

# About the Occultation

- S30 T31 Rev 45 Titan Atmospheric occultation
  - Ingress and Egress
  - Telemetry OFF, 1-way mode

- Science Highlights – From Essam Marouf

The T31 RSS atmospheric occultation is [the last of four Titan occultations planned for the Cassini nominal mission. It's distinguished by being the only one that uses reaction-wheels for pointing control](#) (the T12, T14, and T27 occultation used RCS control) The exceptional expected pointing performance will be critical for accurate measurement of the intensity extinction profiles (X-, S-, and Ka-band) in the neutral atmosphere. This is [particularly important for the highly pointing sensitive Ka-band observations](#). The observations should provide the large and small structure of Titan's neutral atmosphere in exquisite detail. They should also provide "ground-truth" measurements for comparison with the T12/T14/T27 observations. The T31 [occultation covers both the ingress and egress sides, probing latitudes of 75 degs South and 73 degs North, respectively, the highest achieved in the nominal mission](#). Together with T27 (also a North-South occultation), the T31 observations will be critical for characterization of atmospheric dynamics close to Titan's polar regions, in particular Titan's polar vortex.

# DSN Antennas Supporting T31

- DSN Coverage

Station	Pre-cal	BOT	EOT	Post-Cal
DSS-55	148/1615	148/1800	148/2135	148/2150
DSS-25	148/1651	148/1836	148/2135	148/2150
DSS-63	148/1700	148/1800	148/2135	148/2150
DSS-26	148/1706	148/1851	148/2135	148/2150
DSS-14	148/1736	148/1836	148/2135	148/2150

All pass# 3522

- Receivers scheduled
  - 2 closed-loop receivers per antenna
  - All RSRs, VSRs and WWSRs at Goldstone Madrid are scheduled
    - Total: 18 open-loop receivers
  - Open-loop data are prime. Closed-loop data are backup
- RCP required. LCP enhancement.

# Antennas Capabilities

## Simultaneous Band and Polarization

DSS-14

X-RCP  
X-LCP

S-RCP  
S-LCP

DSS-25

X-RCP  
X-LCP

K-RCP

DSS-26

X-RCP  
X-LCP

K-RCP  
K-LCP

Either KLCP or monopulse

DSS-63

X-RCP  
X-LCP

S-RCP  
S-LCP

DSS-55

X-RCP  
X-LCP

K-RCP  
K-LCP

Either KLCP or monopulse

All-Band Dependent Polarizations

Ambient Load or Cold Sky changes will impact both polarizations/both bands

Same-Band Dependent Polarizations

Ambient Load or Cold Sky changes will impact both polarizations/same band

Independent Polarizations

Ambient Load or Cold Sky changes will only impact polarization being changed

# RSR/VSR/WVSR Assignment

Operator	Station	Open-Loop Receiver	DSS	RSR Assignment
Gene	rsops1	RSR1 and RSR3	25	RSR1A -> XRCP
				RSR1B -> KRCP
			14	RSR3A -> XRCP
Danny	PC via rsops2	RSR2 and VSR1	26	RSR2A -> XRCP
				RSR2B -> KRCP
	PC via rsops3	VSR1 and WVSR1	14	VSR1A -> XLCP
				VSR1B -> SLCP
			26	WVSR1A -> XLCP
Elias	rsops2	RSR1 and RSR2	55	RSR1A -> XRCP
				RSR1B -> KRCP
			63	RSR1B -> XRCP
				RSR2B -> SRCP
Don	rsops3	VSR1 and WVSR1	63	VSR1A -> XLCP
				VSR1B -> SLCP
			55	WVSR1A -> XLCP
				WVSR1B -> KLCP

# T31 ORTs

ORT#1, DOY 133 (May 13) over DSS-55, X- and Ka-band

07 133 1115 1330 2230 2245 DSS-55 CAS RSBIORT1 ARRAY-R 3507 N650

07 133 1230 1330 2230 2245 DSS-63 CAS TP T30PB ARRAY-S 3507 N003

- Collected DSS-55 pointing data (monopulse) to update the 4th-order blind pointing model
- Windy

ORT#2, DOY 138 (May 18) over DSS-25, DSS-26 and DSS-55, X- and Ka-band

07 138 1900 2045 0545 0600 DSS-25 CAS TP RSR44-OCCORT2 3512 N748 \*

07 138 1900 2045 0545 0600 DSS-26 CAS TP RSR44-OCCORT2 3512 N750

07 138 1900 2045 0000 0015 DSS-55 CAS TP RSR44-OCCORT2 3512 N750

- Collected DSS-25, DSS-26 and DSS-55 pointing data (monopulse) to update the 4th-order blind pointing model
- Goldstone clear and calm. Madrid partly cloudy.
- DSS-26 monopulse miscalibrated (DR# G107750). Calibrated in LCP mode instead of RCP. Good monopulse data starting at 138/2305.
  - Updated CAD issued. NOPEs to clarify more in future Briefing Messages
- DSS-55 SPS DLF predicts missing 3-way with DSS-25 mode. No impact to monopulse data, only to RSR data acquisition.

ORT#3, DOY 143 (May 23) over DSS-14 and DSS-63, X- and S-band

07 143 1930 2030 0530 0545 DSS-14 CAS TP RSR45-OCCORT3 3517 1639 \*

07 143 1930 2030 2355 0010 DSS-63 CAS TP RSR45-OCCORT3 3517 1639

- Verify X- and S-band (RCP and LCP)