

Technology Roadmaps for Space Exploration (09)
Enabling Technologies for Exploration (3)

Author: Dr. Faramaz Davarian
Caltech/JPL, United States, davarian@jpl.nasa.gov

HYBRID GROUND STATION TECHNOLOGY FOR RF AND OPTICAL COMMUNICATION LINKS

Abstract

To support the future enhancements of NASA's deep space and planetary communications and tracking applications, the Jet Propulsion Laboratory is developing a hybrid ground station that will be capable of simultaneously supporting RF and optical communications. The main reason for adding optical links to the existing RF links is to drastically increase the capacity of deep space communications in support of future Global Space Exploration. It is envisioned that a mission employing an optical link will also use an RF link for telemetry and emergency purposes, hence the need for a hybrid ground station. To save cost, the design for the existing 34-m RF antenna will be moderately modified to accommodate optical signals in addition to RF signals rather than employing a totally new strategy. Two promising approaches have been identified and studied. Both these approaches will soon be demonstrated in the field to expose their pros and cons. The platform for these demonstrations is NASA's experimental 34-m antenna at Goldstone, California. In the first approach, the surface quality of the existing antenna will be improved to accommodate optical signals, hence, dubbed as the polished panel approach. The second option, replaces the center portion of the antenna with glass panels, hence, named the glass panel approach. The first option carries more risk with potential for lower cost. This presentation will describe both options in some detail and will provide field test results. If successful, the following future endeavors will benefit from the hybrid technology: • Robotic Precursors to Human Exploration • Deep Space Exploration • Exploration of Near Earth Asteroids • Human Space Exploration • Participatory Exploration for Inspiration and Education • And more.