What the Deep Space Network (DSN) Can do for you!

Caltech Interplanetary Small Satellite Conference 2016
Interplanetary Network Directorate
Deep Space Network
Jet Propulsion Laboratory

DSN Mission Commitments Office
DSN Mission Interface Manager
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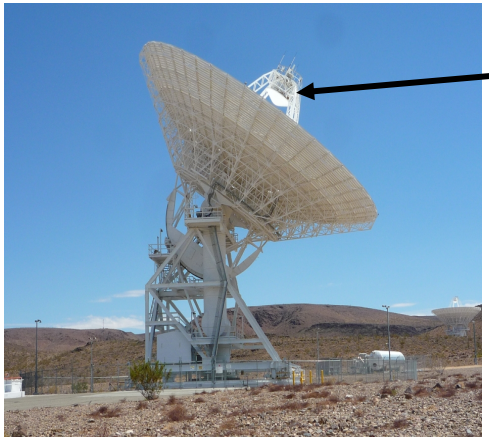
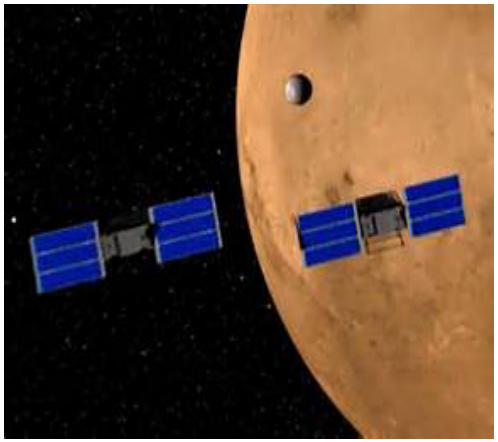
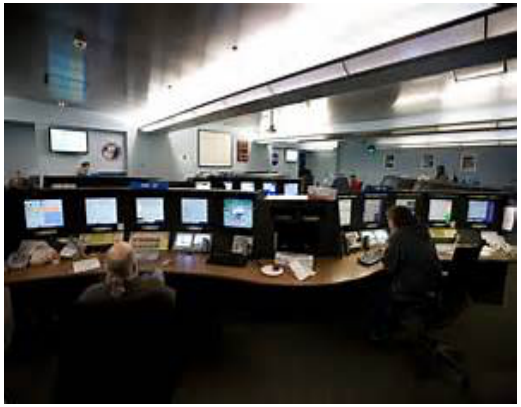
Use the DSN to communicating and operating your CubeSat



DSN Antenna



Your Spacecrafts

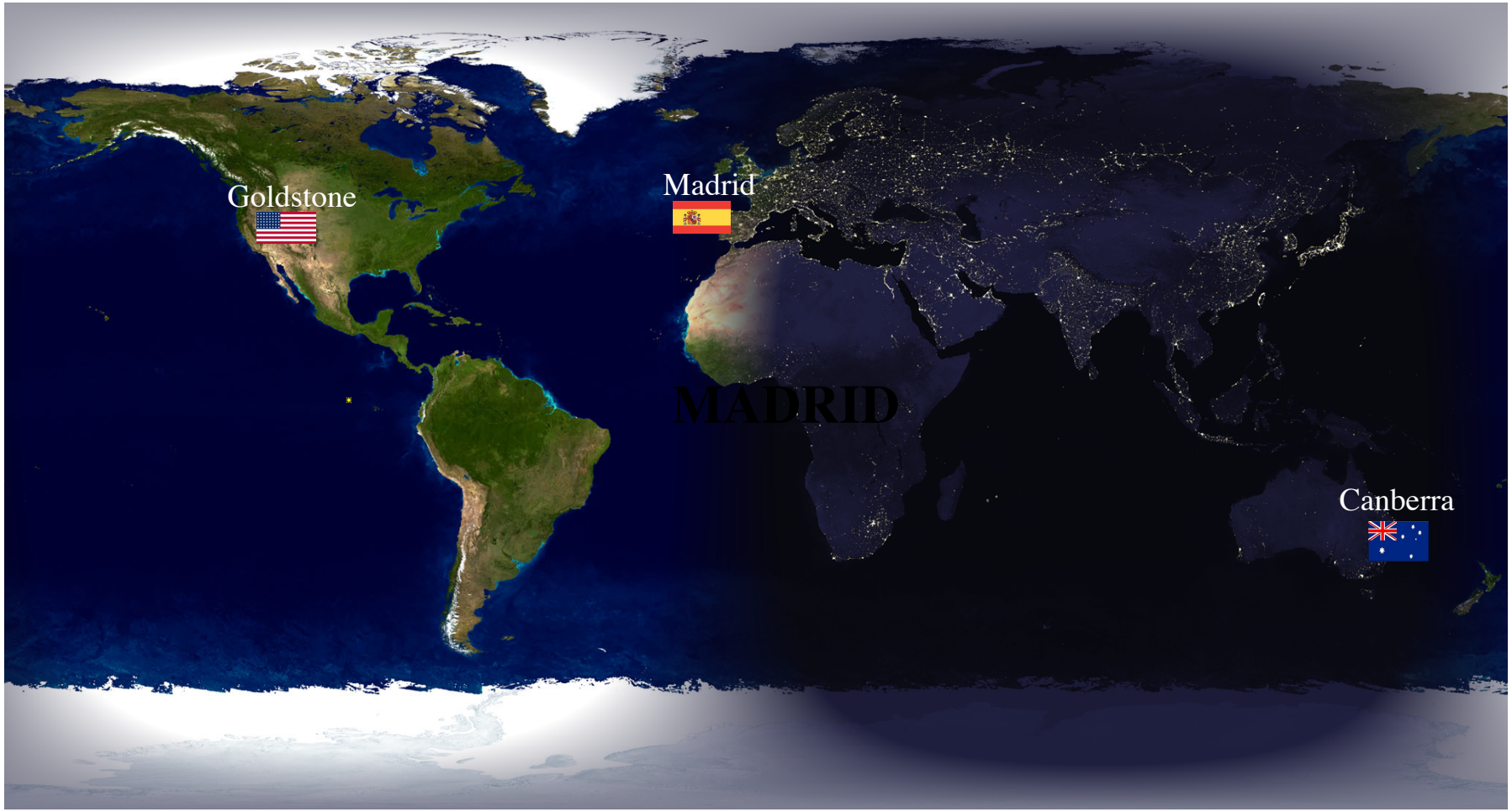


DSCC Signal Processing Center (SPC) located at each DSN complex

JPL Pasadena California Deep Space Operations Center (DSOC)

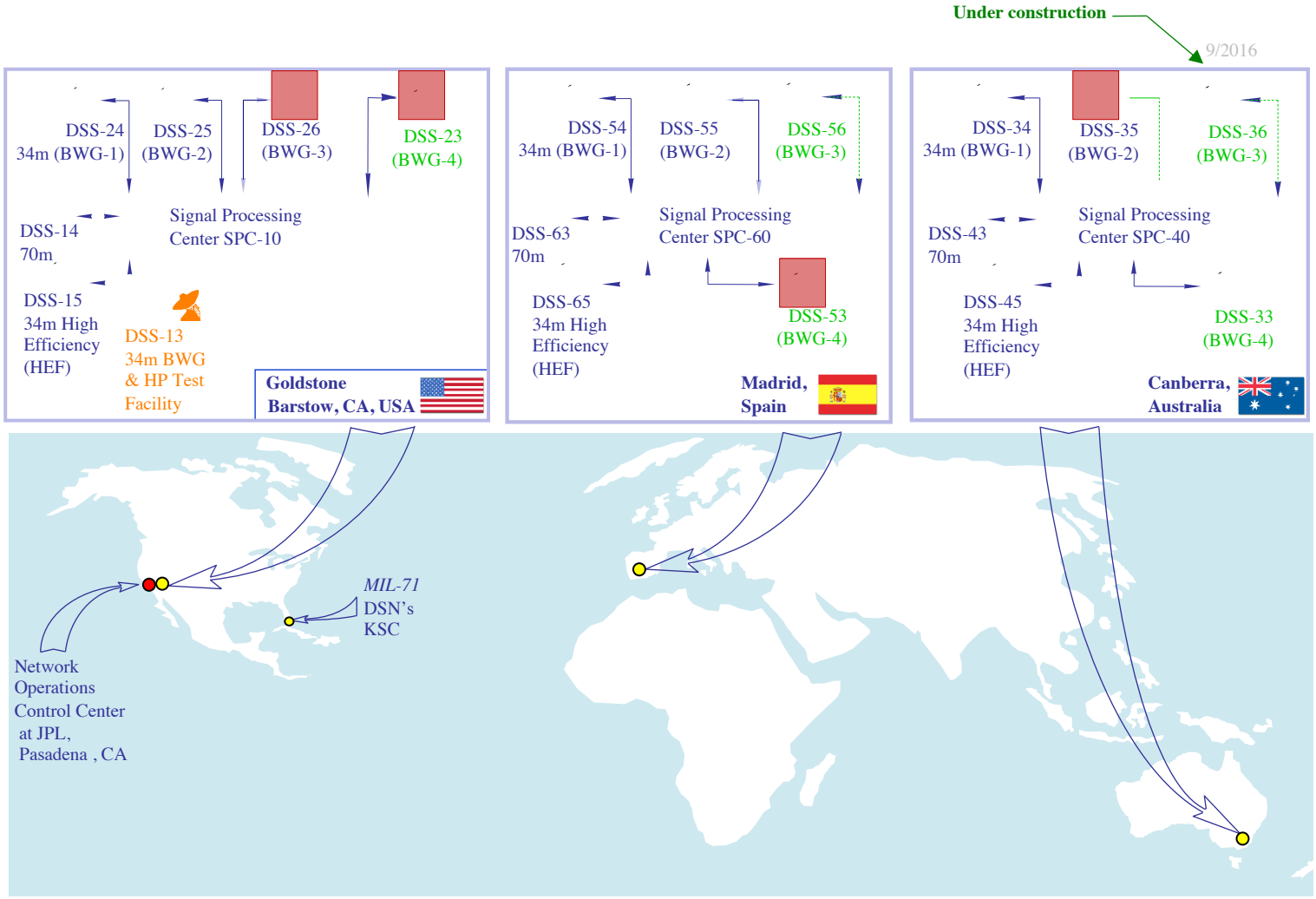
Your CubeSat Mission Operations Center (MOC)

Where Are the DSN Complexes?



Conveniently located about 120 degrees apart for full maximum coverage of your spacecrafts

DSN Complex Resources



LEGEND

Future 34m BWG Antenna

New 80 kW Transmitter

New Antennas

Operational Dates

DSS-36 9/2016
DSS-56 9/2019
DSS-53 9/2020
DSS-33 9/2022
DSS-23 9/2024

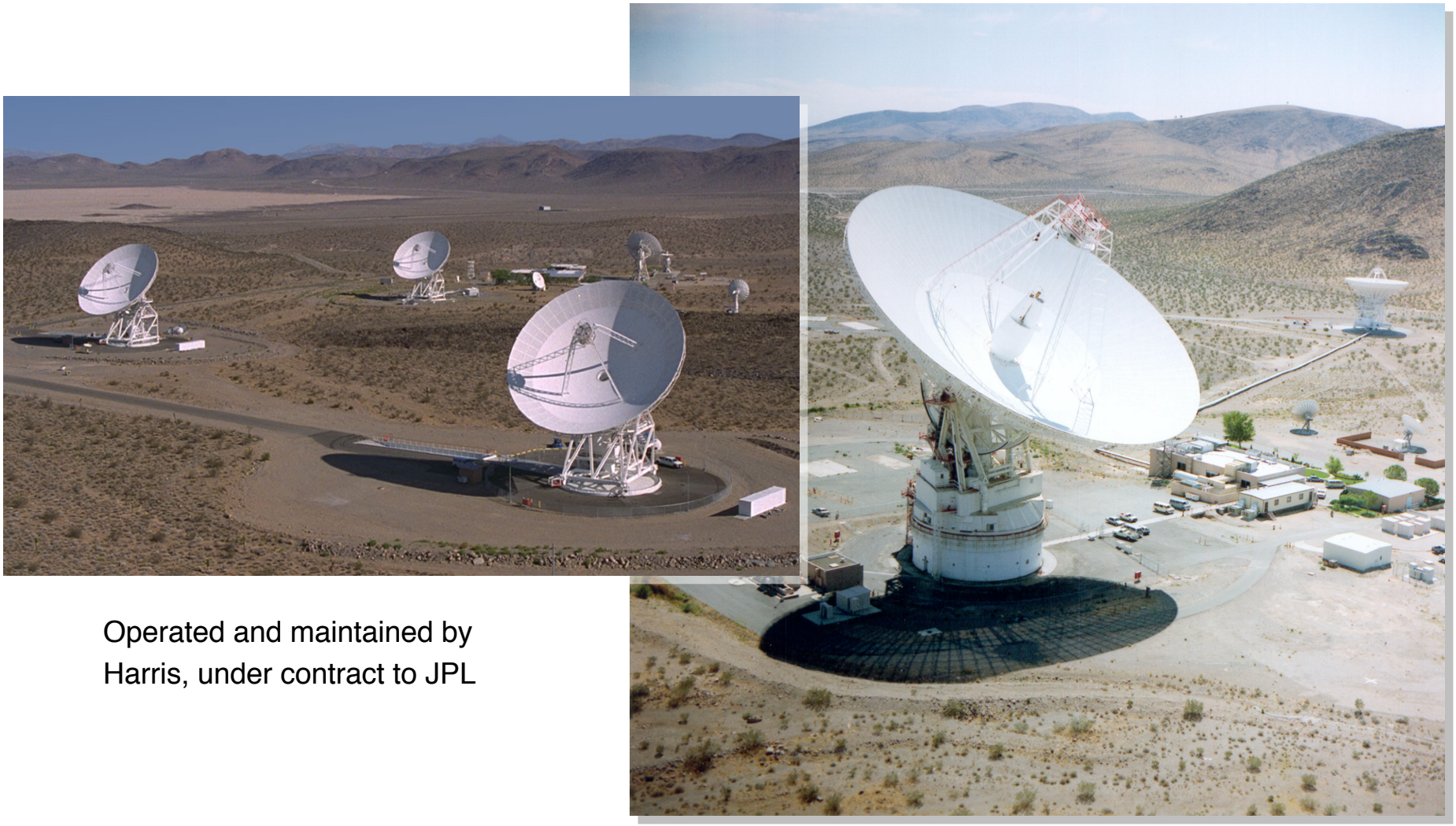
80 kW XTR

Operational Dates

DSS-26 9/2015
DSS-53 9/2020
DSS-35 9/2022
DSS-23 9/2024

Note: All three 34m HEF (DSS-15,DSS-45,DSS-65) will be decommissioned one at a time starting October 2016.

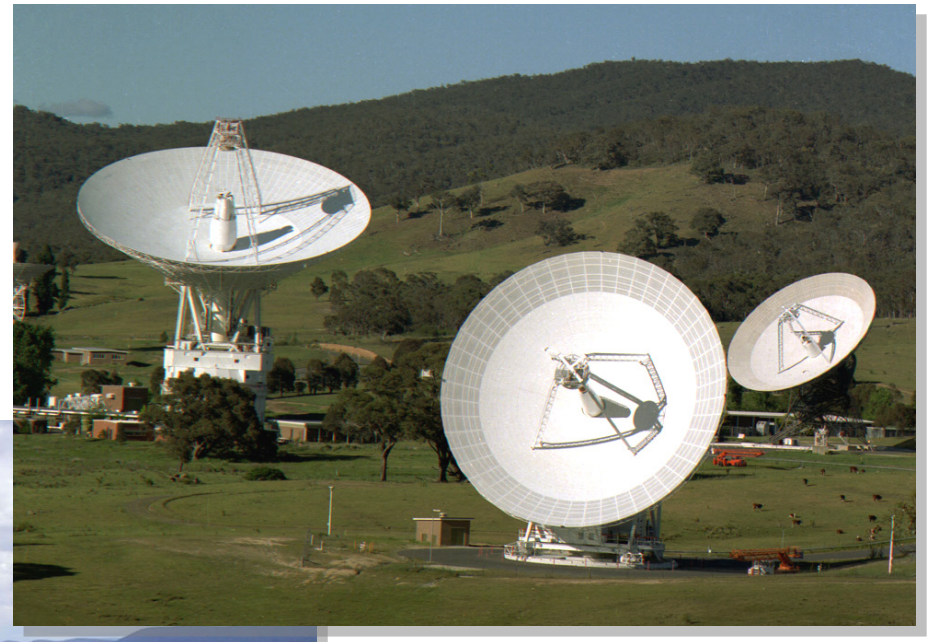
Goldstone California Complex, California, USA



Operated and maintained by
Harris, under contract to JPL

Canberra Complex, Australia

Operated by Raytheon for Australian Commonwealth Scientific and Industrial Research Organization (CSIRO), under contract with JPL

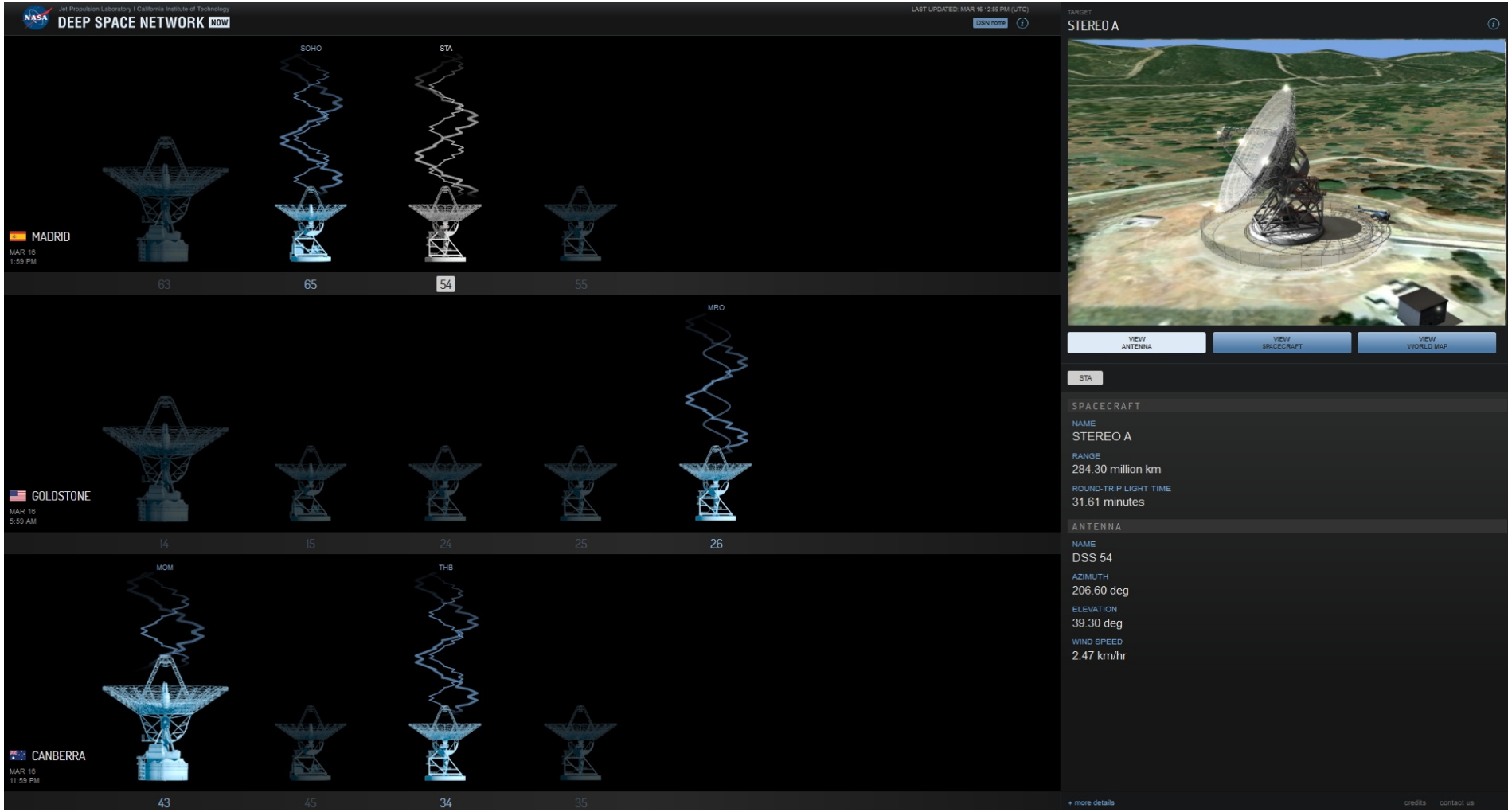


Madrid Complex, Spain

Operated by Ingeniería de Sistemas para la Defensa de España (Isdefe), under contract with Instituto Nacional de Técnica Aeroespacial (INTA) and JPL

Visit DSN NOW

See what we are communicating with in real time



http://eyes.nasa.gov/dsn/dsn.html

DSN Station Capabilities

DSS No.	Antenna Type	Location	Agency / Ops Org	S-Band Uplink Frequency (MHz)	S-Band Downlink Frequency (MHz)	X-Band Uplink Frequency (MHz)	X-Band Downlink Frequency (MHz)	Ka-Band Downlink Frequency (MHz)
14	70m	Goldstone, California	NASA/DSN	2110 - 2118	2270 - 2300	7145 - 7190	8400 - 8500	-
15	34HEF	Goldstone, California	NASA/DSN	2025 – 2120	2200 - 2300	7145 - 7190	8400 - 8500	-
24	34B1	Goldstone, California	NASA/DSN	2025-2120	2200 - 2300	7145 - 7190, 7190 - 7235	8400 - 8500	25500 - 27000
25	34B2	Goldstone, California	NASA/DSN	-	-	7145 - 7190, 7190 - 7235	8400 - 8500	31800 - 32300
26	34B3	Goldstone, California	NASA/DSN	-	-	7145 - 7190, 7190 - 7235	8400 - 8500	31800 - 32300
34	34B1	Canberra, Australia	NASA/DSN	2025-2120	2200 - 2300	7145 - 7190, 7190 - 7235	8400 - 8500	25500 - 27000, 31800 - 32300
35	34B2	Canberra, Australia	NASA/DSN	-	-	7145 - 7190, 7190 - 7235	8400 - 8500	31800 - 32300
36	34B3	Canberra, Australia	NASA/DSN	-	-	7145 - 7190, 7190 - 7235	8400 - 8500	31800 - 32300
43	70M	Canberra, Australia	NASA/DSN	2110 - 2120	2270 - 2300	7145 - 7190	8400 - 8500	-
45	34HEF	Canberra, Australia	NASA/DSN	2025-2110	2200 - 2300	7145 - 7190	8400 - 8500	-
54	34B1	Madrid, Spain	NASA/DSN	2025 - 2110 2110 - 2120*	2200 - 2300	7145 - 7190, 7190 - 7235	8400 - 8500	25500 - 27000, 31800 - 32300
55	34B2	Madrid, Spain	NASA/DSN	-	-	7145 - 7190, 7190 - 7235	8400 - 8500	31800 - 32300
63	70m	Madrid, Spain	NASA/DSN	2110-2118*	2270 - 2300	7145 - 7190	8400 - 8500	-
65	34HEF	Madrid, Spain	NASA/DSN	2025 - 2110	2200 - 2300	7145 - 7190	8400 - 8500	-

DSN Service Overview

- The DSN supports telecommunication and tracking operations with multiple deep space scientific missions
- The DSN also supports near-Earth missions above low earth orbit, including those at lunar distances, the Sun-Earth LaGrange points, and in highly elliptical Earth orbits
- The DSN offers services to a wide variety of mission customers, at multiple frequency bands, through all phases of a mission's lifetime

Customers • NASA • Other Government Agencies • International Partners	**Mission Phases** • Launch and Early Orbit Phase (LEOP) • Cruise • Orbital • In-situ
Mission Orbits • Geostationary or Geosynchronous Earth Orbit (GEO) • Highly Elliptical • Lunar • La Grange • Earth Drift-Away • Planetary	**Frequency Bands** • S-Band (2 GHz) • X-Band (7, 8 GHz) • Ka-Band (26, 32 GHz)

Characteristics of DSN Standard Data Services

- Standard Interfaces
  - DSN-provided data services are accessed via well-defined, standard data and control interfaces
    - the Consultative Committee for Space Data Systems (CCSDS),
    - the Space Frequency Coordination Group (SFCG),
    - the International Telecommunication Union (ITU),
    - the International Organization for Standardization (ISO),
    - de facto standards widely applied within industry,
    - and common interfaces specified by the DSN
  - Data service interface standards enable interoperability with similar services from other providers
  - Mitigates the need for additional development effort on the part of both the DSN and the customer
  - Maximizes the customer's opportunities to reuse
  - Helps keep costs down
- "Pick & Choose”
  - DSN standard data services are independent of each other
- "Plug & Play”
  - DSN standard data services are multi-mission in nature and generally require table adaptations
  - No development is required on the part of the DSN beyond configuration, parameter updates, mission service validations and interface testing
  - Development on the customer’s side is limited to using the standard service and meeting its interfaces

Standard DSN Services
For communicating and operating CubeSats

- **Command Services**
  - Forward Space Link Extension (SLE)
    - Command Link Transmission Unit (CLTU) Radiation
- **Telemetry Services**
  - Return Space Link Extension (SLE)
    - Frame service
- **Tracking Services (Trajectory)**
  - Validated Radio Metric Data
  - Delta-DOR (Differential 1-way ranging)
- **Calibration and Modeling Services (Earth info)**
  - Platform Calibration
  - Media Calibration
- **Radio Science Services (Radio Wave Experiments)**
  - Experiment Access
  - Data Acquisition
- **Service Management**
  - Allocation and scheduling of assets
  - Configuring, monitoring, and controlling the DSN asset
  - Reporting service execution results

DSN Mission Interface Management

- DSN Mission Support Definition and Commitments Office (9021) functions as the service provider gateway for all projects and is located at JPL Pasadena, California
  - DSN Mission Interface Manager (MIM) is responsible for interfacing with the customers from pre-project planning through design, development, testing, flight operations, and closeout

Mission Interface Manager Contact Info:

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Important References for using the DSN

- **DSN Commitments Office Website**
  - http://deepspace.jpl.nasa.gov/advmiss/index.html

- **DSN Documents applicable to all mission using the DSN**
  - **DSN Mission Service Interfaces, Polices, and Practices (MSIPP)** (875-0001)
  - **DSN Services Catalog** (820-100)
  - **DSN Telecommunications Link Design Handbook** (810-005)
    - http://deepspace.jpl.nasa.gov/advmiss/missiondesigndocs/