R&D STRATEGIES FOR DEEP SPACE TELECOMMUNICATIONS AT NASA'S JET PROPULSION LABORATORY

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Abstract

For over 35 years the Jet Propulsion Laboratory has been NASA's lead center for the robotic exploration of the solar system. As a part of that responsibility, JPL is the focal point for deep space telecommunications, in part because of the many unique deep space technology requirements. JPL not only manages NASA's Deep Space Network but provides the general telecommunications architecture and systems designs, and, for both flight and ground systems and subsystems, conducts unique research and development to ensure that future deep space mission technology needs are met in a timely manner.

NASA's future robotic spacecraft missions will be dramatically different from recent large, complex missions, such as Voyager, Galileo, and Cassini. Future missions will be characterized by relatively small size, shorter lifetimes, simple payloads, and, above all, lower cost. In addition, there will be many of these smaller missions, rather than a few large missions. This presents great challenges to the telecommunications designers for both flight and ground equipment. The flight equipment must be lower in size, mass, power consumption, and cost. The ground equipment must be more autonomous, yet must have high performance to reduce the spacecraft burden, and must be flexible to track a proliferation of spacecraft, each with differing needs.

Some of the deep space telecommunications initiatives planned or already under way include: Ka-band systems, miniaturized transponders, high efficiency solid-state amplifiers, lightweight spacecraft antennas, arraying of ground antennas, flight and ground autonomy, simultaneous multiple spacecraft tracking, and optical space telecommunications systems.