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Paper Abstract

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Paper Title: Galileo optical link takes a step towards Deep-space optical communications

Description:

Abstract

The Galileo Optical Experiment (GOPEX), was successfully conducted over an eight-day period (December 9 through December 16, 1992). Laser beams were beamed from Earth-based transmitters at the Table Mountain Facility, California, and Starfire Optical Range, New Mexico to the Galileo spacecraft as it receded from Earth on its way to **Jupiter.** The experiment was performed over distances ranging from 1 - 6 million km, and demonstrated the feasibility of deep-space optical communications.

Optical and microwave (32 GHz, Ka band) communications are considered the most viable emerging technologies to support the missions of the twenty-first century. As we continue to explore and better understand our solar system, there will be demands to return

increasing volumes of data from deep-space probes to Earth, and existing 70 meter Deep Space Network systems will be unable to support this increased demand. With NASA's drive towards faster, better and cheaper, the mini and micro spacecraft are expected to play an ever increasing role in future space exploration. Weight and size are the driving considerations for subsystems on these spacecraft, and small light-weight optical telescopes coupled to miniature laser transmitters are being favorably considered as an attractive alternative to the large microwave antennas.

GOPEX is the first in a series of JPL optical communications experiments that are planned to (i) demonstrate the application of critical concepts, subsystems and components to optical communications technology, (ii) validate optical communications performance models, and (iii) improve the conceptual design of a deep-space and near-Earth optical communications network. Such a network is envisioned to be global in extent, and will require construction of optical stations on several continents. Industry can play a role in the development of this new breaking technology by assisting in addressing some of the current technology challenges such as the development of efficient, light weight and low cost transmitters for the spacecraft, and the fabrication of low-cost large-segmented-aperture optical receiving antennas with good figure quality. The development of these major technology areas will lead to business opportunities in areas ranging from the design and construction of facilities to house the large aperture antennas, to the fabrication of optical components, such as lasers, detectors, modulators, modulated corner cubes.