On-demand, Dynamic Reconfigurable Broadcast Technology for Space Laser Communication

Programmable phase mirror allows for high efficiency, security, and compactness through targeted illumination and sharing aperture.

Space optical networks are slated to become the dominant form of communication due to their high data rates, customizable configurations, and signal coverage. To make these networks feasible, issues to be overcome include the large coverage angles, dynamic nature of desired orbits for coverage, data losses through optical beam sizes, and unnecessary illumination of large spaces absent satellite presences.

**BENEFITS**
- Multiple tracking of satellites simultaneously
- Individual tracking of satellites providing greater security
- High optical power efficiency through smaller individual spot size
- Real-time updates and dynamic configurations of orbits desired by user
THE TECHNOLOGY

NASA Goddard Space Flight Center has developed a configurable phase mirror system that can address likely obstacles in space optical communications. Through using miniature adjustable mirrors and programmed phase delays to diffract a single communication beam, numerous diffracted beams can be sent to other satellites in various directions for communication and tracking. The initial laser beams wave profile can be dynamically regulated through a fast Fourier transform (FFT) so that when it reaches its desired destination, it forms an intended illuminated spot at the target satellite. Since all the diffracted beams share the same phase mirror, the antenna gain needed to broadcast these beams does not require a multiplied aperture.

APPLICATIONS

The technology has several potential applications:

- Inter-satellite communication, including SmallSats
- Simultaneous optical tracking of spacecraft
- Real-time space-based remote sensing

More Information

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GSC-17922-1, GSC-TOPS-194