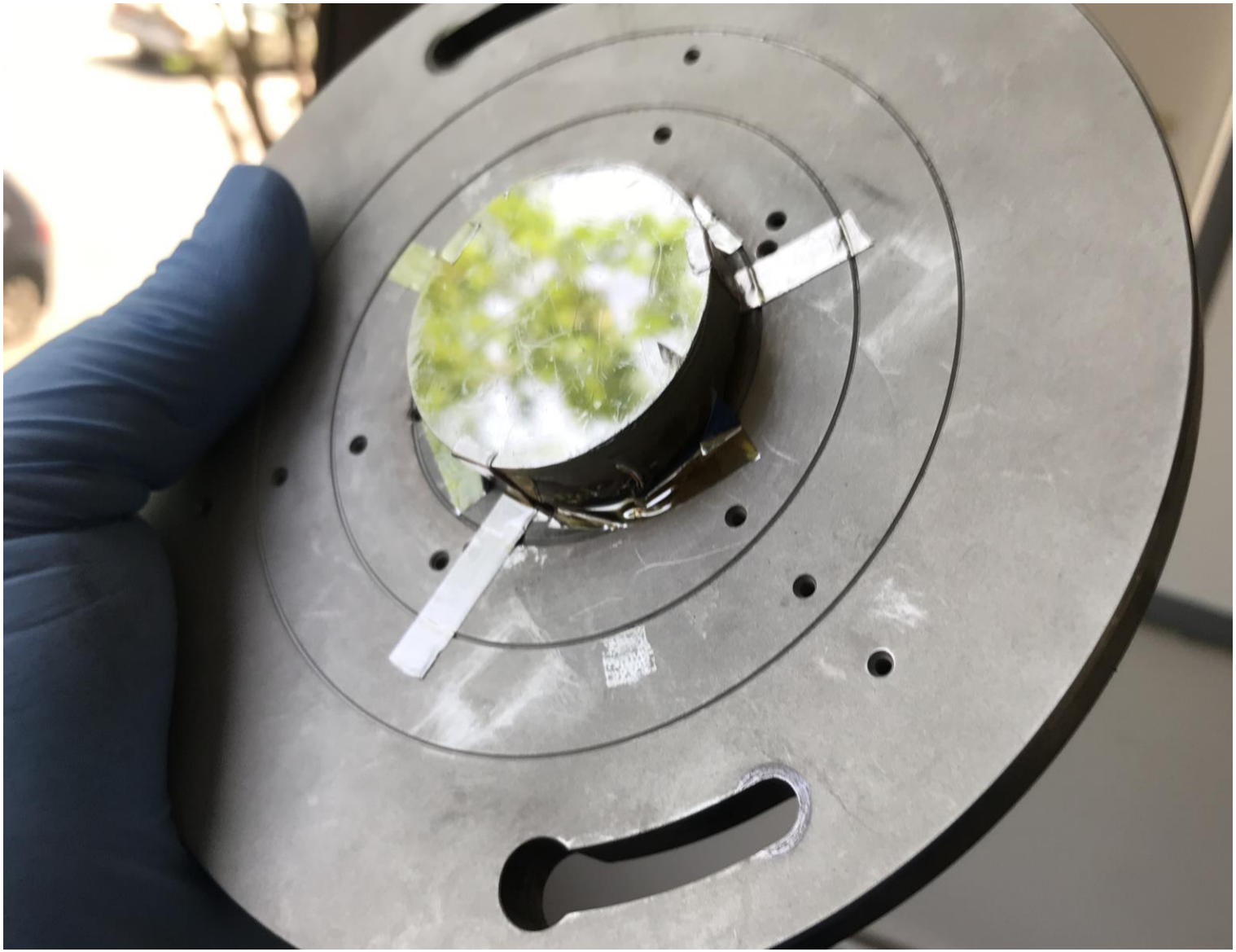
PI: Jacqueline Davis (MSFC)
Project Title: Advanced X-ray Optics: Computer-Controlled Polishing of High-Quality Mandrels
Significance: High-quality X-ray optics may enable Explorers and other missions
Image Caption: High-resolution metrology to measure polished mandrel



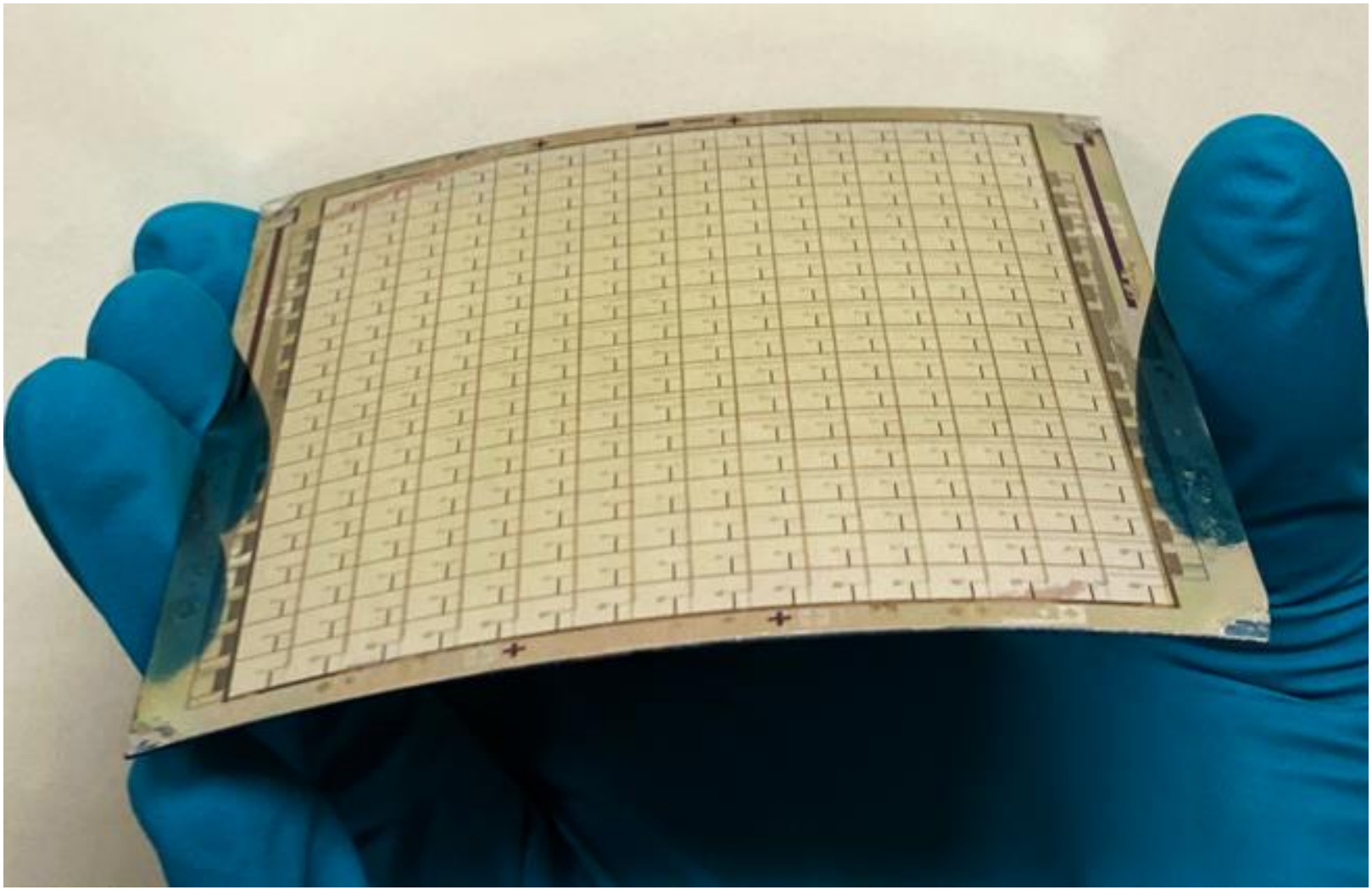
PI: Kiranmayee Kilaru (MSFC)
Project Title: Advanced X-ray Optics: Differential Deposition for Figure Correction in X-Ray Optics
Significance: High-quality X-ray optics may enable Explorers and other missions
Image Caption: Active slit for differential deposition

PI: Stephen Bongiorno (MSFC)
Project Title: Advanced X-ray Optics: Full-shell direct polishing
Significance: High-quality X-ray optics may enable Explorers and other missions
Image Caption: Mandrel being polished

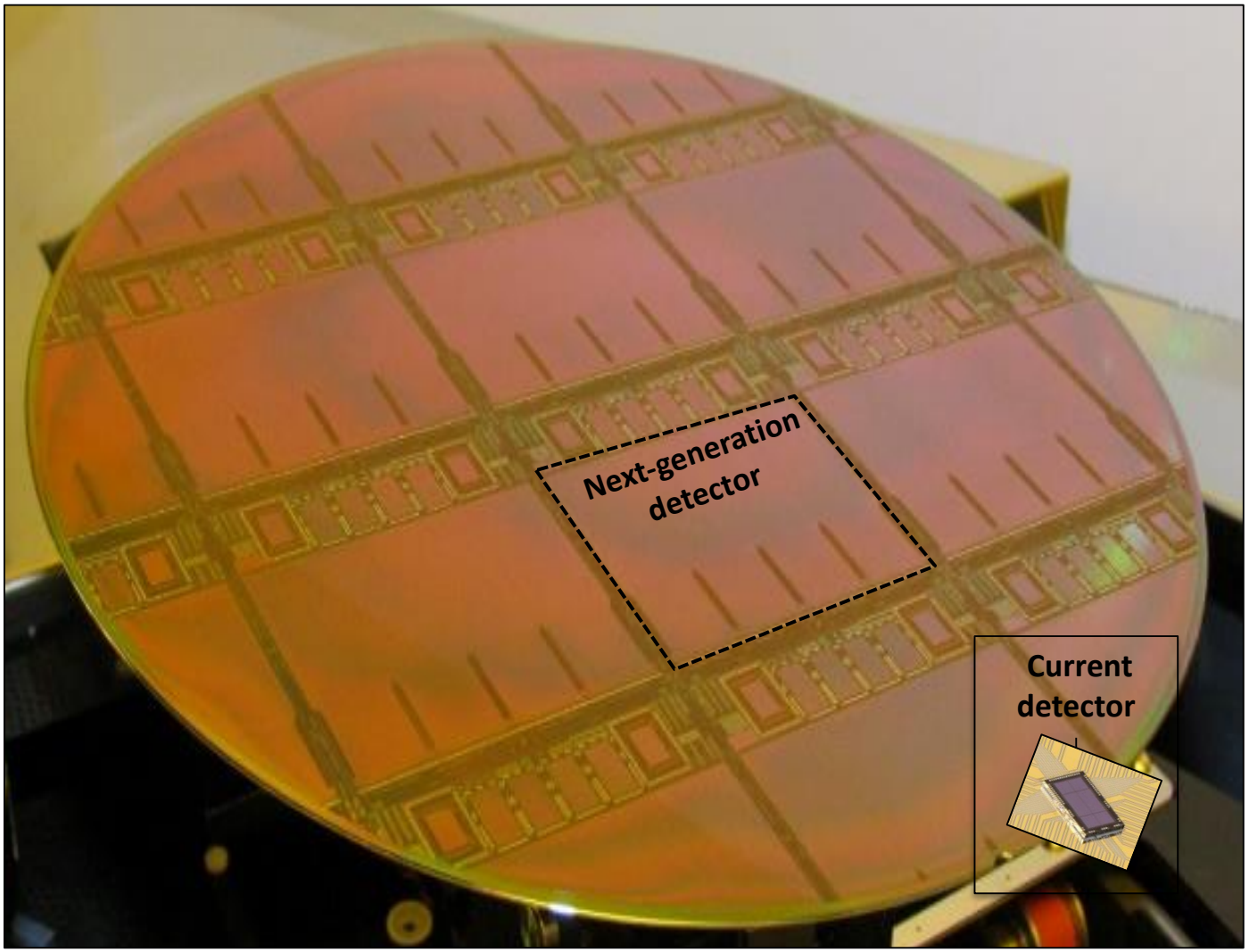
PI: David Broadway (MSFC)
Project Title: Advanced X-ray Optics: Mirror Coatings
Significance: High-quality X-ray optics may enable Explorers and other missions
Image Caption: Hi-C primary EUV multilayer mirror



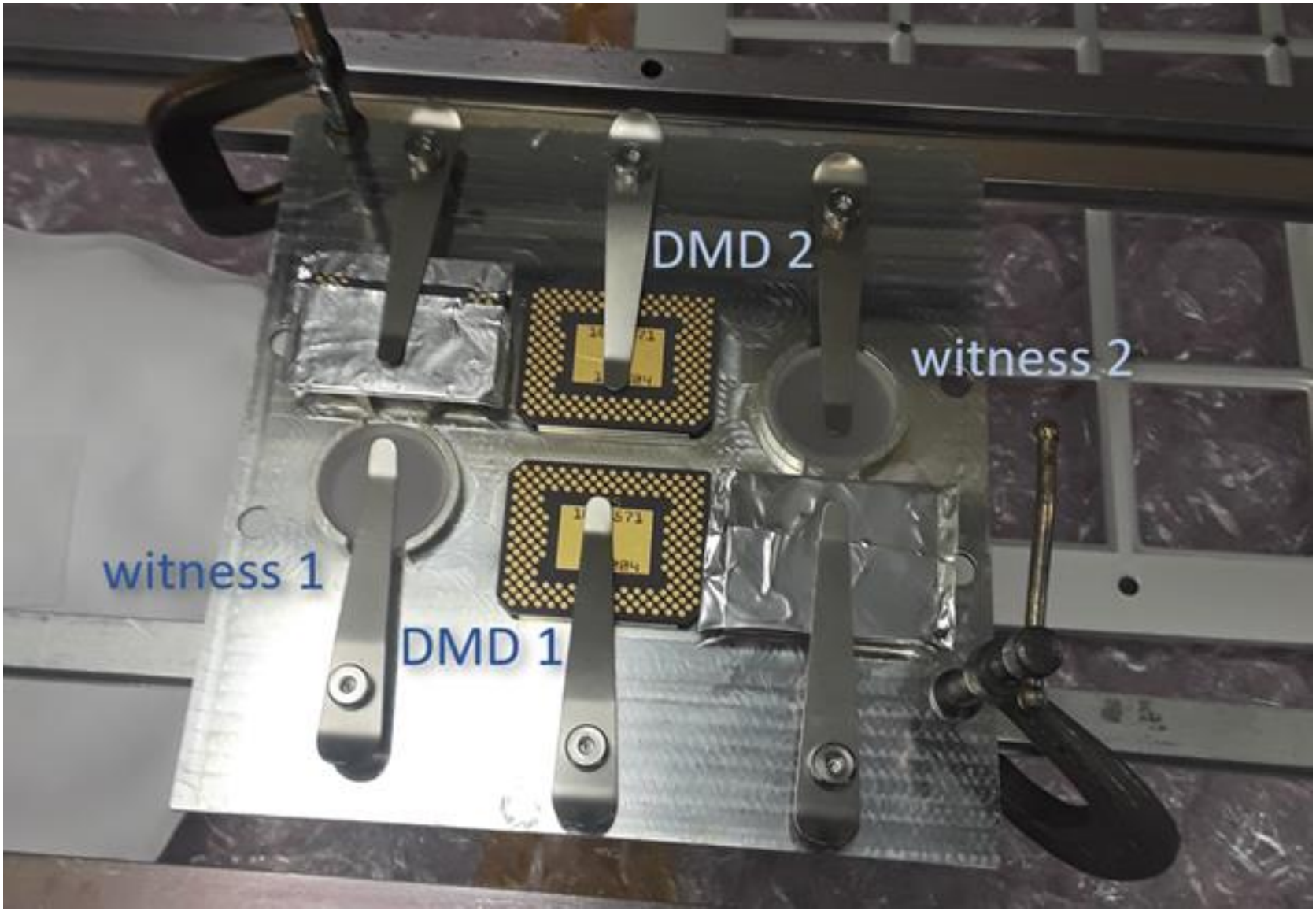
PI: David Broadway (MSFC)
Project Title: Advanced X-ray Optics: Hybrid X-Ray Optics by Additive Manufacturing
Significance: High-quality X-ray optics may enable Explorers and other missions
Image Caption: Polyimide aerogel



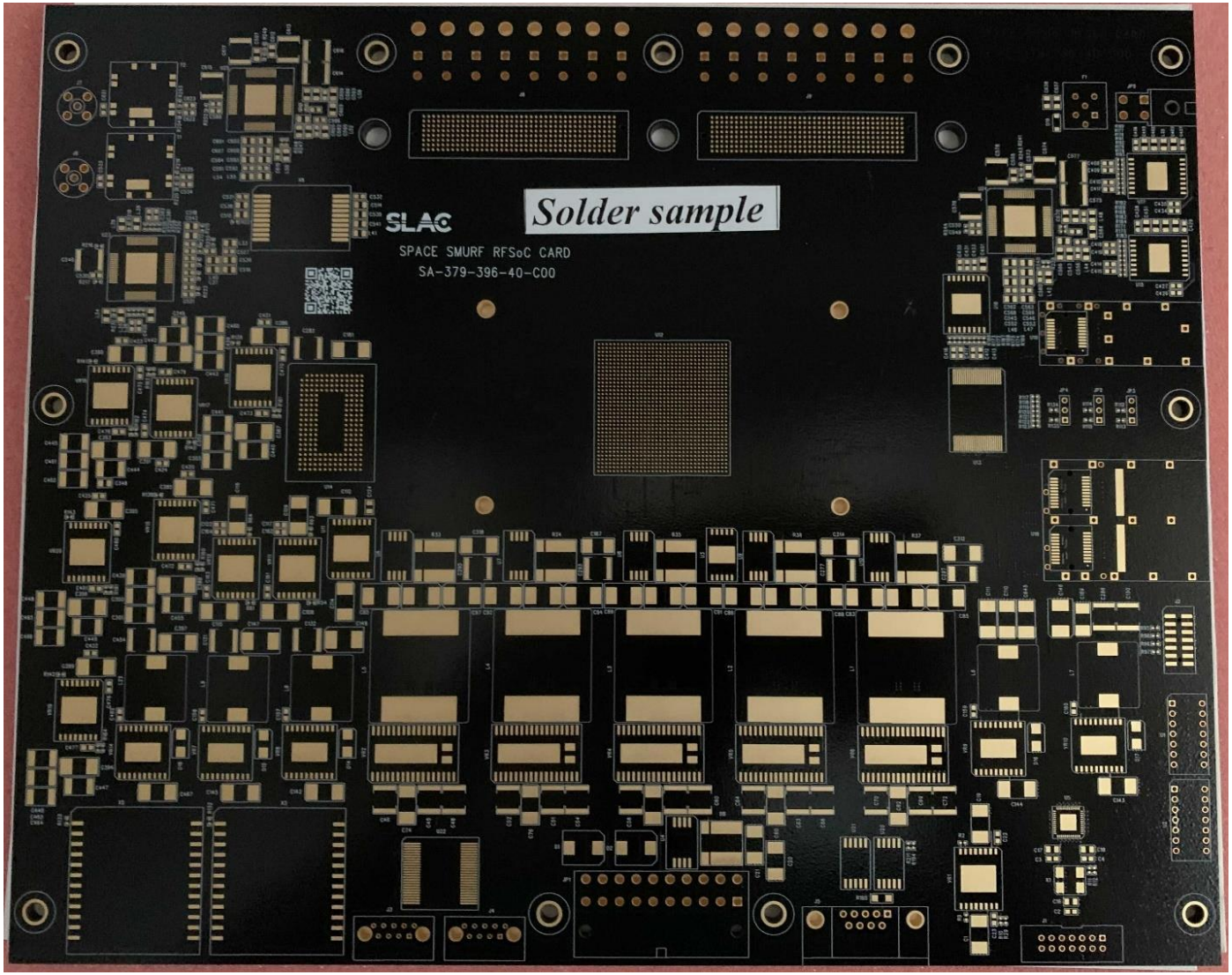
PI: Paul Reid (SAO)
Project Title: Adjustable X-Ray Optics
Significance: Adjustable X-ray optics are a backup technology for Lynx
Image Caption: Back side of X-ray mirror segment with row-column ZnO TFTs, ESD circuits, and piezo cells



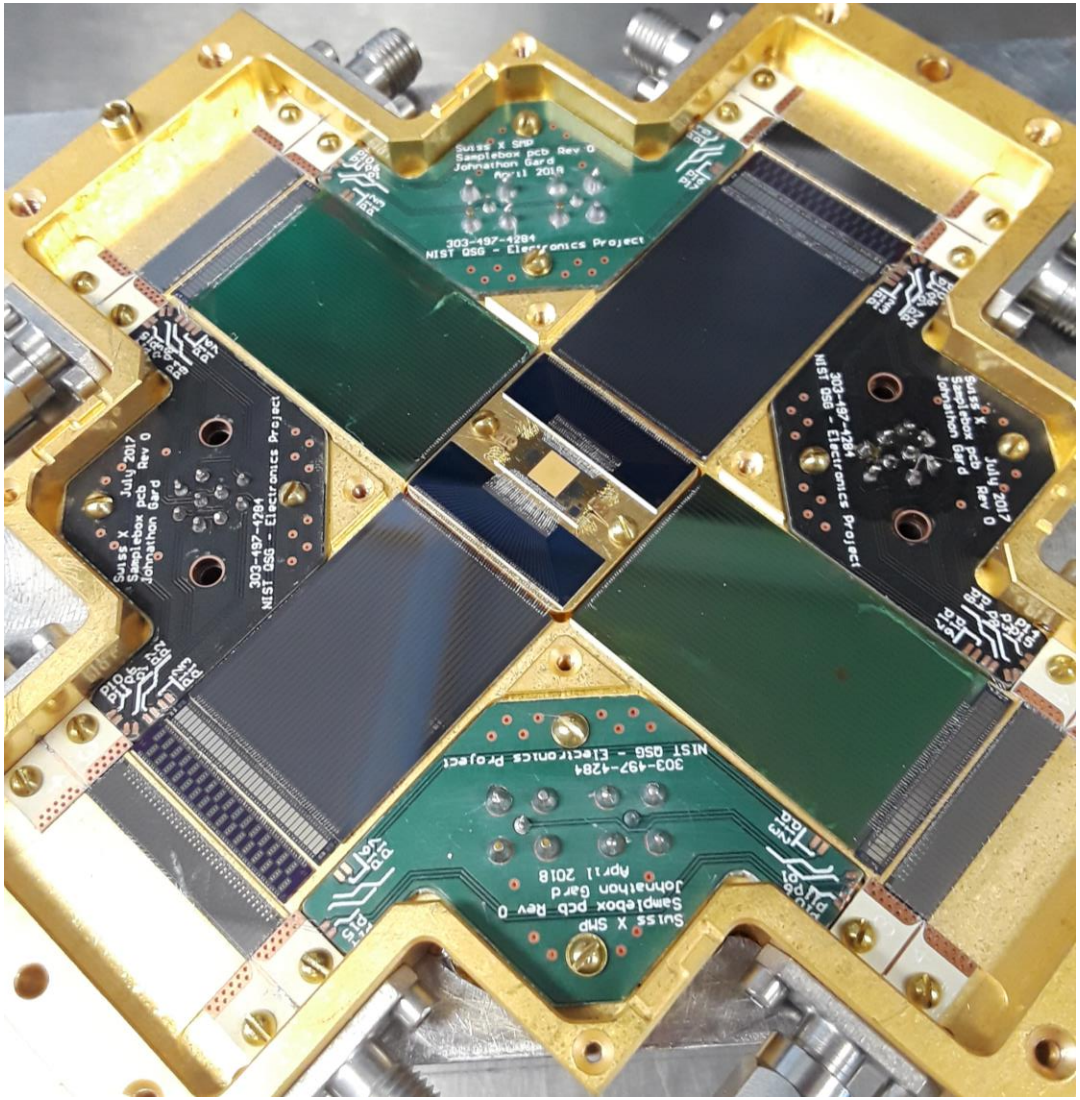
PI: Mark Bautz (MIT Kavli Institute for Astrophysics and Space Research)
Project Title: Toward Fast, Low-Noise, Radiation Tolerant X-ray Imaging Arrays for Lynx: Raising Technology Readiness Further
Significance: Advanced X-ray detectors may enable Lynx
Image Caption: Six next-generation devices on 200-mm wafer. Inset shows current, much smaller sensor



PI: Zoran Ninkov (RIT)
Project Title: Development of Digital Micromirror Devices for Far-UV Applications
Significance: May enable multi-object spectrometry in future missions
Image Caption: COTS DMDs being recoated

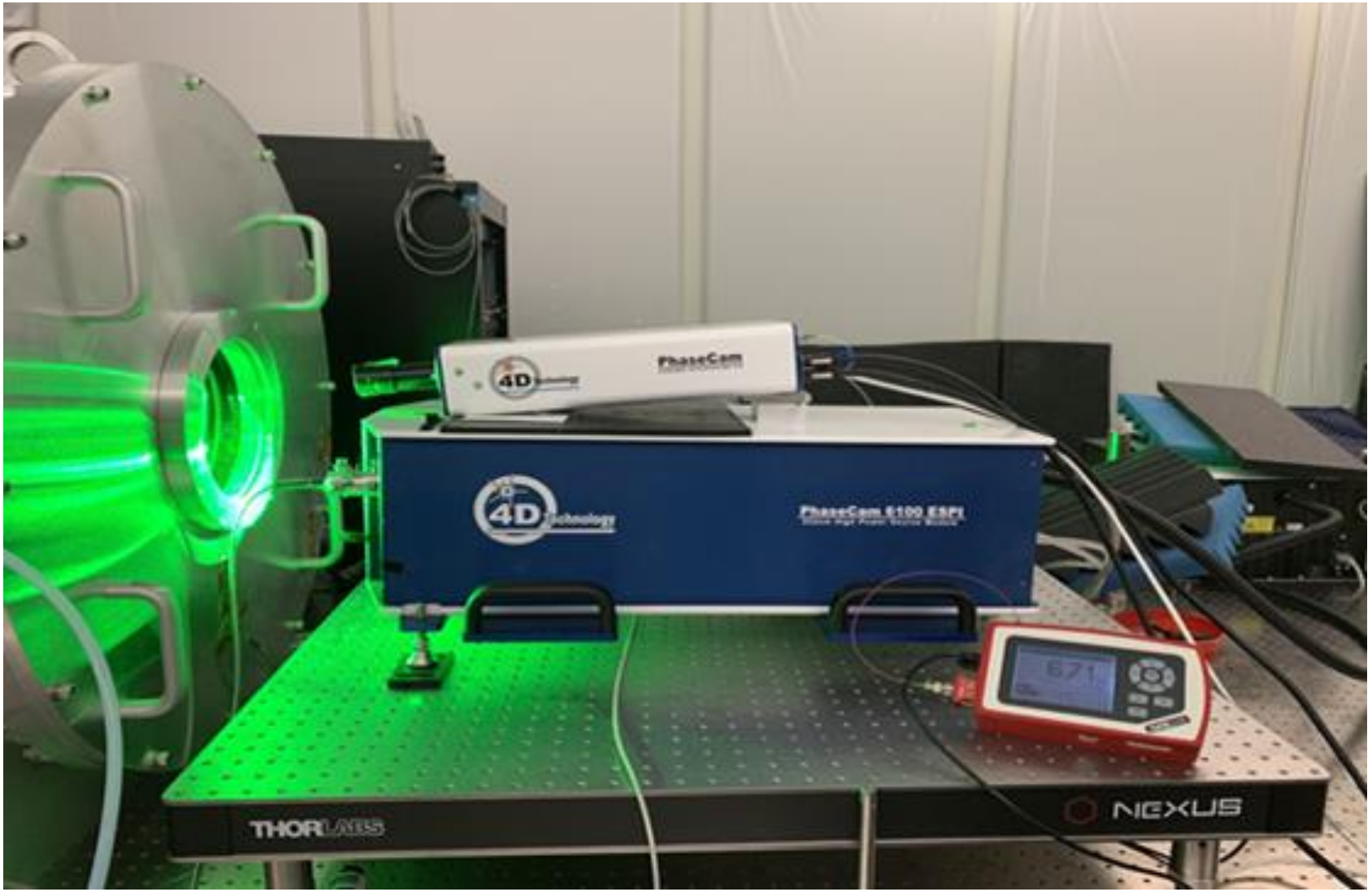


PI: Josef Frisch (SLAC)
Project Title: Advancing High-Density Readout Technology for Superconducting Sensor Arrays for Spaceflight
Significance: High-density readout may enable large focal planes in future missions
Image Caption: RFSoC board

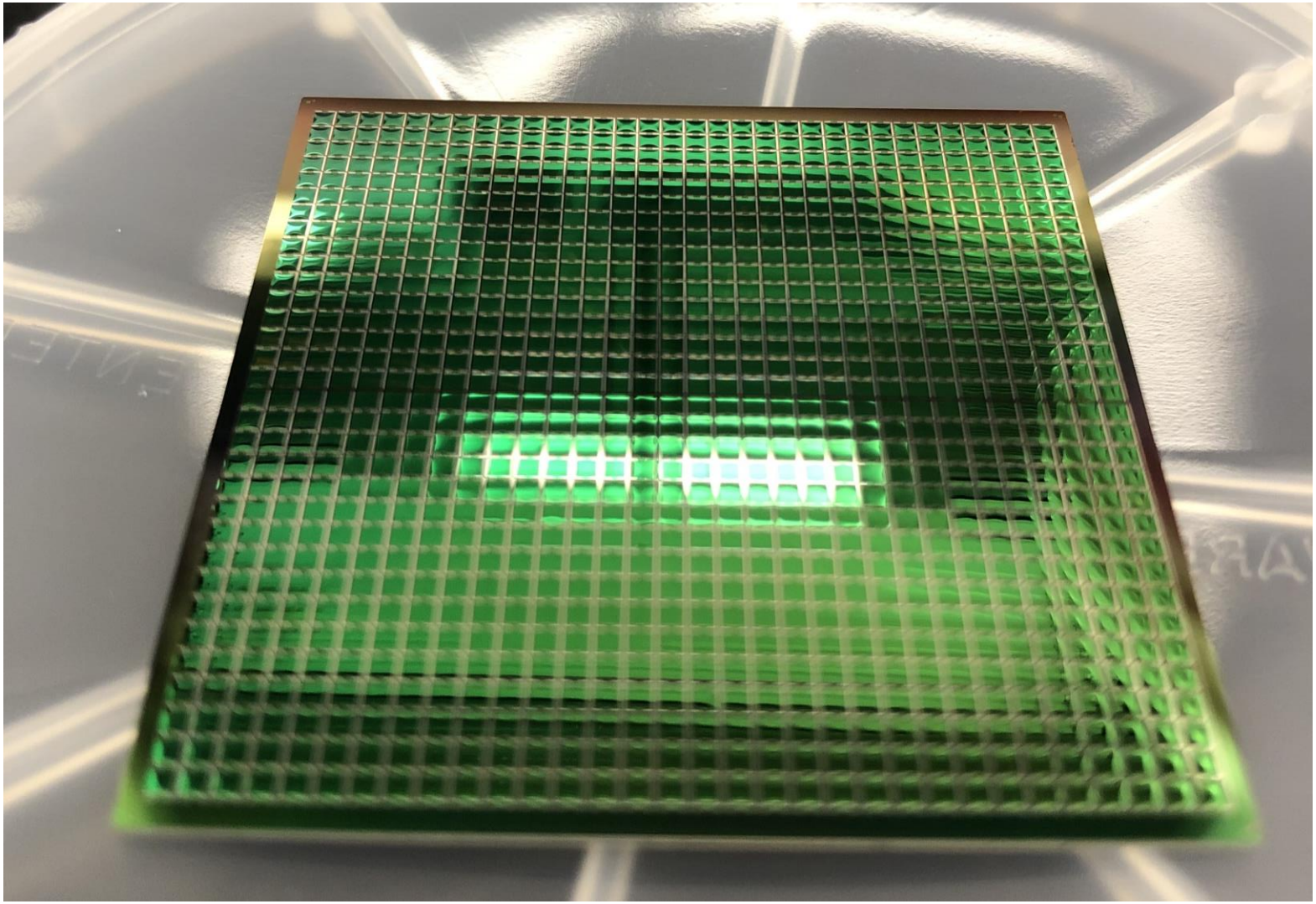


PI: Douglas Bennett (NIST)
Project Title: Technology development for Microwave SQUID multiplexing for the Lynx X-ray Observatory
Significance: May enable the Lynx mission
Image Caption: Measuring hydra TESs using µMUX

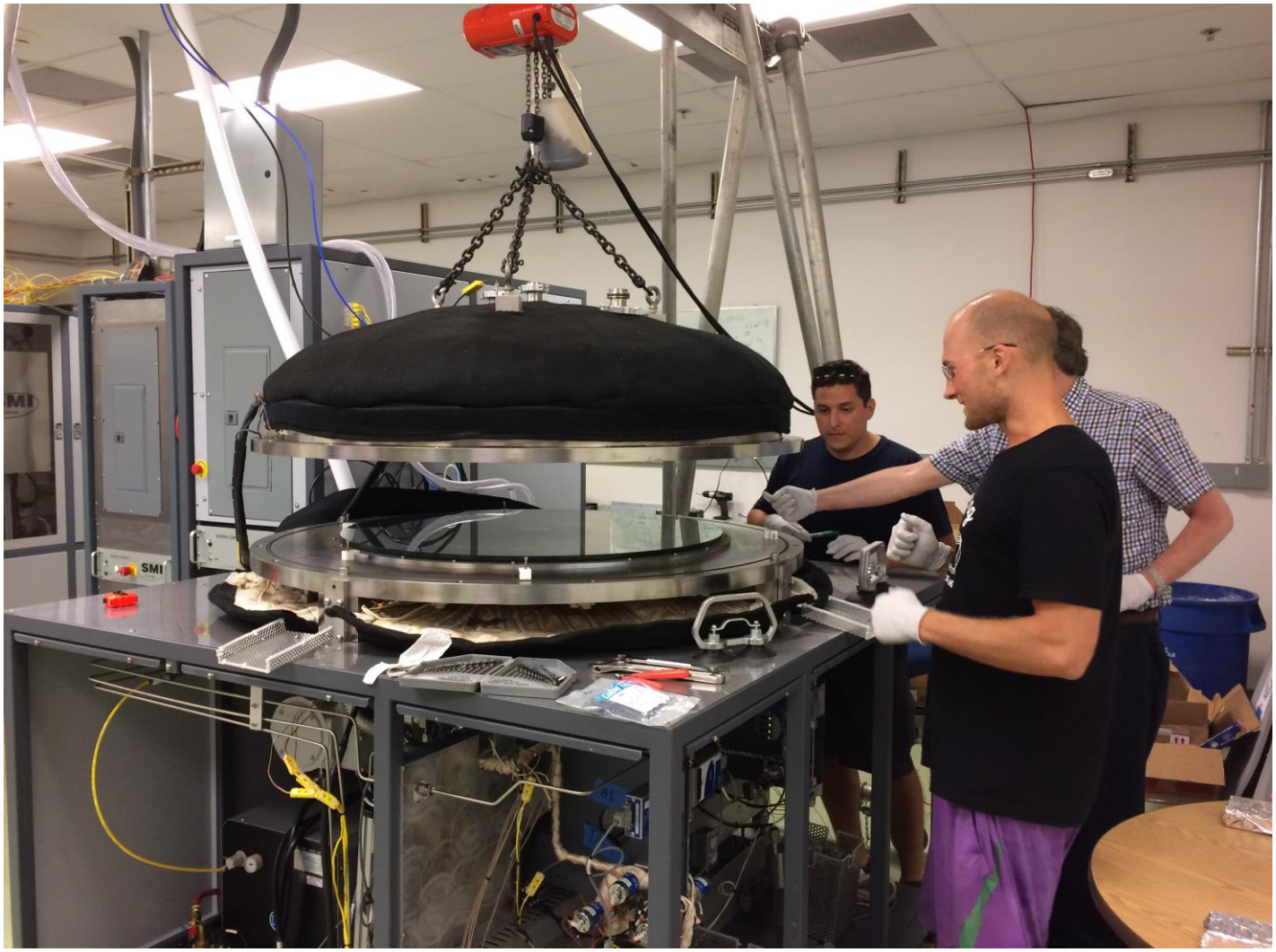
PI: James Tuttle (GSFC)
Project Title: High-Efficiency Continuous Cooling for Cryogenic Instruments and sub-Kelvin Detectors
Significance: Baselined by the Lynx, Origins, PICO, and GEP
Image Caption: Two-stage 10K-to-4-K Continuous Adiabatic Demagnetization Refrigerator (CADR)



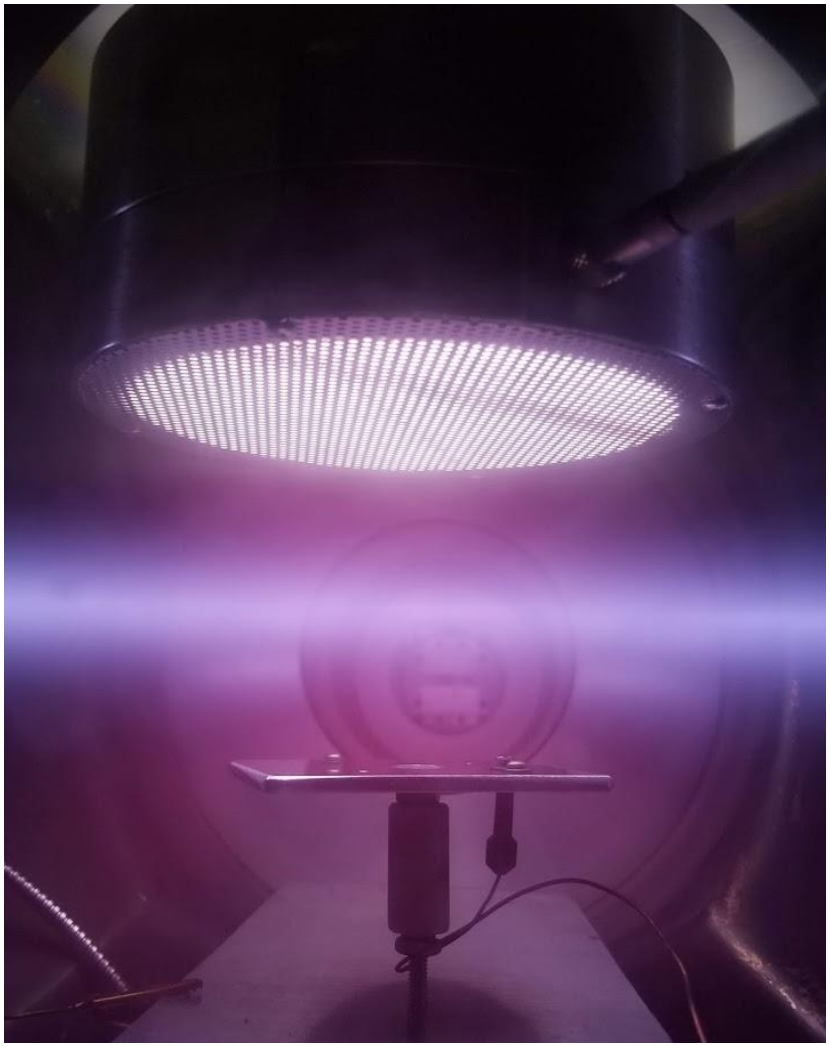
PI: Babak Saif (GSFC)
Project Title: Ultra-Stable Structures
Significance: May enable the HabEx and LUVOIR missions
Image Caption: Speckle interferometer for ultra-precise measurements of non-reflective objects



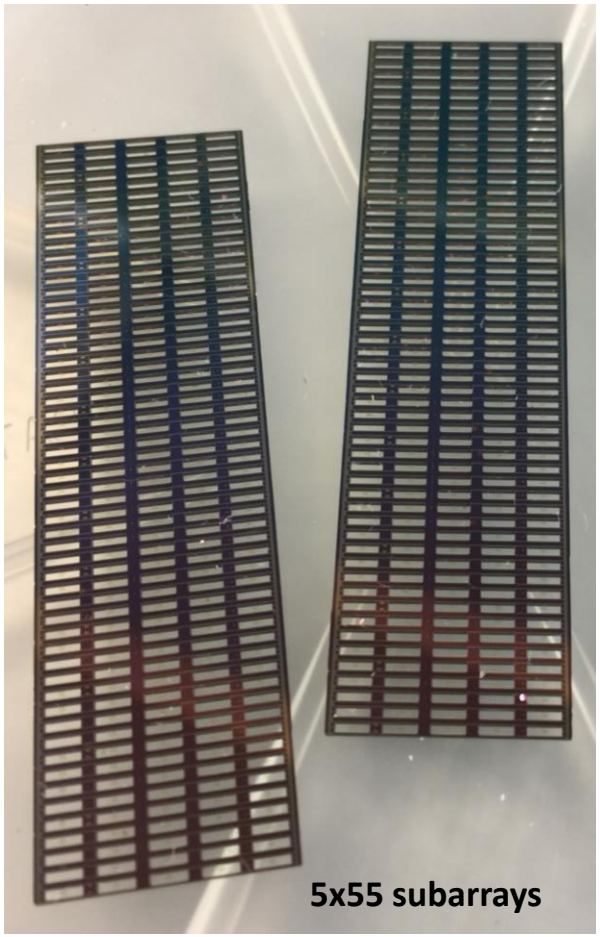
PI: Johannes Staguhn (JHU & GSFC)
Project Title: Development of a Robust, Efficient Process to Produce Scalable, Superconducting Kilopixel Far-IR Detector Arrays
Significance: May enable the Origins mission
Image Caption: Far-IR detector array

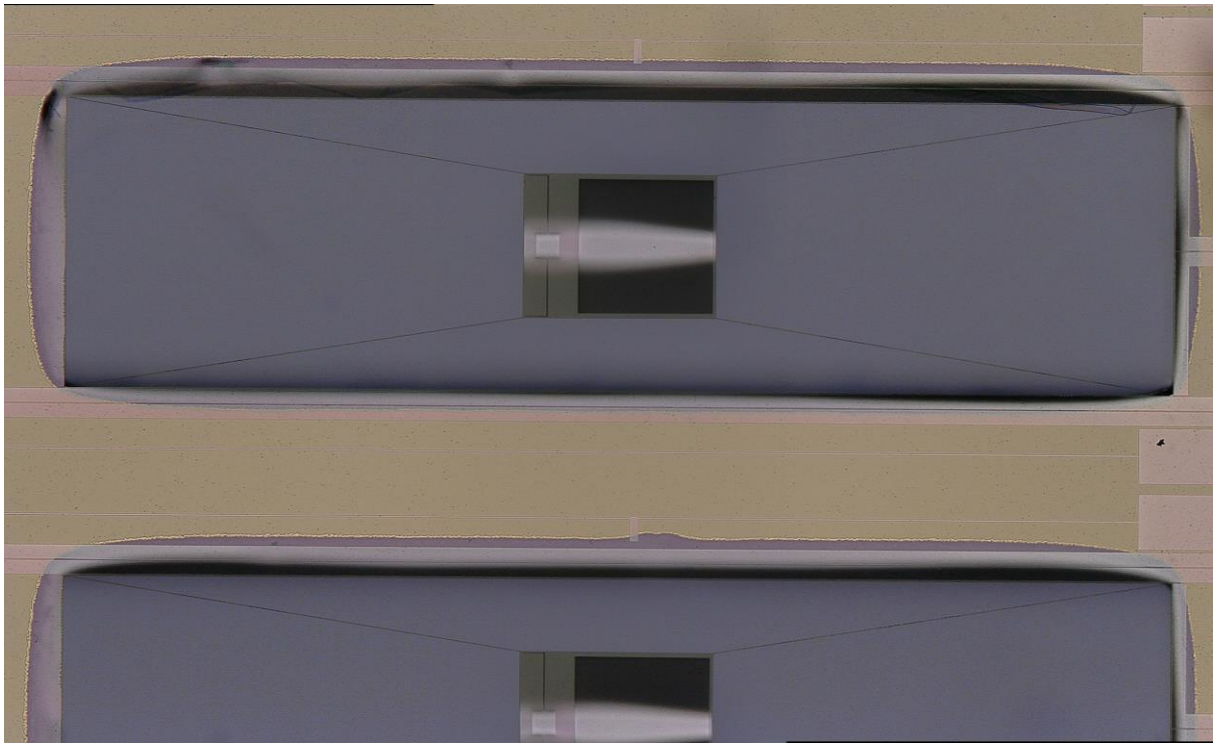


PI: John Hennessy (JPL)
Project Title: High-Performance, Stable, and Scalable UV Aluminum Mirror Coatings Using ALD
Significance: May enable future far-UV missions
Image Caption: Custom 0.9-m ALD tool, developed to coat ground-based astronomical mirrors for ALD-protected silver

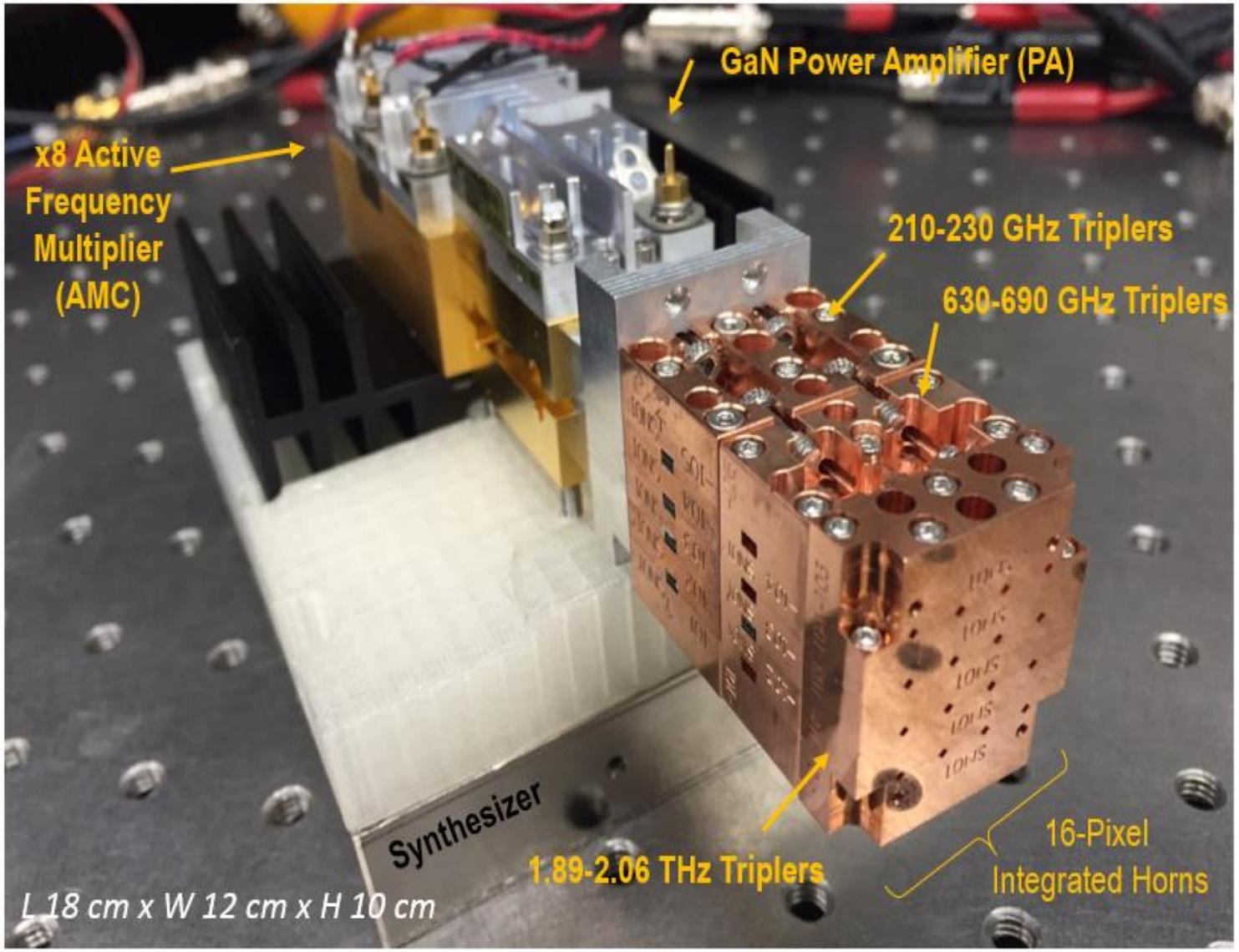


PI: Manuel Quijada (GSFC)
Project Title: E-Beam-Generated Plasma Etching for Developing High-Reflectance Mirrors for Far-Ultraviolet Astronomical Instrument Applications
Significance: May enable future far-UV missions
Image Caption: Large Area Plasma Processing System (LAPPS) at NRL used for removing oxidation from aluminum optics

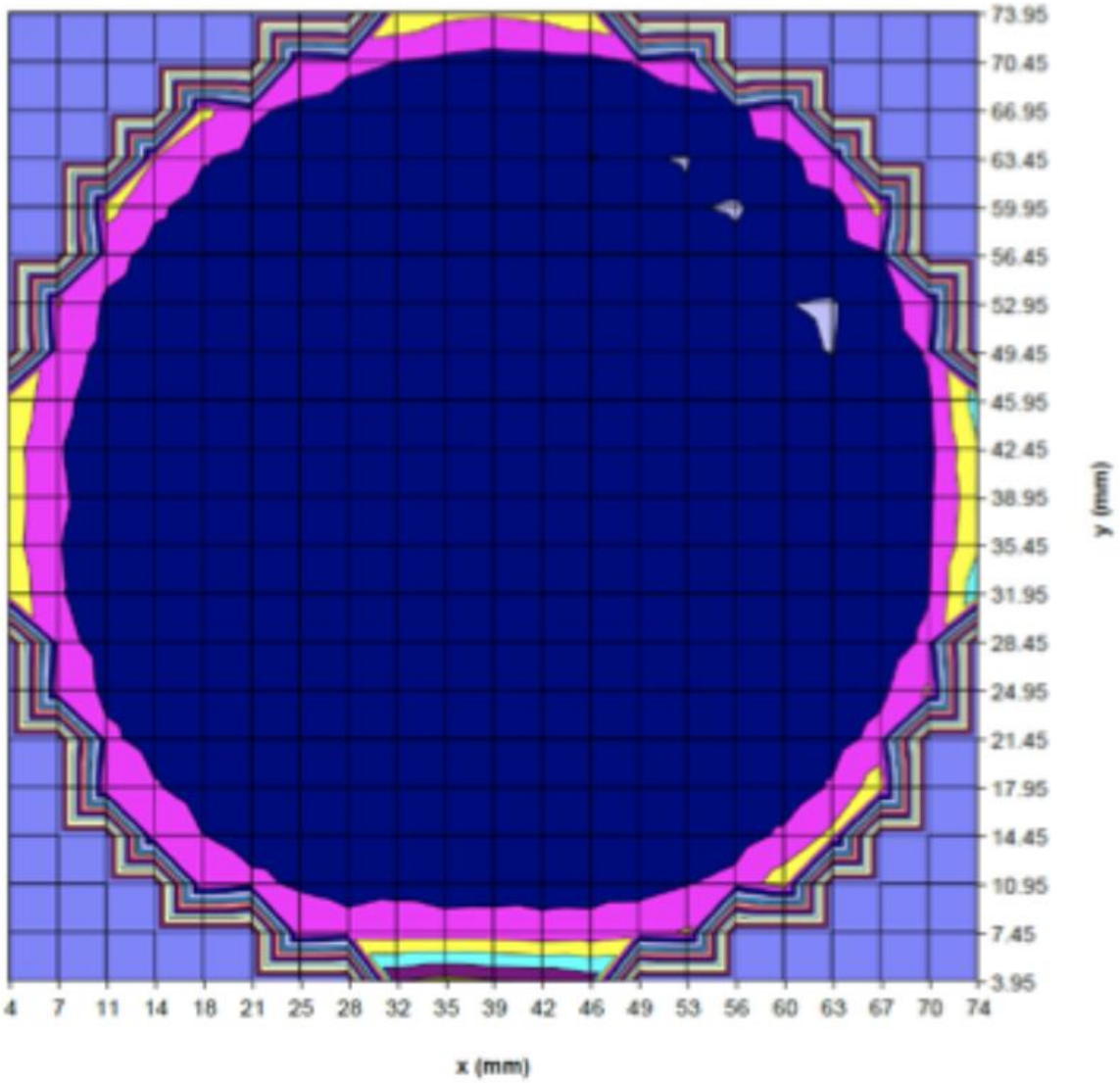




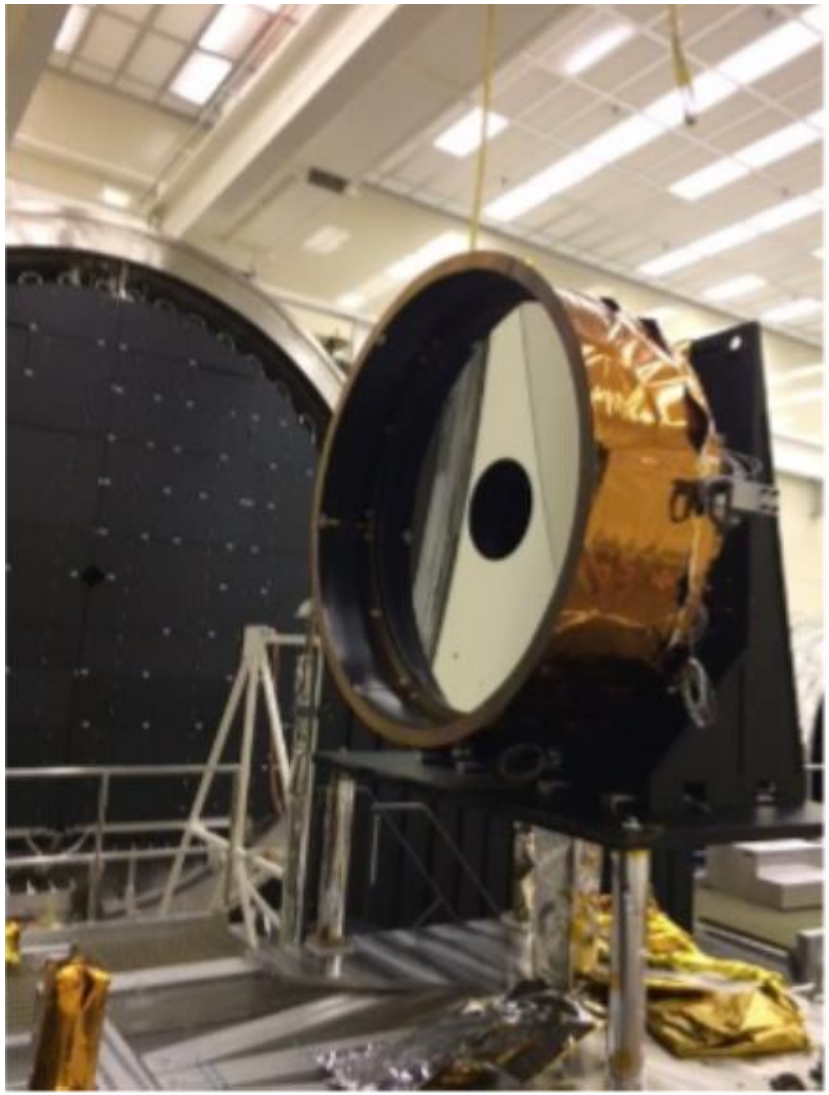
PI: C. Matt Bradford (JPL)
Project Title: Ultra-Sensitive Bolometers for Far-IR Space Spectroscopy at the Background Limit
Significance: May enable future far-IR missions
Image Caption: Initial TES bolometer fabrication



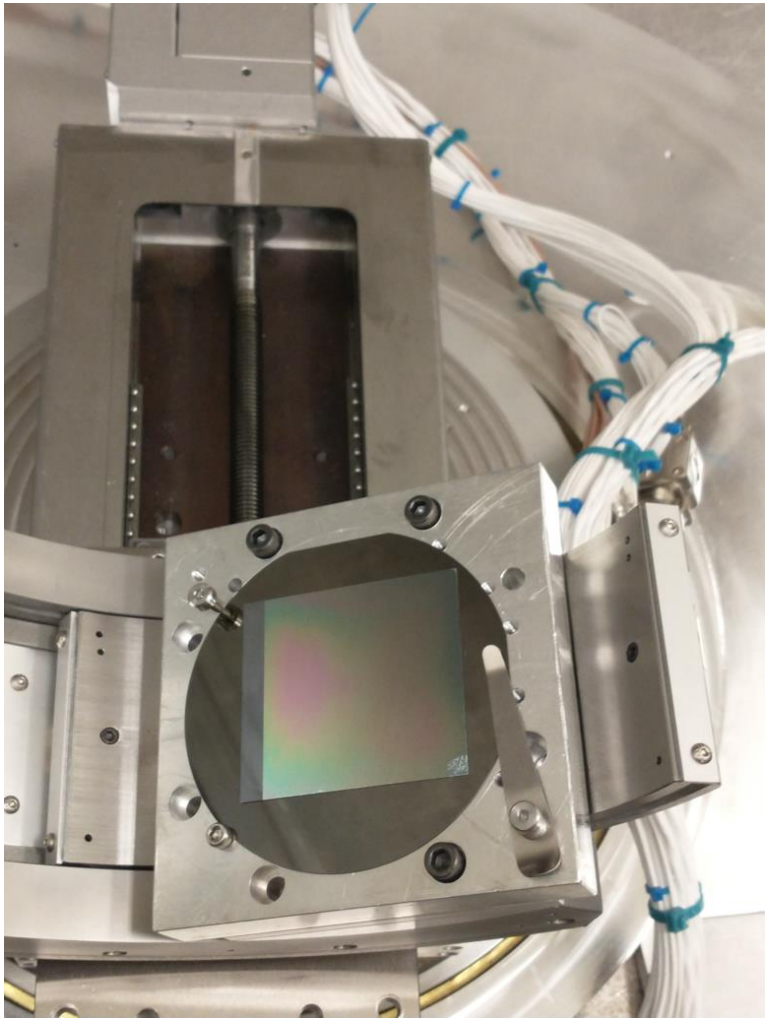
PI: Imran Mehdi (JPL)
Project Title: Development of High-Resolution Far-Infrared Arrays
Significance: May enable future far-IR missions
Image Caption: 16-Pixel 1.9-2.06 THz Local Oscillator Subsystem

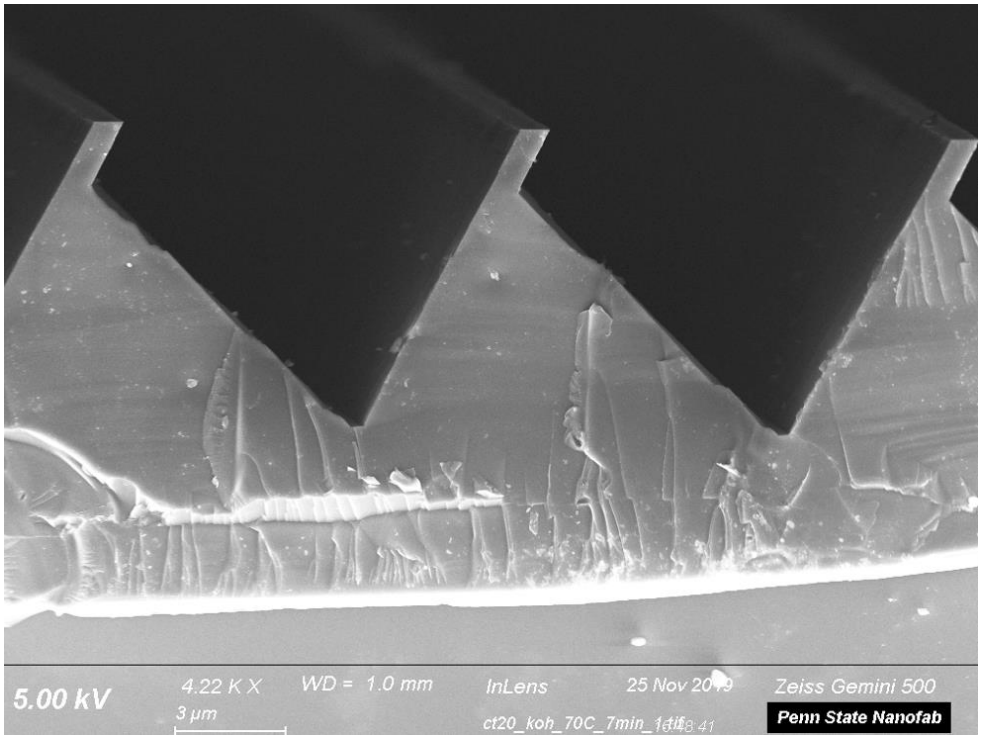


PI: Michael Bottom (U. of Hawaii)
Project Title: Photon counting NIR LmAPD Arrays for Ultra-low Background Space Observations
Significance: May enable spectroscopy of extrasolar planets
Image Caption: Growth uniformity of wafer yielding six usable sites for 1k×1k LmAPD detector

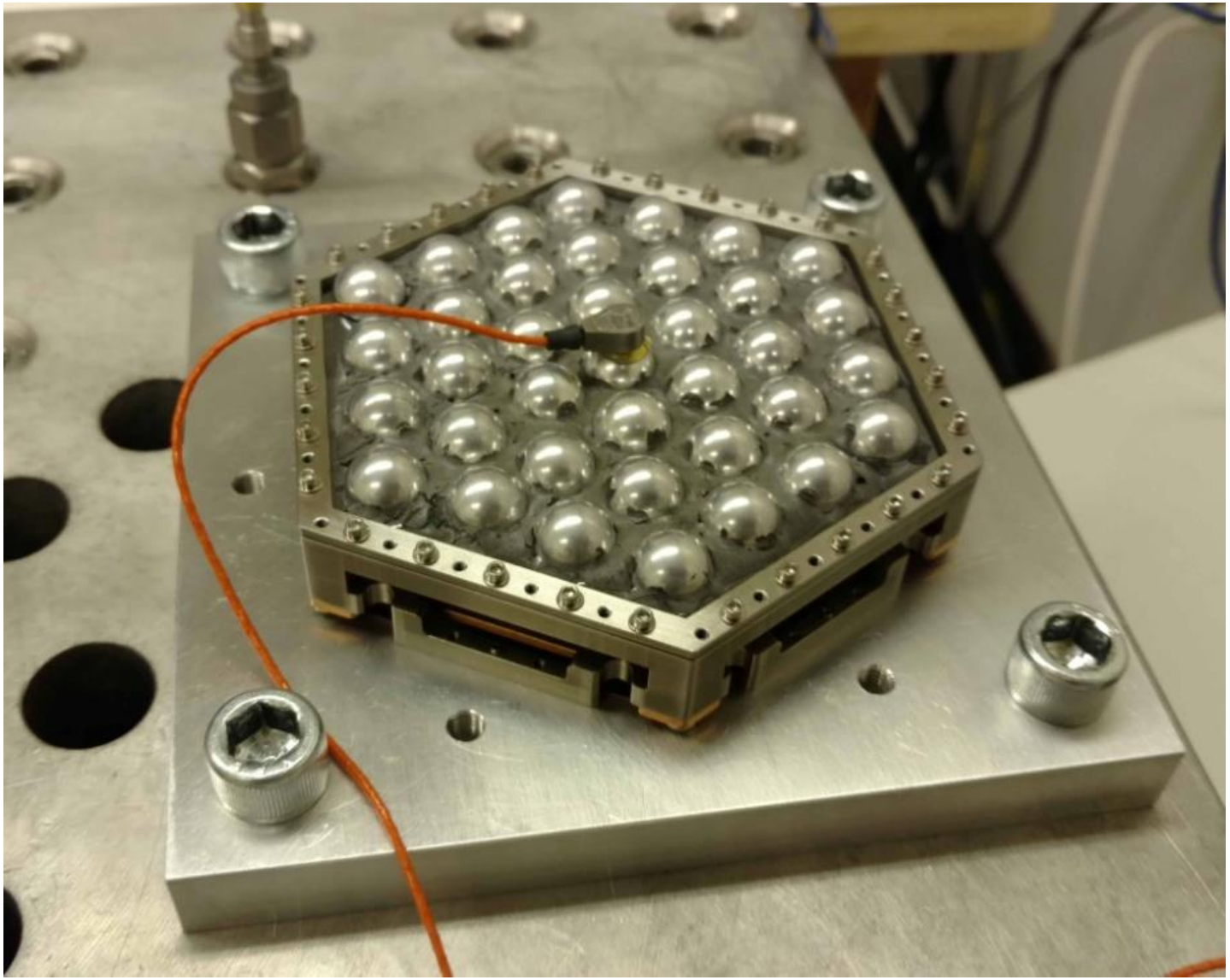


PI: H. Philip Stahl (MSFC)
Project Title: Predictive Thermal Control (PTC) Technology to enable Thermally Stable Telescopes
Significance: May enable required ultra-stability for HabEx and LUVOIR missions
Image Caption: 1.5-m AMTD-2 ULE® mirror in active thermal enclosure

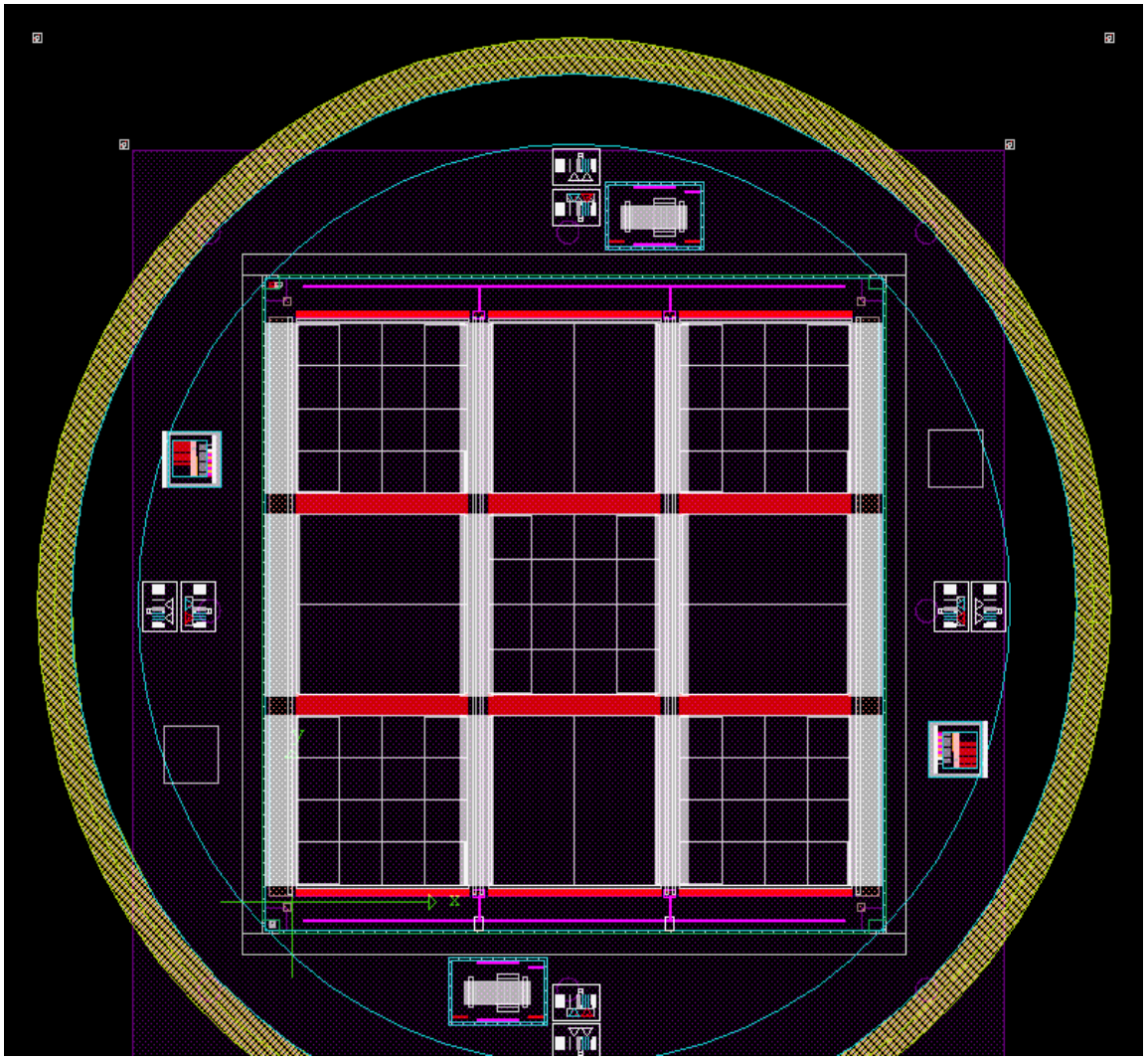




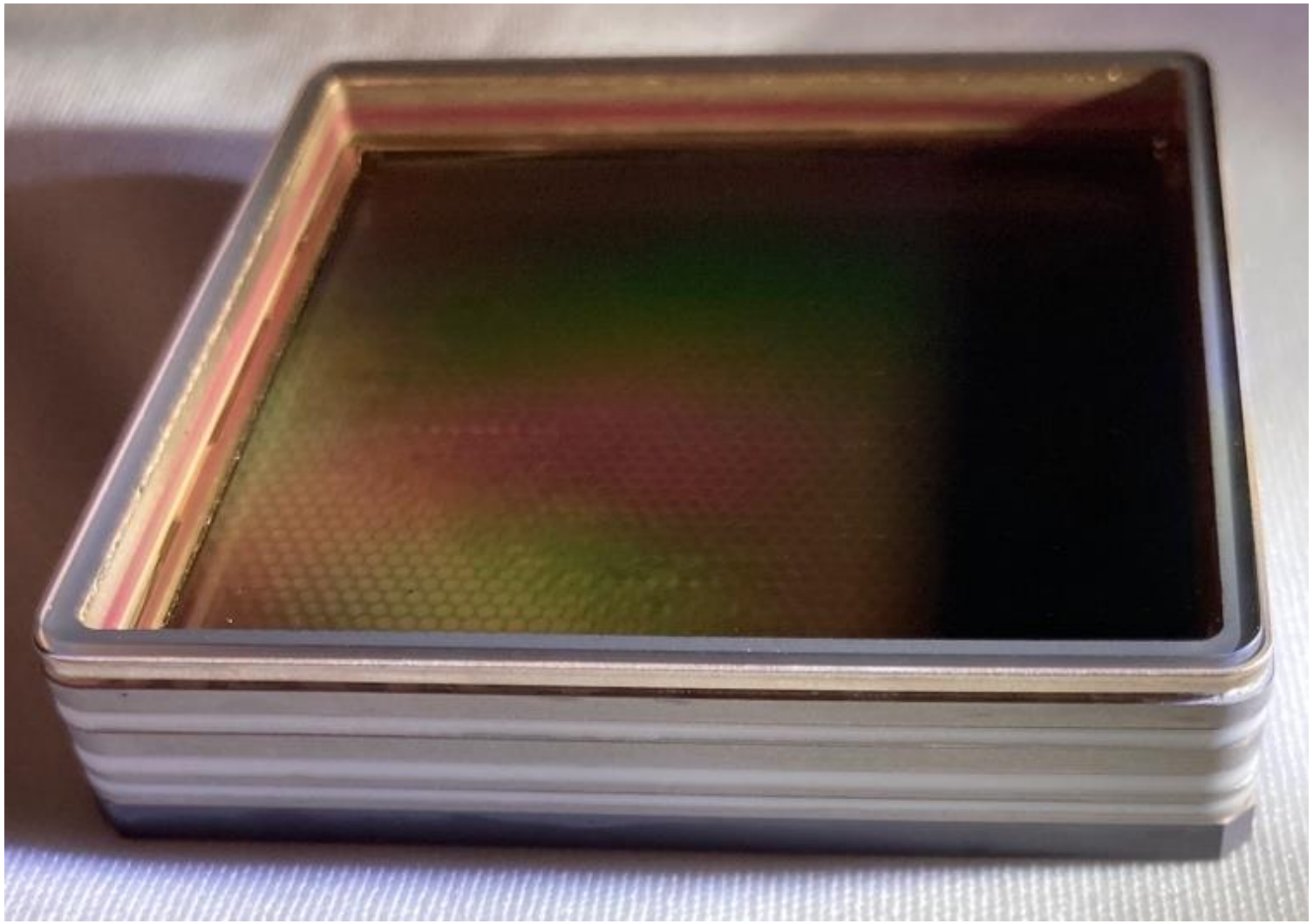
PI: Brian Fleming (U. of Colorado)
Project Title: Electron-Beam-Lithography Ruled Gratings for Future UV/Optical Missions: High Efficiency and Low Scatter in the Vacuum UV
Significance: May enable future UV/optical spectroscopic missions; enables current UV suborbital missions
Image Caption: Protoflight CHESS echelle grating and SEM image of ruled grating



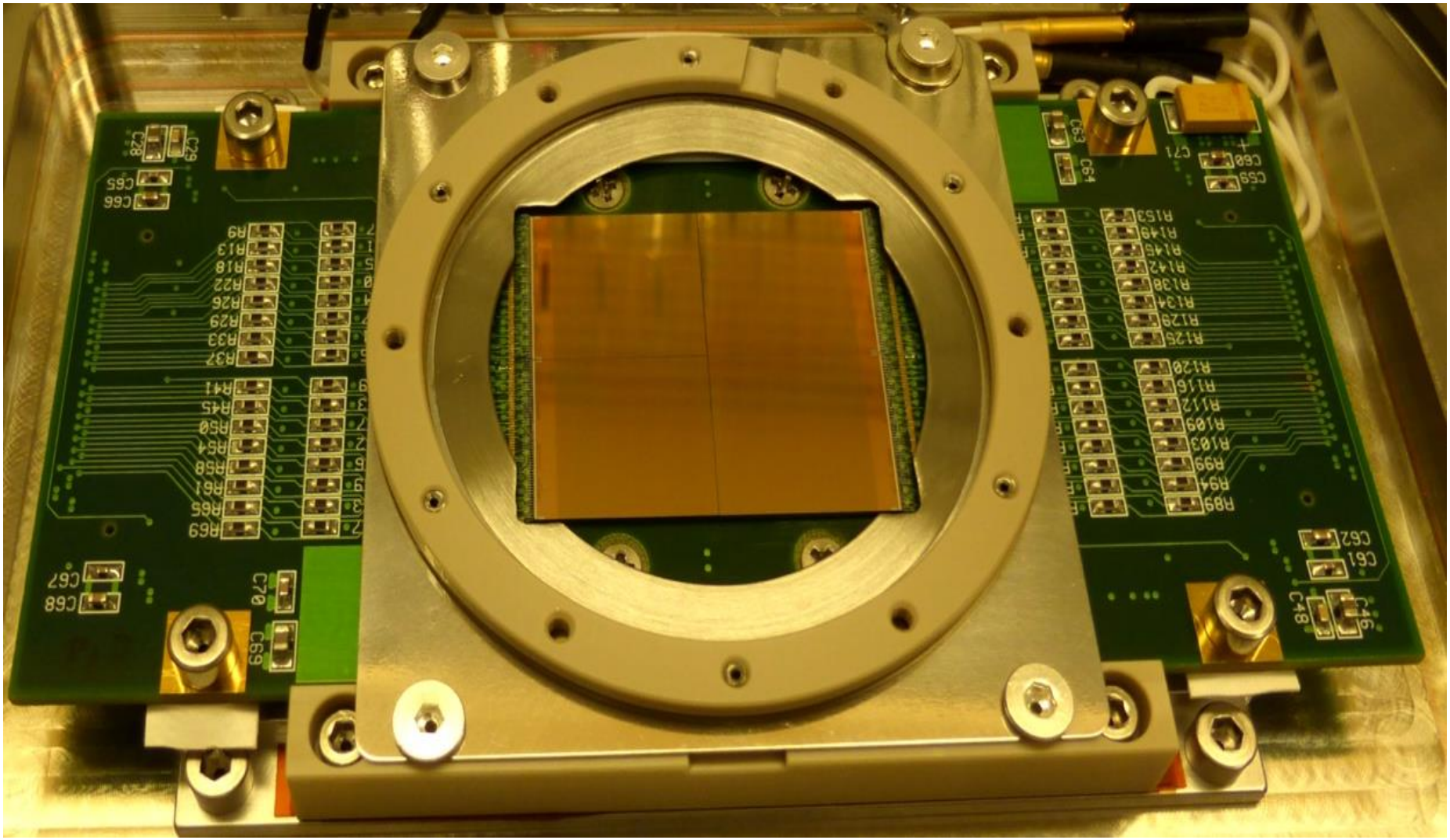
PI: Adrian T. Lee (UC Berkeley)
Project Title: Technology Development for LiteBIRD and other CMB Missions
Significance: May enable future CMB missions
Image Caption: Mock array in vibration test



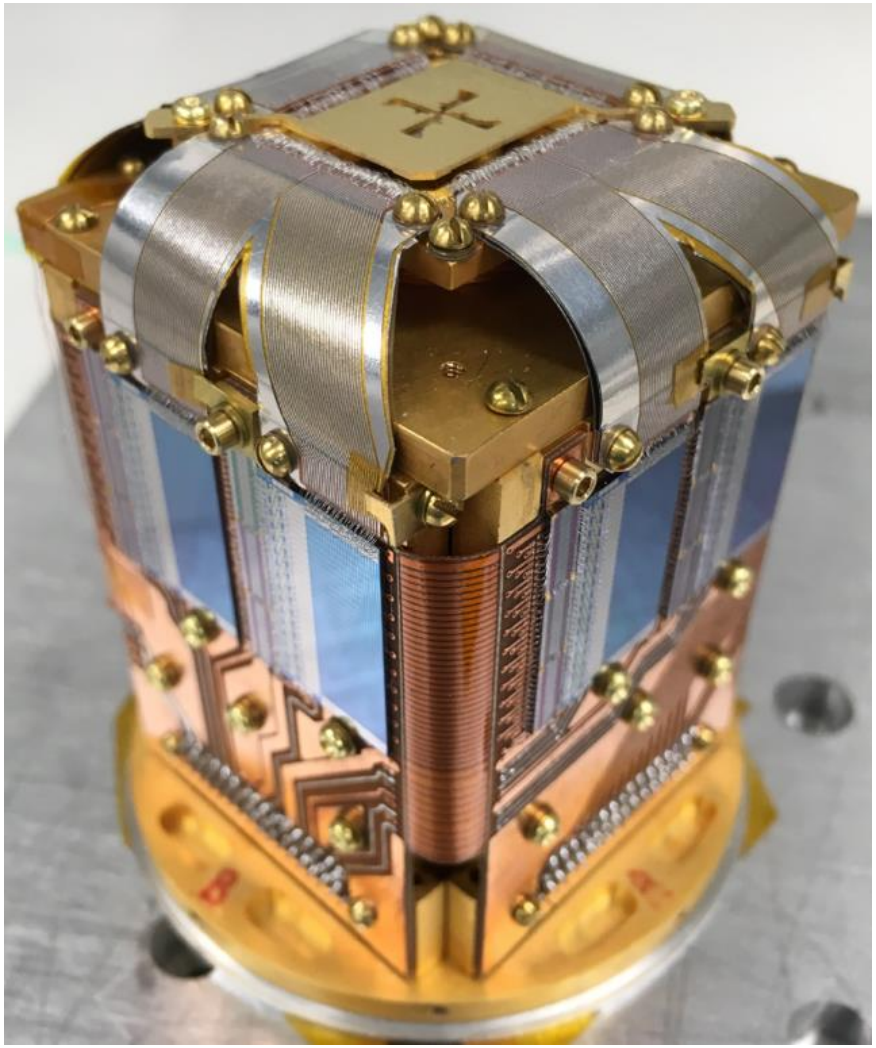
PI: Matt Greenhouse (GSFC)
Project Title: Scalable Microshutter Systems for UV, Visible, and IR Spectroscopy
Significance: May enable sparse-field multi-object spectroscopy for e.g. LUVOIR, HabEx, CETUS, and/or AERIE
Image Caption: Mask layout for 734×348 array; Small sections in sub-arrays consist of microshutters with various keystone structures



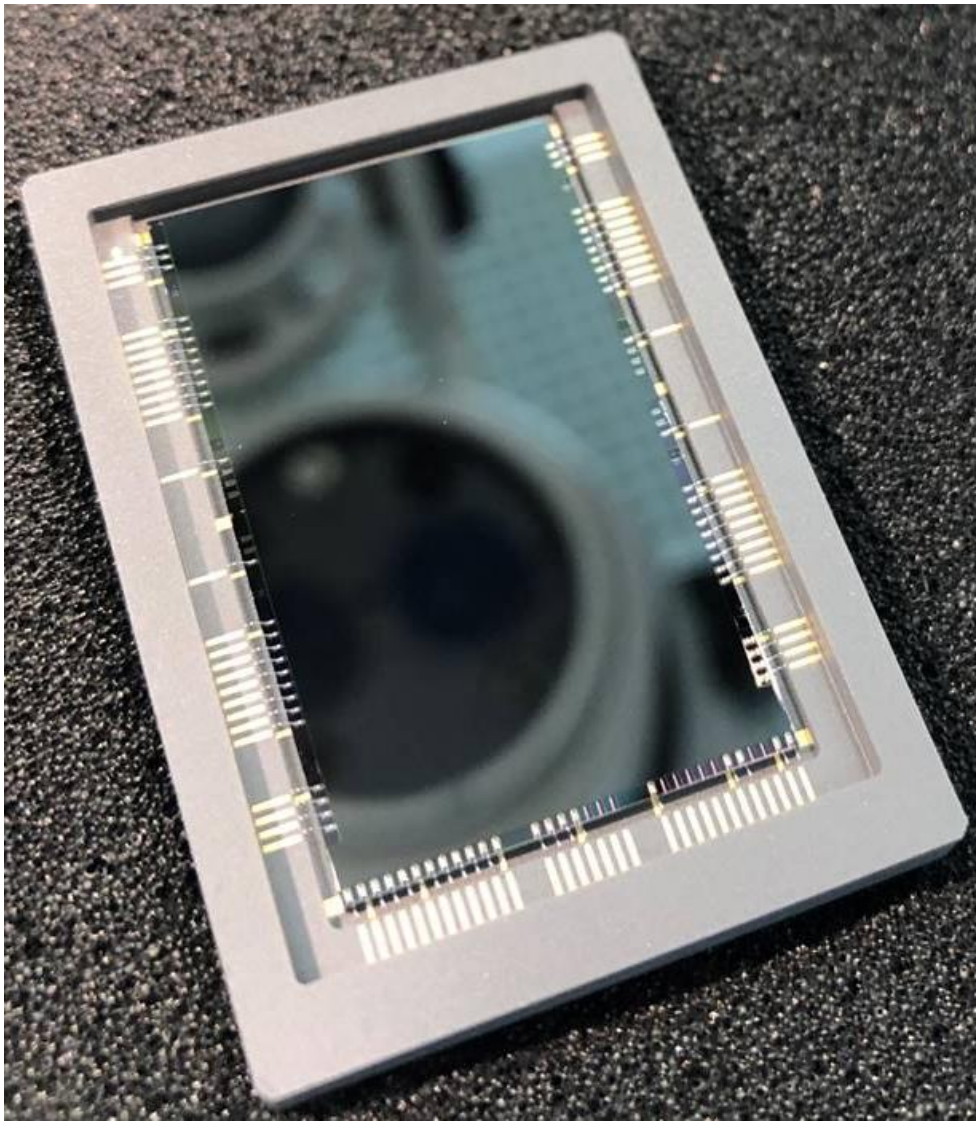
PI: Oswald Siegmund (UC Berkeley)
Project Title: High-Performance Sealed-Tube Cross-Strip Photon-Counting Sensors for UV-Vis Astrophysics Instruments
Significance: Baselined by HabEx, LUVOIR, and CETUS
Image Caption: Planacon 50-mm sealed tube with sapphire input window, bialkali cathode, ALD borosilicate MCPs, and LTCC XS anode



PI: John Vallerga (UC Berkeley)
Project Title: Large-Format, High-Dynamic-Range UV detector using MCPs and Timepix4 readouts
Significance: May enable future far-UV missions with large focal planes
Image Caption: MCP/Timepix detector with 2×2 array of Timepix chips in the center



PI: F. Scott Porter (GSFC)
Project Title: Advanced X-ray Microcalorimeters: Lab Spectroscopy for Space Atomic Physics
Significance: Supports NASA X-ray observatories by developing similar instruments in ground-based labs, replicating conditions in astrophysical sources observed by spaceflight instruments, and observing them parametrically to help interpret space-based data
Image Caption: NIST-developed 8-column × 32-row TDM “snout” package



PI: Shouleh Nikzad (JPL/Caltech)
Project Title: Advanced FUV/UV/Visible Photon-Counting and Ultralow-Noise Detectors
Significance: Detectors baselined by SHIELDS, HabEx, LUVOIR, and ground facilities
Image Caption: 2D Delta-Doped EMCCD Detector