

## IAF ABSTRACT

### The Mars Observer-DSN Ka-Band Link Experiment

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After a decade of planning and anticipation the era of Ka-band (32-35 GHz) communications with deep space probes was ushered in on January 8, 1993. On that day, a 0.025 watt Ka-band beacon from Mars Observer, then at a distance of 50 million km, was acquired and tracked by NASA's Deep Space Network (DSN) Research and Development station at Goldstone, California. On January 17 telemetry was received at a data rate of 250 bits per second over this Ka-band link.

The purpose of this paper is to describe the Ka-band Link Experiment (KABLIX) including: objectives, system configuration, advanced technology utilization, results to date, and plans for the future.

The low-cost beacon is the fourth harmonic (33.7 GHz) of a sample of the 20 watt operational 8.4 GHz X-band down link on the spacecraft and is launched from the 28 cm subreflector on the 1.5 m high gain X-band antenna. The ground station features a new 34-meter beam wave guide antenna and uses a low-loss dichroic mirror to allow simultaneous tracking of both the Ka-band and the X-band signals. The extremely weak Ka-band signal is received through a liquid helium cooled feed and cavity maser amplifier to minimize noise. Acquisition and tracking is accomplished by a digital receiver aided by a programmable local oscillator to remove doppler broadening.

Although initial performance results are consistent with spacecraft and ground system capability and atmospheric effects, data acquisition will continue for the duration of the mission in order to ascertain the practical advantages of Ka-band for future projects.