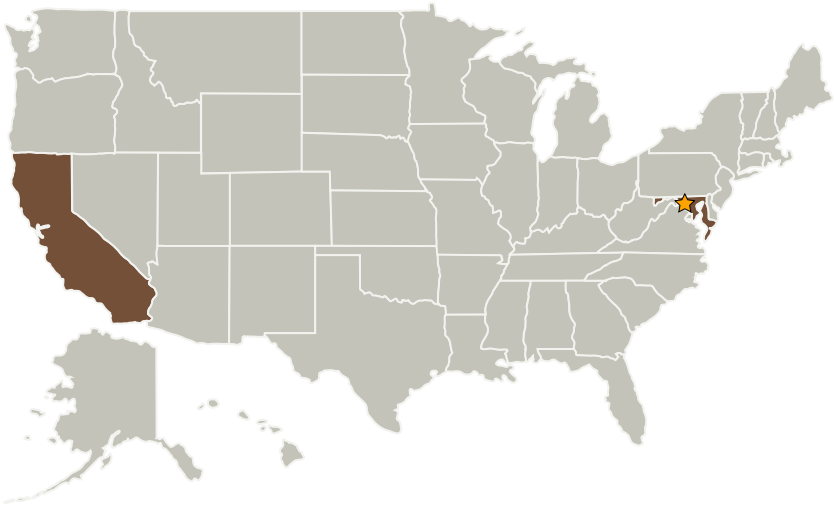
Precision Membrane Optical Shell (PMOS) Technology for RF/Microwave to Lightweight LIDAR Apertures, Phase II

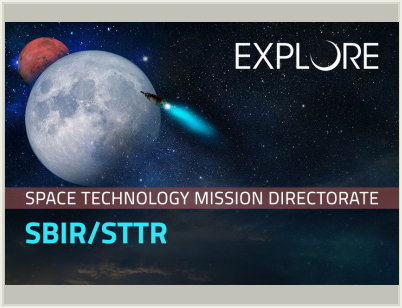
Completed Technology Project (2007 - 2009)

Project Introduction

Membrane Optical Shell Technology (MOST) is an innovative combination of 1) very low areal density (40 to 200g/m2) optically smooth (<20 nm rms), metallic coated reflective membrane thin films, 2) advanced fabrication techniques that transform the films into self supporting shells through the introduction of permanent optically relevant double curvature, and 3) discrete active boundary control to enable rigid body alignment and maintainment of surface figure in face of environmental disturbances. Areal densities of better than 2 kg/m2 (including actuators) are projected. Current measured surface figure is ≈1 to 10 microns rms at up to the 15 cm size, and we are poised for further improvements. Demonstrated material and fabrication techniques are scaleable to at least the 2m+ diameter single surface apertures and larger apertures are possible through segmentation techniques. Proven stowage and deployment techniques enable space flight application. We propose advancing 1) the basic fabrication technology and 2) the TRL level of MOST apertures for ground and space based apertures. The key resulting innovation is implementation of low areal density, compact roll stowable approaches to realize low mass, low cost reflective apertures for RF/Microwave to LIDAR. Other NASA and DOD applications are expected as precision and aperture size increase.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Mevicon, Inc.	Supporting Organization	Industry	Sunnyvale, California

Primary U.S. Work Locations	
California	Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  └ TX05.1 Optical Communications
    └ TX05.1.2 Large Apertures