



Simultaneous Amplitude and Wavefront Control with MEMS Deformable Mirror and Spatial Filter Array

Description

NASA GSFC has developed a novel approach whereby a single deformable mirror can replace two deformable mirrors when it is coupled to a passive device known as a spatial filter array (SFA). The deformable mirror is a hexagonal packed MEMS segmented deformable mirror where each segment is separately controlled in piston, tip and tilt. Each segment is optically mapped to a single fiber of the SFA that effectively decimates the optical beam into an array of beamlets. The fiber passively spatially filters the higher spatial frequency errors in both amplitude and wavefront and the lower spatial frequencies of wavefront are controlled via pistoning the mirror segments, and the amplitude is controlled via tip/tilting the segments to slightly steer the focused beam on the end of the fiber to balance the beamlets. The output of the SFA results in a cleaned up beam in both amplitude and wavefront.

Features and Benefits

- Reduces components costs by replacing the need for two deformable mirrors
- Both the deformable mirror & SFA are used together w/ sensing & control algorithms to simultaneously control both Amplitude & Wavefront errors
- Generally amplitude errors are controlled by specifying the tolerances on the optical coatings on an optical surface, but using the deformable mirror and SFA, the errors are controlled in a closed-loop fashion via sensing and feedback

Applications

- Coronagraphy
- Microscopy
- Beam-forming Optics
- Ground Telescopes
- Missile Tracking
- Precision Gun Sights

For More Information

If you are interested in more information or want to pursue transfer of this technology, GSC-16143-1, please contact:

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To view Goddard's entire portfolio of wavefront sensing technologies, please visit:
<http://ipp.gsfc.nasa.gov/wavefront>