



# Iris Transponder Enhancements for Deep Space and Lunar Operations

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Iris Radio

# Overview of Iris Radio

## What is the Iris Radio?

- 1U X-band software-defined transceiver for use with the NASA Deep Space Network
- Initially designed by JPL, successfully demonstrated on the Mars Cube One (MarCO) mission
- Intended for harsh environment Class D missions
- 4 W transmit power, -145 dBm receive sensitivity
- Supports radiometric navigation

## What makes the Iris Radio different?

- Not all components used are fully space qualified but have been selected to operate in high radiation encountered in deep space and lunar environments
- Present platform and project team very adept at special features and customizations



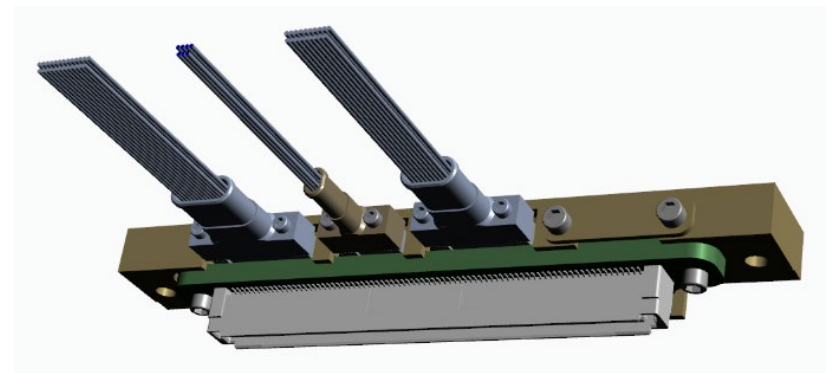
# Iris Radio Improvements

## Command Improvements

- Uplink command decryption to meet NASA STD-1006 requirements
- Sensitivity increased
  - Noise figure <2.1 dB
  - Implementation loss <0.5 dB
- Uplink rates increased to 3.125 Mbps
- Carrier acquisition
  - Faster sweeps
  - Acquisition/tracking modes
- MSPA capabilities
  - SCID filter
  - Iris sweep or FFT-assisted acquisition
  - One-way uplink ranging with CSAC

## Interface Improvements

- New 50 MHz SpaceWire C&DH interface
- 160-pin Nano-D adapter
- Switched RF connectors from GPPO to SMPM-T
- Over-the-air updates and spare firmware banks



# Iris Radio Improvements

## Telemetry Improvements

- Data rates increased to 12.5 Msps
- New telemetry modulation options
  - QPSK, OQPSK (optional pulse shaping)
  - GMSK
- New telemetry encoding
  - LDPC 1/2, 2/3, 4/5, 7/8
- Beacon mode support
- Meets NTIA and SFCG masks at high rates

## Navigation Improvements

- New navigation modes
  - Regenerative PN ranging
  - PN DDOR
  - One-way uplink ranging with CSAC

