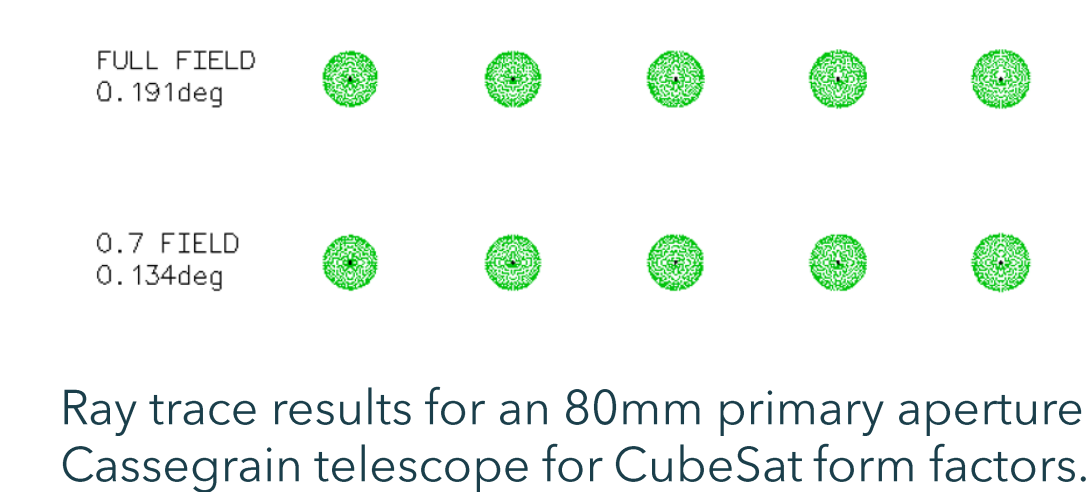
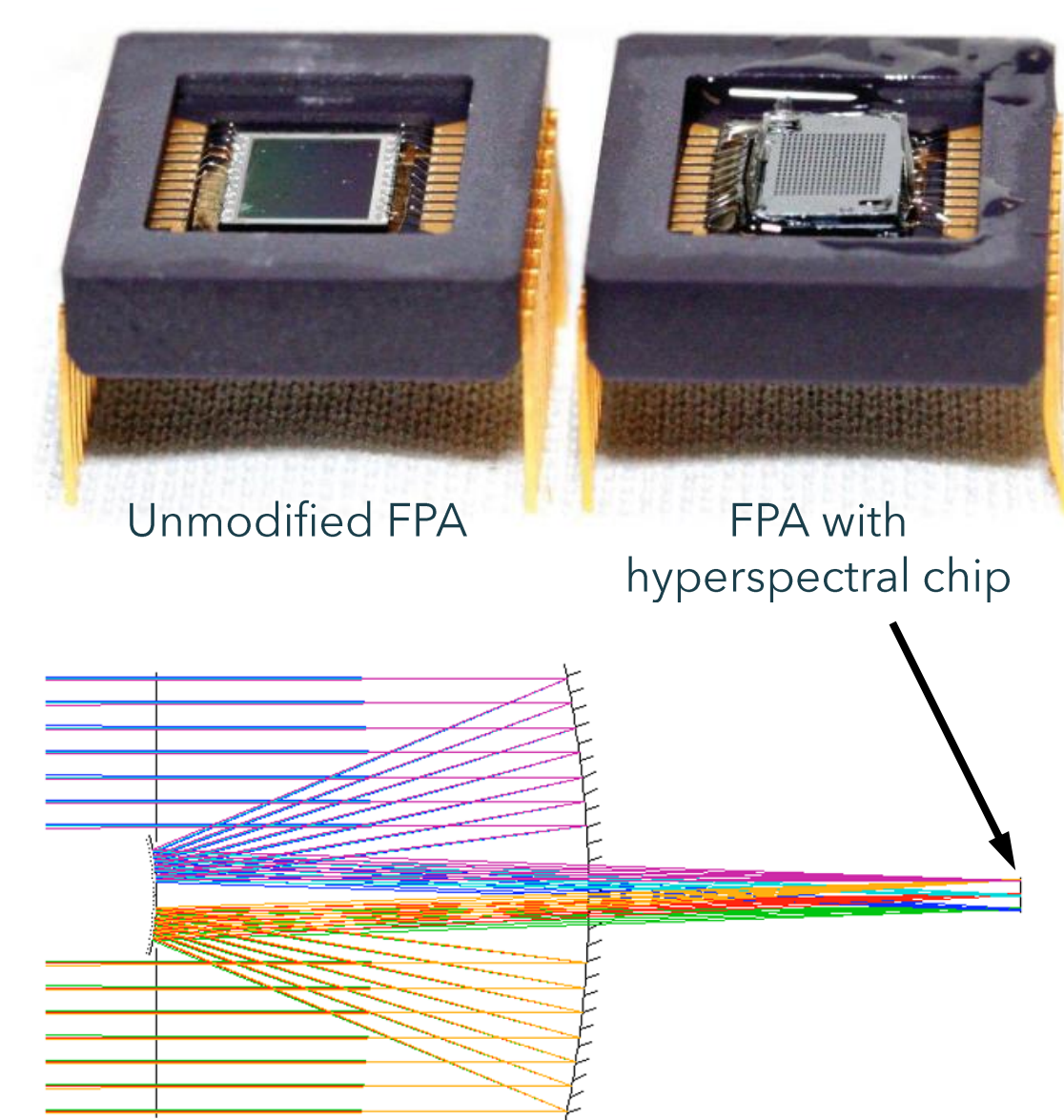
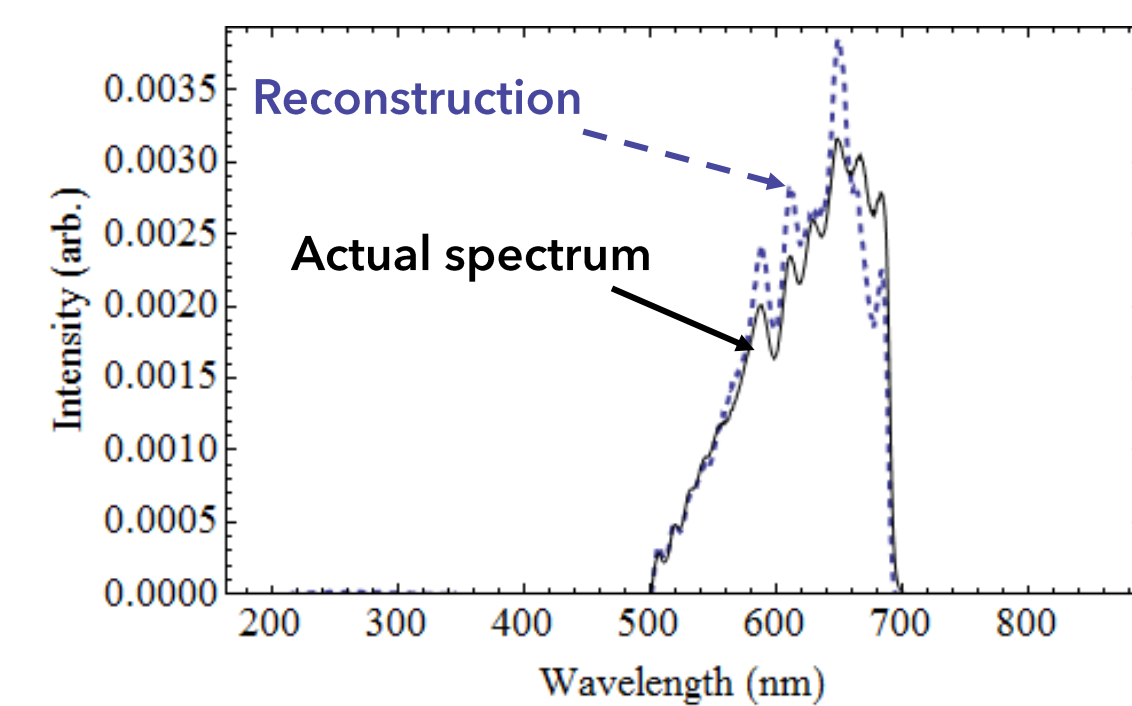
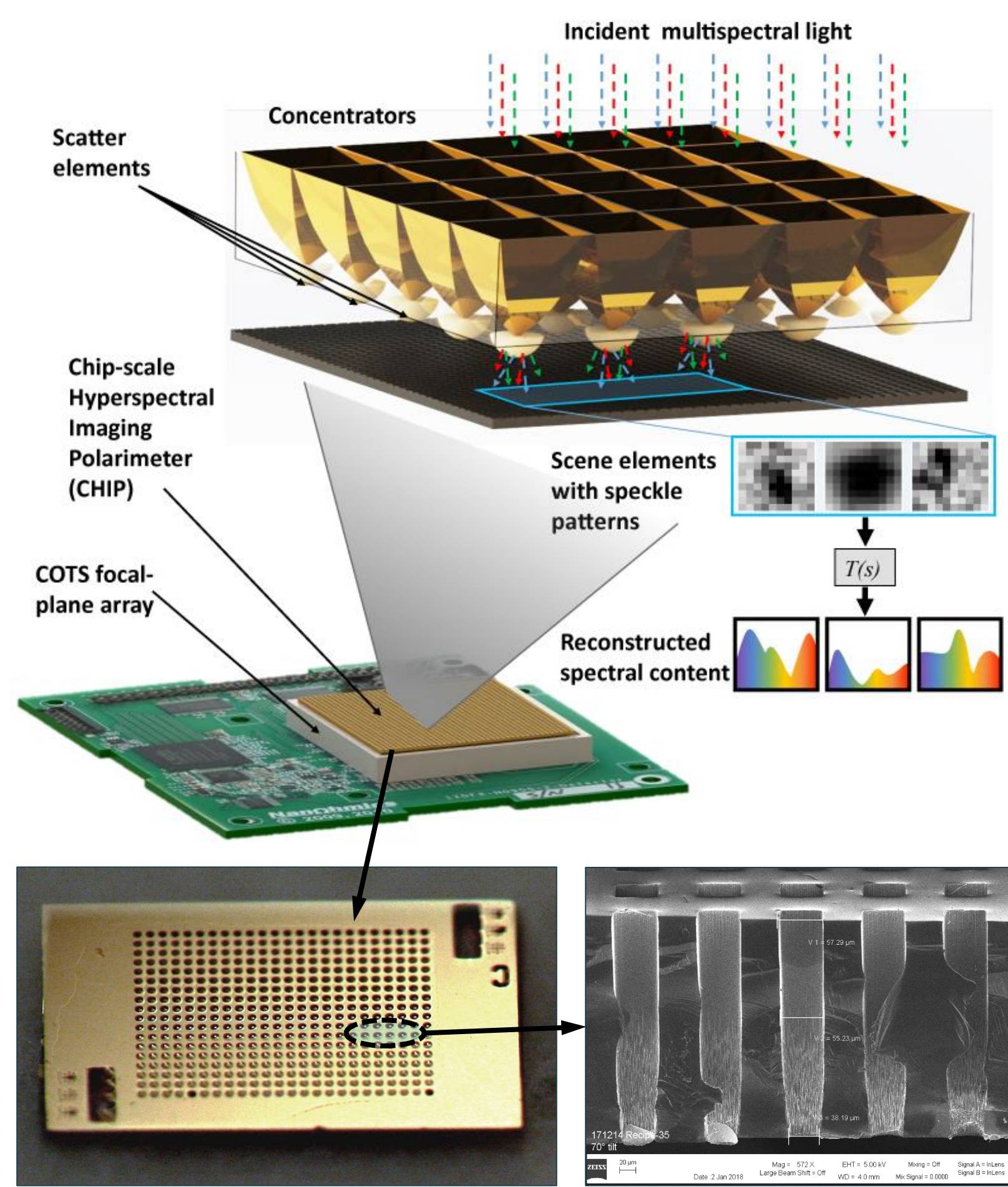


Research Highlights in Computational Imaging, Micro-optics, and Materials Science at Nanohmics, Inc.

CubeSat Hyperspectral Imaging and Optical Microconcentrators

Contact: Chris Mann, cmann@nanohmics.com

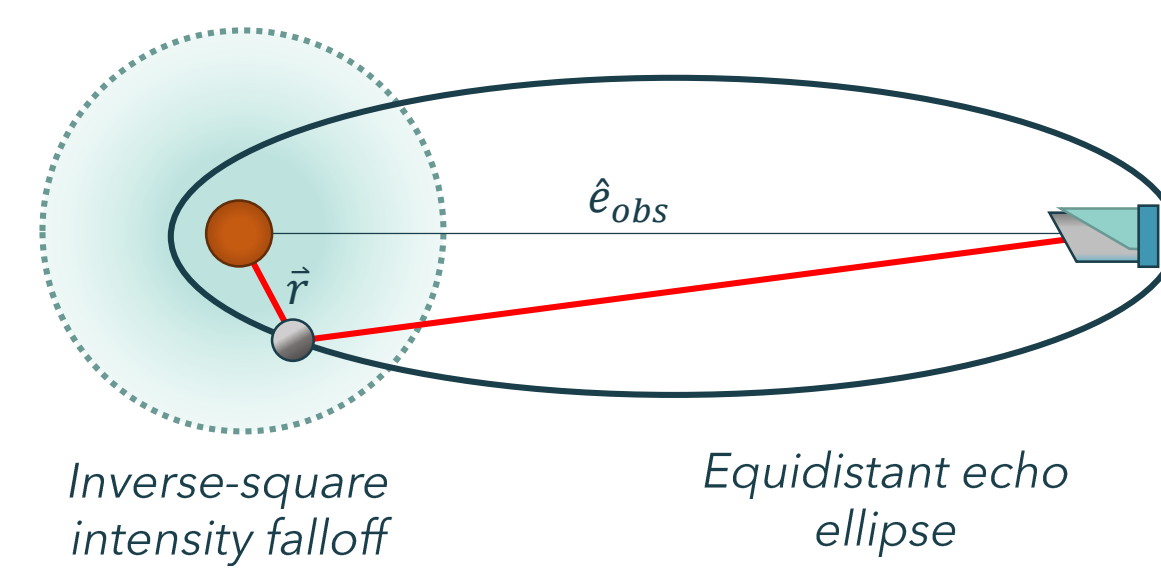
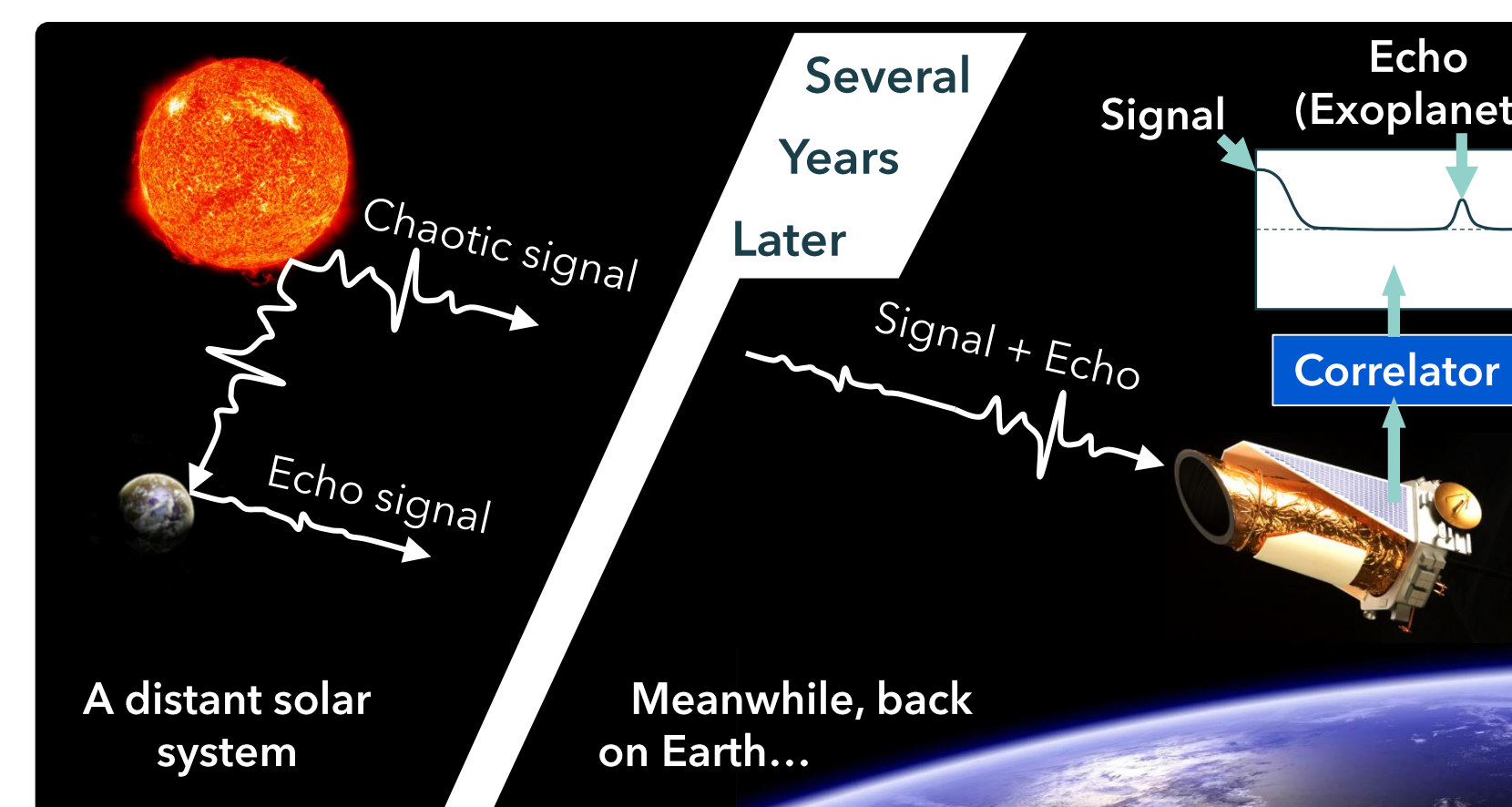
In a 2016-19 NASA STTR program in collaboration with Tilak Hewagama at the University of Maryland, Nanohmics is developing a hyperspectral imager for CubeSat applications. The system leverages a novel microconcentrator array technology and a 'non-diagonal' spectroscopy method that converts a COTS focal plane into full-frame chip-scale spectral imager with spatial-spectral registration.



Stellar Echo Detection of Exoplanets

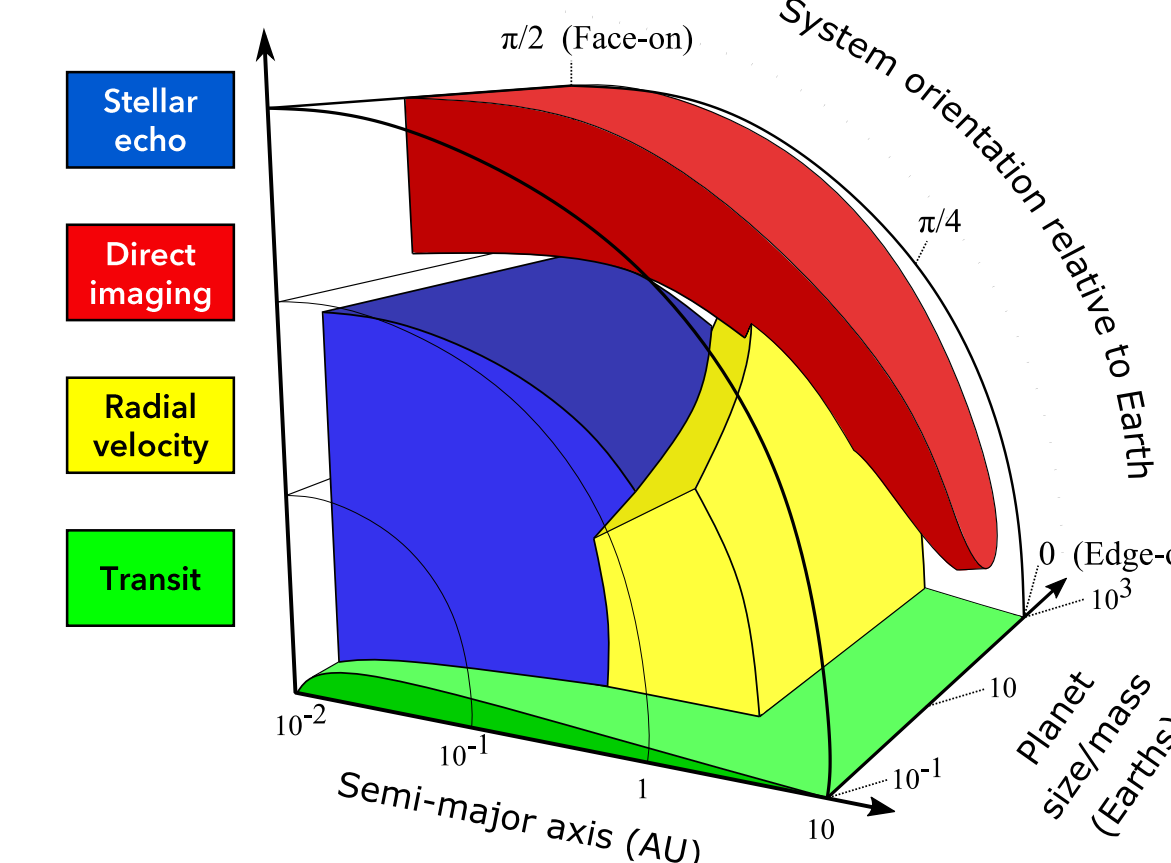
Contact: Chris Mann, cmann@nanohmics.com

In a 2016-19 NASA NIAC program, Nanohmics is collaborating with Ben Bromley at the University of Utah to study the feasibility of detecting exoplanets through faint echoes in lightcurves. These signatures are detectable for all orbital orientations and works best for inner solar system objects. We are seeking observation partners to demonstrate the technology.



The echo lag depends on position relative to Earth:

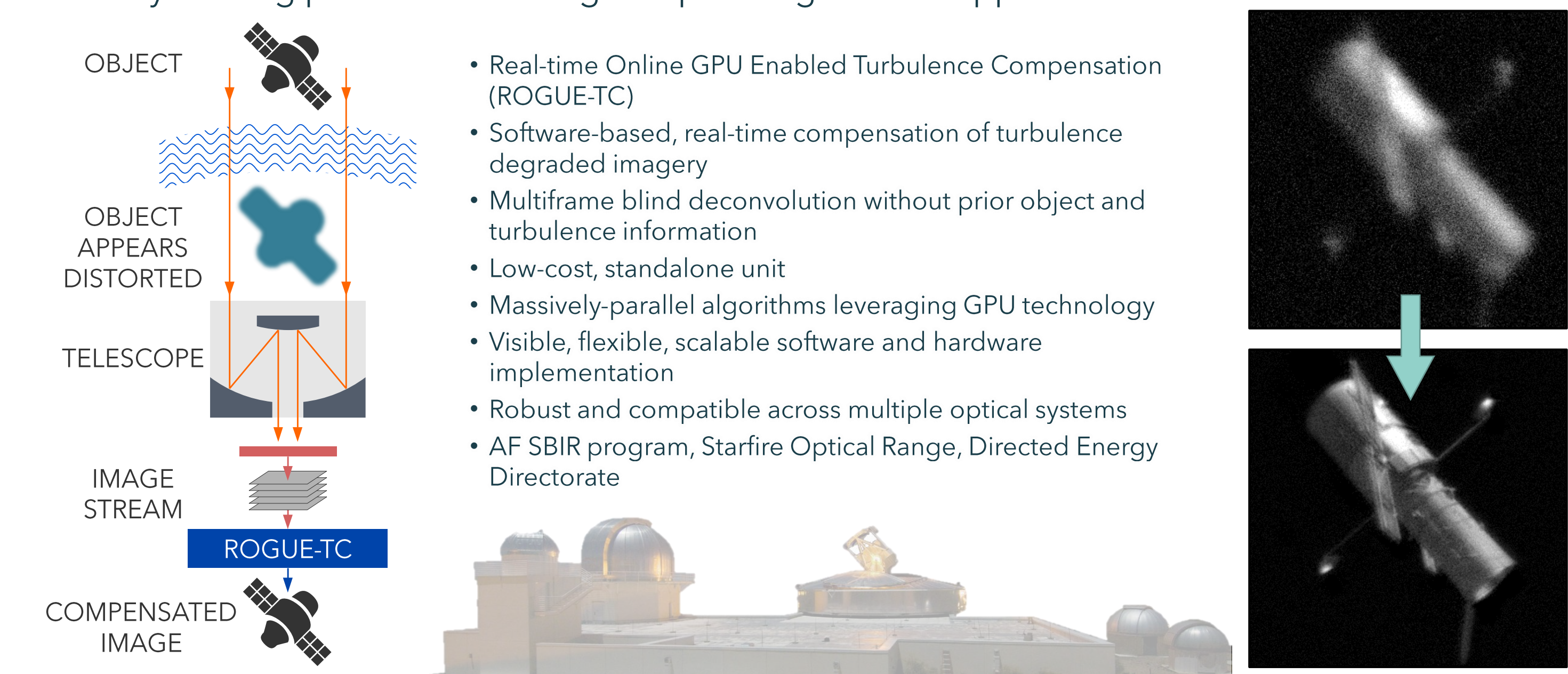
- $\tau_{echo} = (|\vec{r}| - \vec{r} \cdot \hat{e}_{obs})/c$
- \hat{e}_{obs} : pointing from star to telescope
- \vec{r} : a vector pointing at planet
- c : speed of light



Realtime Multiframe Blind Deconvolution for Imaging through Turbulence

Contact: Sebastian Liska, sliska@nanohmics.com

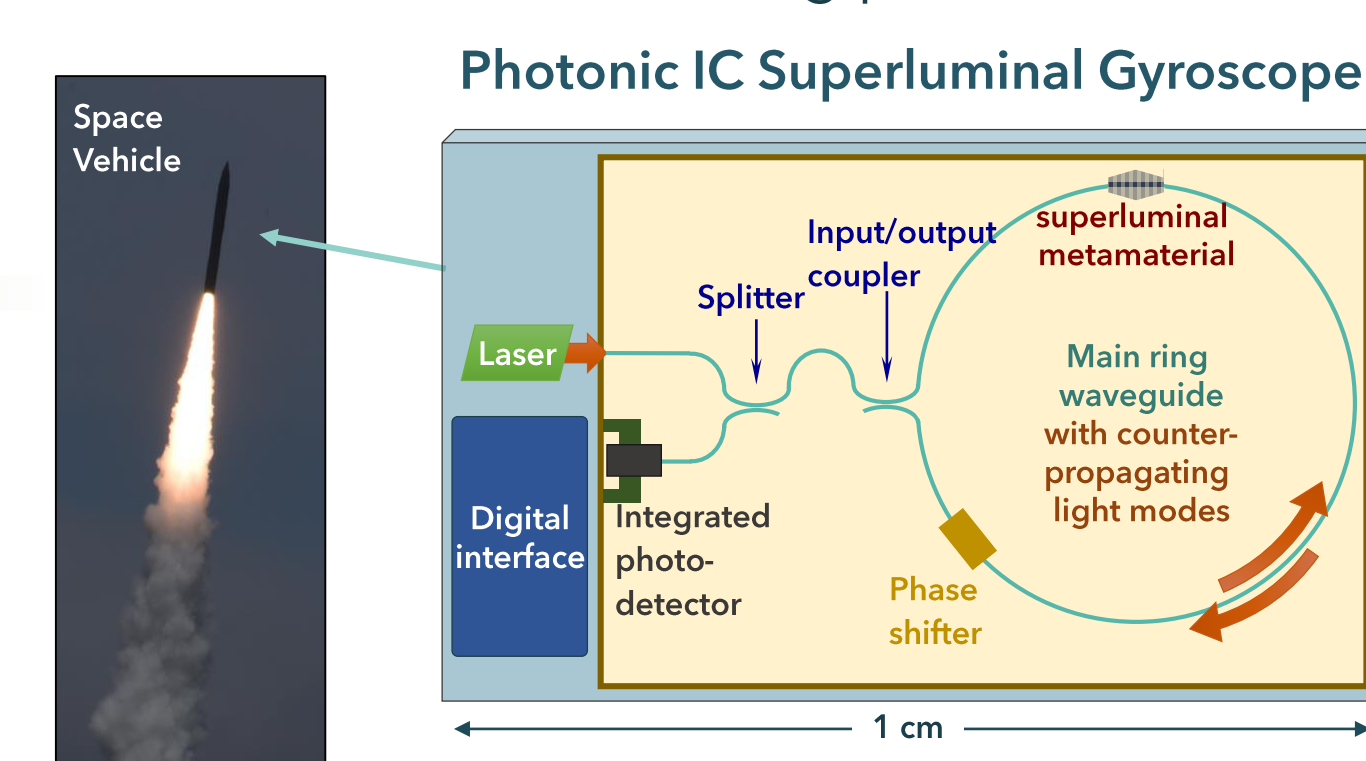
Nanohmics has developed massively-parallel implementations of multiframe blind deconvolution algorithms for real-time imaging through turbulence using a low-cost system. The solution was designed as a sensor-agnostic, turnkey system for telescopes at the Starfire Optical Range. We are actively seeking partners for testing and pursuing mission opportunities.



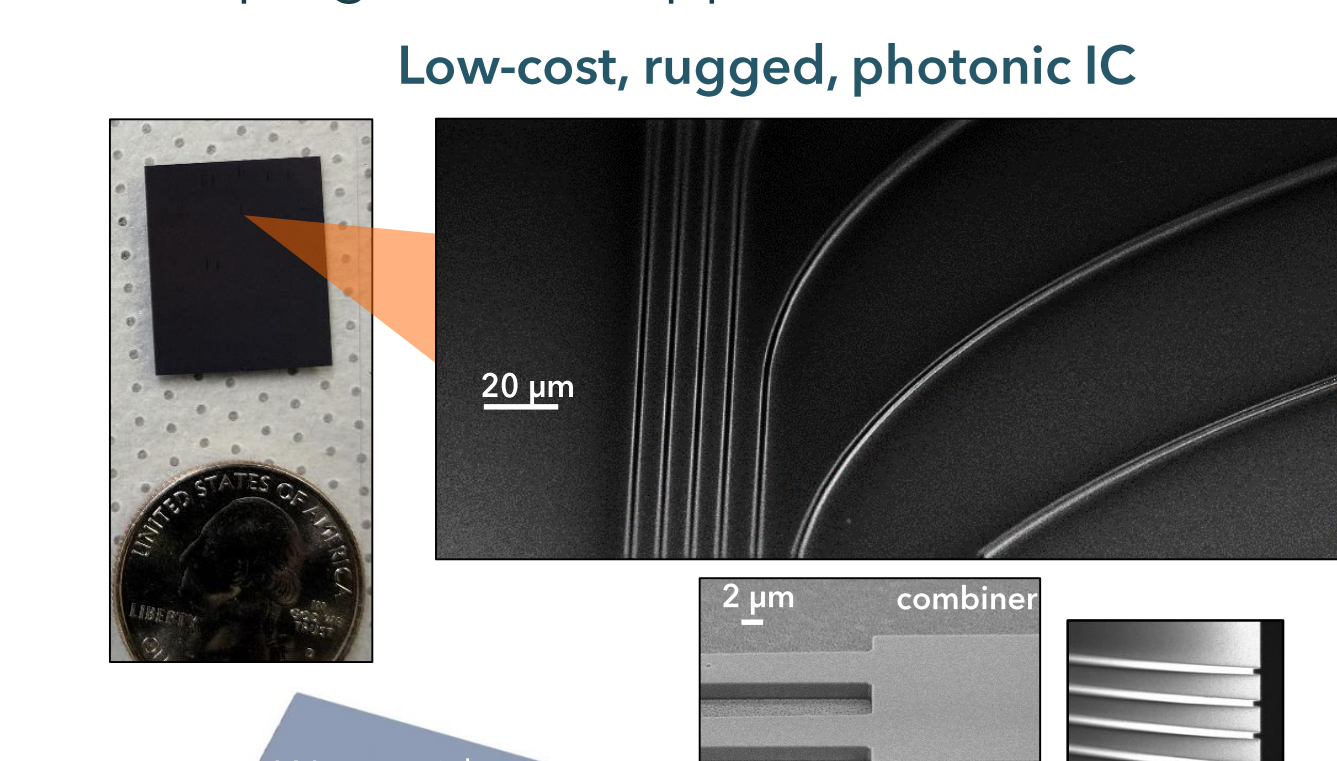
Photonic ICs for Gyros and Spectroscopy

Contact: Mark Lucente, mlucente@nanohmics.com

Nanohmics is developing photonic ICs for gyroscope and spectrometer applications. Our silicon process produces precision waveguides, combiners and other features suited to interferometers and other sensors, and we are actively developing the process for other materials and substrates. We are seeking partners for testing and developing mission opportunities.



- Rugged, chip-scale gyroscope based on superluminal multilayer metamaterial to increase sensitivity ~1000x
- Photonic integrated circuit (PIC) for low size, weight, and power (SWaP) and cost
- Will operate in harsh conditions: radiation, temperature, shock
- Key component of inertial measurement units (IMUs) for air and space vehicles

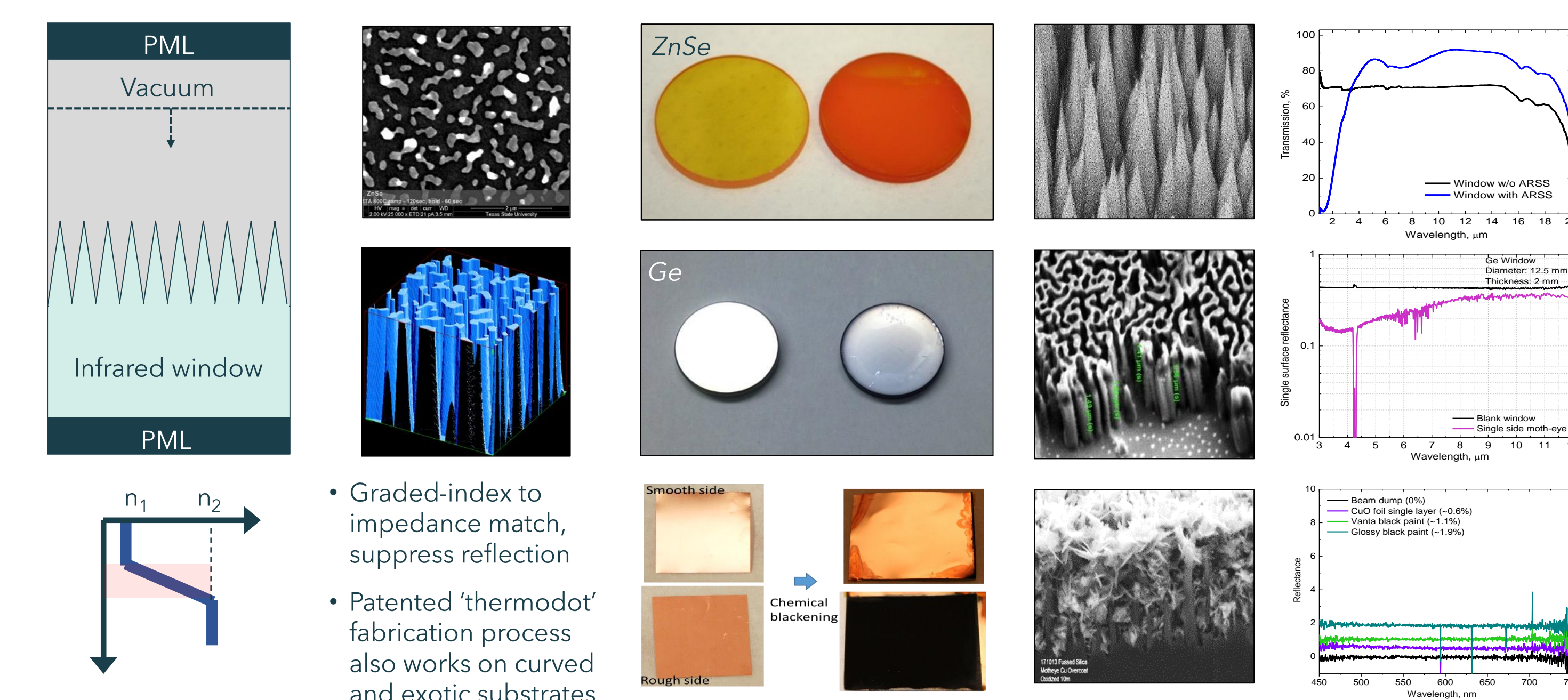


- Rugged, chip-scale spectrometer based on interferometry in a waveguide
- Photonic integrated circuit (PIC) for low size, weight, and power (SWaP) and cost

Anti-reflective Surface Structures for Optics

Contact: Karun Vijayraghavan, kvijay@nanohmics.com

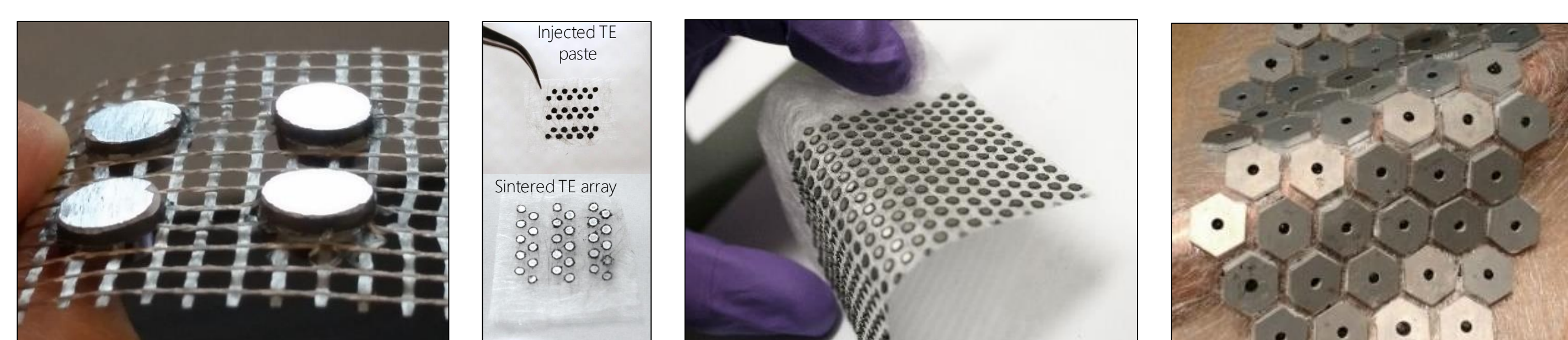
Nanohmics designs and manufactures broadband anti-reflective 'motheye' structures on a variety of substrates for next-generation infrared imaging systems, and light absorbing 'super-black' materials (i.e. black-silicon, copper-oxide) for stray-light suppression in coronagraphs and telescopes. We are actively marketing these capabilities for NASA and DOD.



Membrane-supported Thermoelectrics

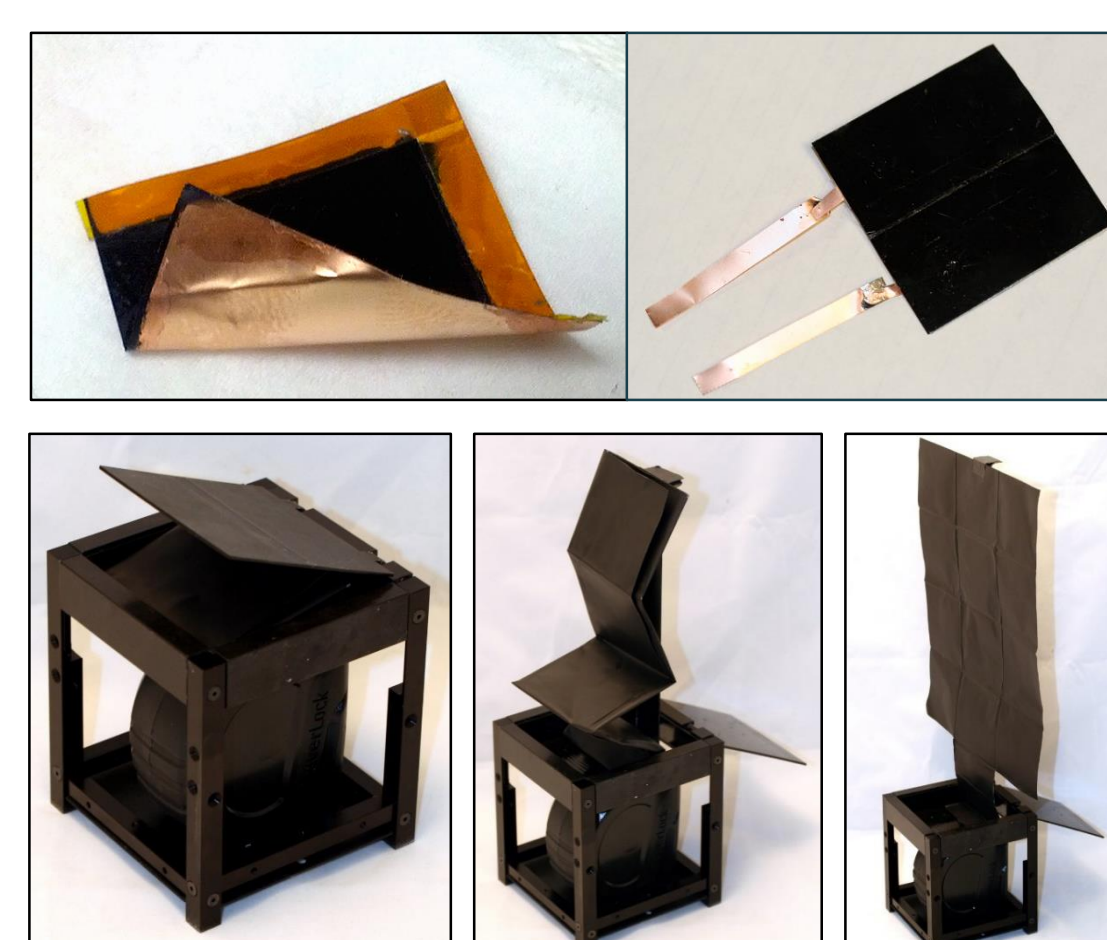
Contact: Steve Savoy, ssavoy@nanohmics.com

Nanohmics has developed a process for fabricating thermoelectric elements in a fiberglass support matrix, enabling roll-to-roll fabrication and novel configurations. Under a 2016-19 SBIR program, Nanohmics is developing a thermoelectric 'fabric' for power generation and temperature stabilization of icy world exploration spacecraft. In a prior NASA SBIR program, we showed that this technology can be used as a low-cost high-power solar thermoelectric generator for CubeSat missions to Venus. We are seeking partners for pursuing mission opportunities.

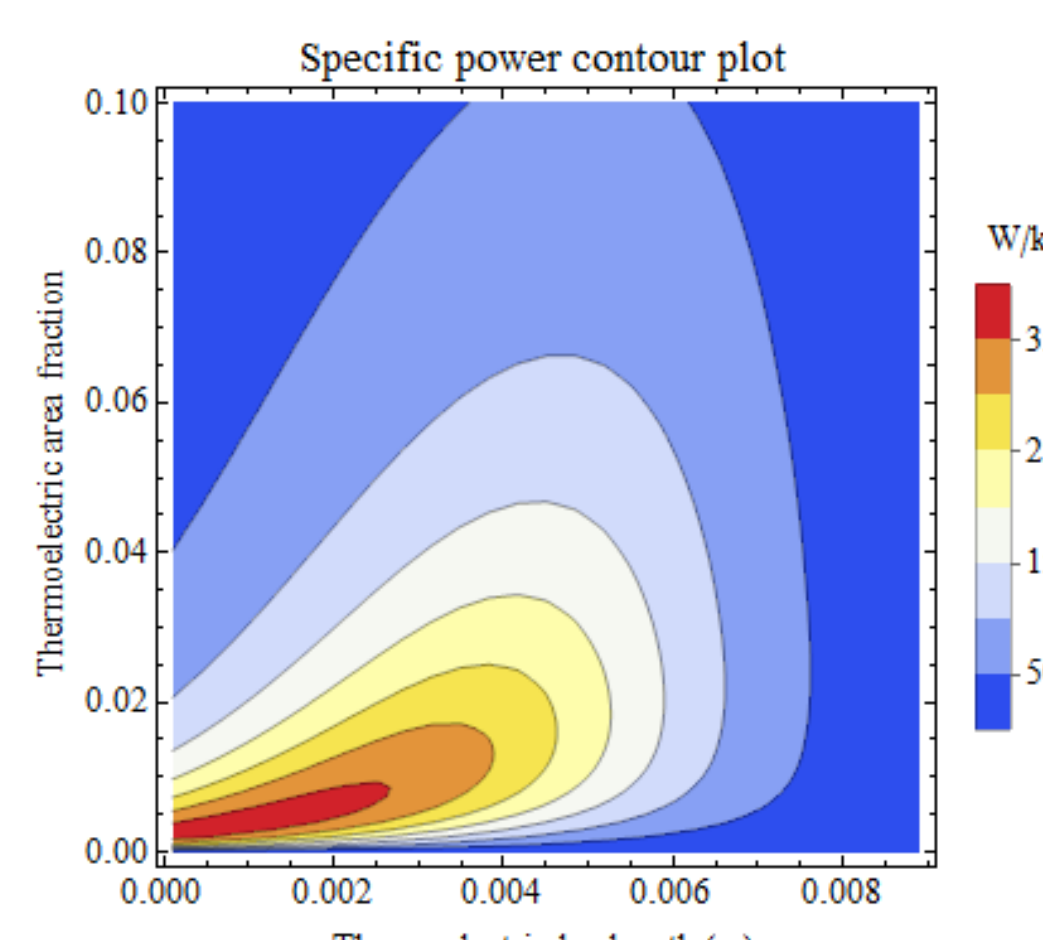


Mission concept: PbTe Solar Thermoelectric Generator for Venus-like orbits

Solar-selective absorbers integrated with low-emissivity, high thermal and electrical conductivity electrodes dramatically reduce the final system mass in a <1U package. Cost is at least an order of magnitude lower per watt than state-of-the-art photovoltaics.



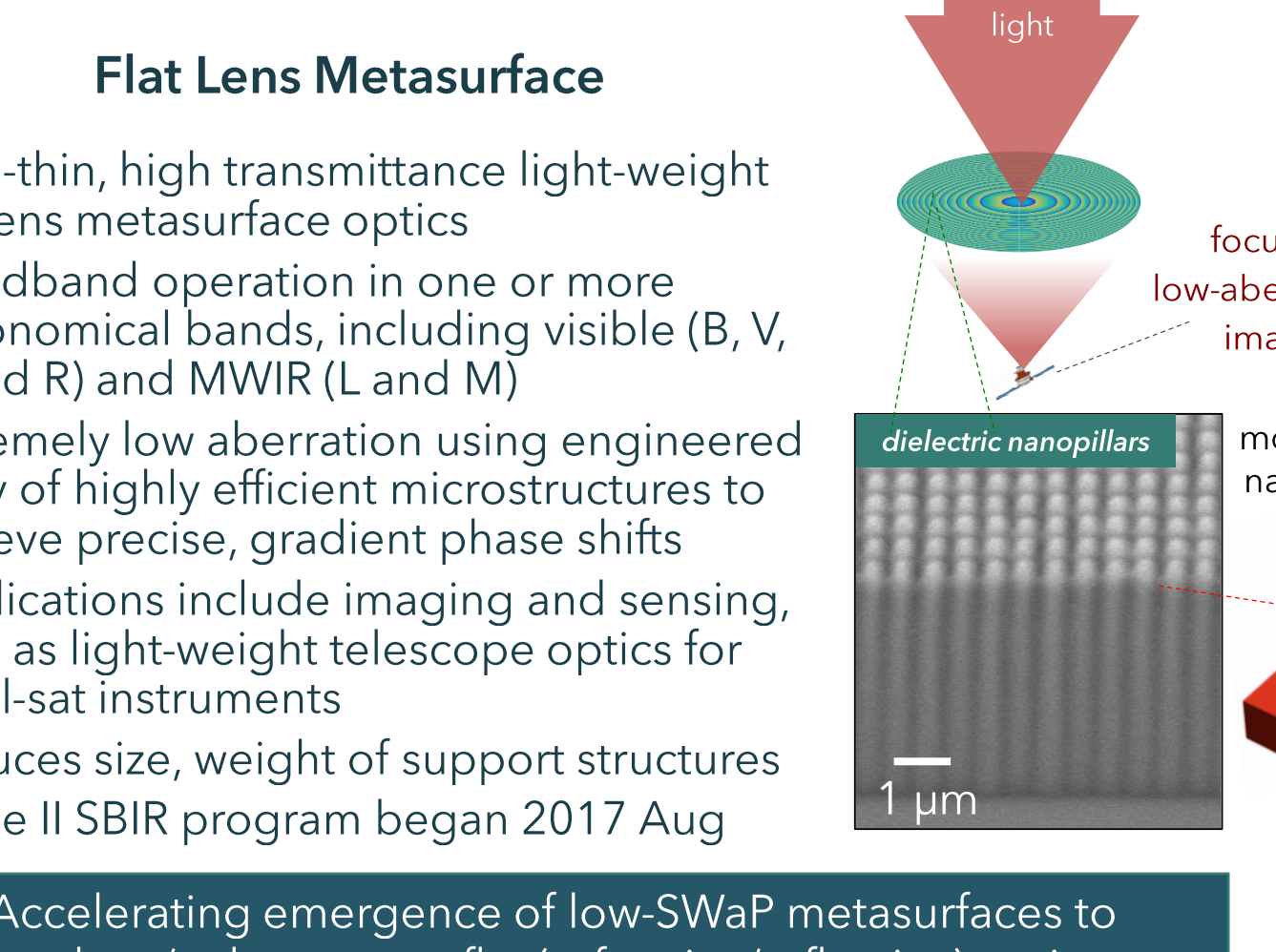
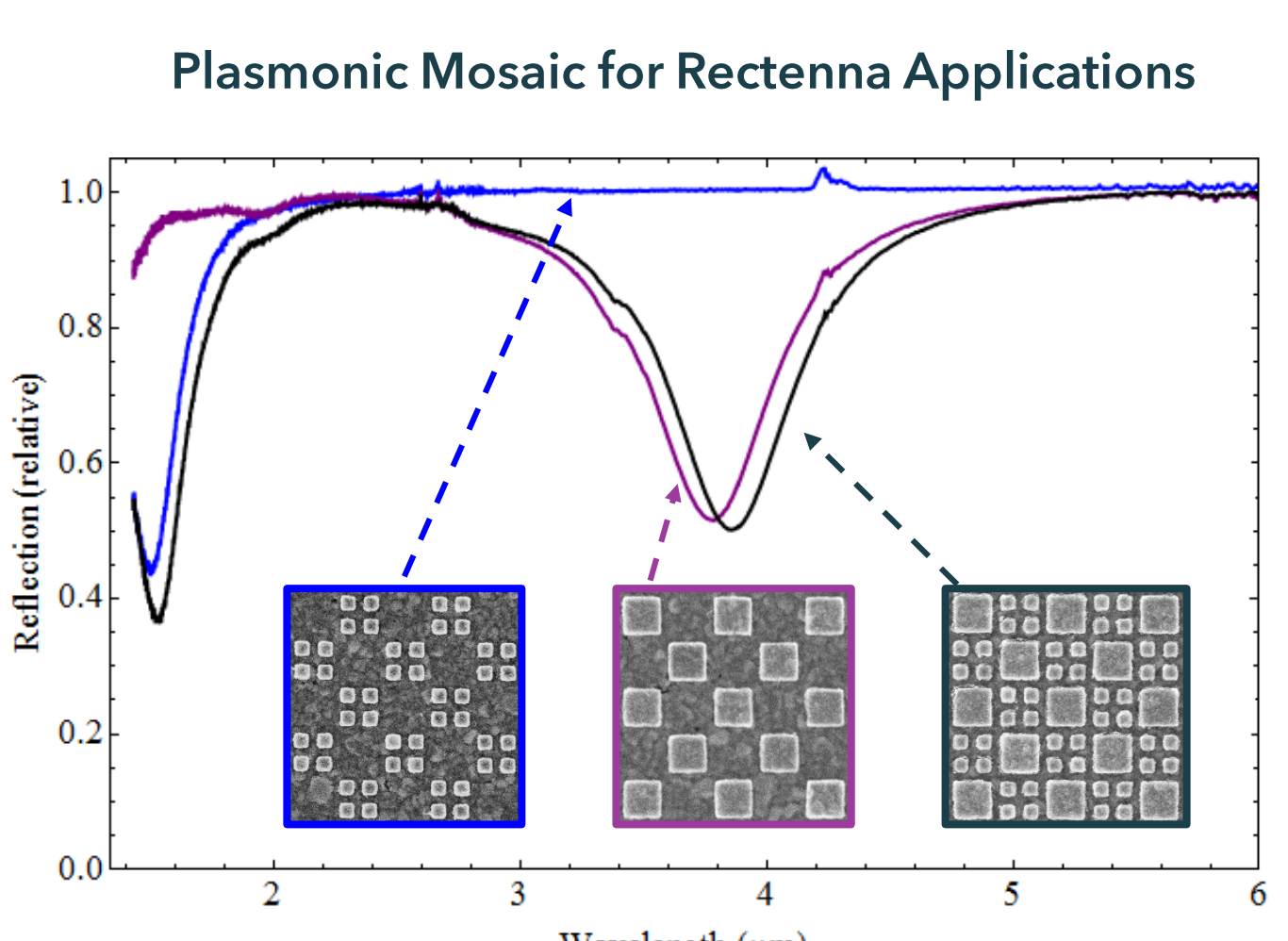
- CubeSat-deployable form factor enables ultra-robust power generation in the inner solar system
- Maximum specific power: 376W/kg
- Concentrator ratio: 333
- TE leg length: 120µm
- System mass: 0.32kg/m²
- System power: 119W/m²
- Hot side temperature: 438°C
- Efficiency: 8.1%



Optical Metamaterials

Contact: Karun Vijayraghavan, kvijay@nanohmics.com & Mark Lucente, mlucente@nanohmics.com

Nanohmics is developing plasmonic and metamaterials for all-optical signal processing, infrared detection, thermophotovoltaics, and compact imaging systems. Device concepts include perfect absorbers, Fano-resonant notch filters, planar metasurfaces, and rectennas.



Accelerating emergence of low-SWaP metasurfaces to replace/enhance non-flat (refractive/reflective) optics

Laser Threat Sensor for Space Assets

Contact: Mike Mayo, mmayo@nanohmics.com

- Novel optical system collects light over full hemisphere
- Light is focused onto an image sensor, spot position determines angle-of-arrival
- Transmission through optional custom color filter can help determine wavelength, assist in rejecting broadband sources (e.g. sun glints, stars, planets)
- Signal processor collects and assesses laser threat information, provides simple messages to controller



About Nanohmics

Nanohmics, Inc. is a research & development company based in Austin, TX. Founded in 2002 by three scientists, the company has grown to 35+ scientists and engineers that specialize in concept-to-prototype instrumentation development and low-volume manufacturing. We are always open to new teaming and collaboration opportunities. For more information, visit us at www.nanohmics.com or contact the PI's listed on the research highlights.

We're hiring! Search for Nanohmics on Indeed.com to see current job listings