

# About the Occultation

- S80 Rev 197 Saturn atmospheric & rings occultation on DOY 244 (Aug 31 – Sep 1 PDT)
  - Atmospheric ingress and rings egress occs
  - Telemetry OFF, Ranging OFF, **2-way/3-way mode**
  - Covered by Canberra (U/L & D/L), Madrid (U/L & D/L) and Goldstone (D/L)

- From Essam Marouf:

The S80/Rev197 RSS Saturn occultations include a high southern latitude (~62 degs) atmospheric occultation on the ingress side and a partial ring occultation on the egress side. They are very distant occultations (spacecraft distance over 2 million km from Saturn; ~36 RS). Because of this large distance, during the nearly 8 hours period the spacecraft is geometrically occulted from Earth by Saturn, Earth never really fully sets behind Saturn as seen from the spacecraft (ray bending angle < ~1.22 degs). The speed with which the virtual Earth moves around the limb is very slow. During a nearly 2.3 hours ingress limb-track maneuver, one of the longest implemented so far, the troposphere will be probed to a maximum bending angle of about 0.82 degrees, large enough to capture good part of the troposphere. This unusual observation geometry was only captured once before (back in 2006 on Rev28). Together with atmospheric occultations completed during the Prime mission, the S80/Rev197 occultation will help in characterization of time and seasonal variability of the thermal structure of the atmosphere, especially over the southern polar region. The egress ring occultation probes only the Cassini Division and Ring A. Profiles of observed ring structure acquired at a new ring opening angle of ~18.2 degs and new longitude will help in characterizing the variability of ring structure with observation geometry, critical for investigating waves in Ring A, gravitational wakes, and gravitational overstability. The occultation will be conducted in the 2-way configuration with the reference X-band uplink signal provided by DSS-43 followed by DSS-63, with an unfortunate uplink coherent gap about 7 minutes long. The downlink S/X/Ka-band signals will be observed primarily by the Madrid complex (DSS-55 and DSS-63) during the ingress atmospheric occultation and primarily by the Goldstone complex (DSS-25 and DSS-14) during the egress Ring A occultation. The Rev 197 occultation will be the last Saturn atmospheric or ring radio occultation in the Cassini Mission until June 2016.

# DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post							
13 244	0530	0630	1145	1200	DSS-43	CAS	TP	RS197-RIOCC	5816	1647	1A1
13 244	0730	0900	1145	1200	DSS-34	CAS	TP	RS197-RIOCC	5816	N750	1A1
13 244	0945	1115	2030	2045	DSS-55	CAS	TP	RS197-RIOCC	5816	N750	1A1
13 244	1010	1110	2040	2055	DSS-63	CAS	TP	RS197-RIOCC	5816	1635	1A1
13 244	1700	1830	2300	2315	DSS-25	CAS	TP	RS197-RIOCC	5816	N748	1A1
13 244	1730	1830	2300	2315	DSS-14	CAS	TP	RS197-RIOCC	5816	1647	1A1

- DSS-43 then DSS-63 will provide uplink

- Receivers scheduled

- 2 closed-loop receivers per antenna
- Open-loop receivers (RSRs, WVSRs, VSRs)
- Open-loop data are prime. Closed-loop data are backup
  - Will need ramp info in closed-loop data for processing
- Only RCP will be recorded
  - 2-way/3-way and 1-way modes

# S80 Rev 197 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
43 2-way	Gregory	rsops1	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
43 1-way	Danny	rsops4	WVSR1	WVSR1A -> XRCP WVSR1B -> SRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 16, 50, 100 1, 16, 50, 100 (with offset)
34 3-way	Gregory	rsops1	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
34 1-way	Danny	rsops4	WVSR2	WVSR2A -> XRCP WVSR2B -> KRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 2, 16, 50 1, 2, 16, 50 (with offset)
63 3-way	Gregory/ Elias	rsops2	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
63 1-way	Danny	rsops4	WVSR1	WVSR1A -> XRCP WVSR1B -> SRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 16, 50, 100 1, 16, 50, 100 (with offset)
55 3-way	Gregory/ Elias	rsops2	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
55 1-way	Danny	rsops4	WVSR2	WVSR2A -> XRCP WVSR2B -> KRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 2, 16, 50 1, 2, 16, 50 (with offset)

# S80 Rev 197 Open-Loop Assignment cont'd

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
14 3-way	Dustin	rsops1	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
14 1-way	Danny	rsops4	WVSR1	WVSR1A -> XRCP WVSR1B -> SRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 16, 50, 100 1, 16, 50, 100 (with offset)
25 3-way	Dustin	rsops1	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
25 1-way	Danny	rsops4	WVSR2	WVSR2A -> XRCP WVSR2B -> KRCP	1, 2, 3, 4 5, 6, 7, 8 1, 2, 3, 4 5, 6, 7, 8	1, 16, 50, 100 1, 16, 50, 100 (with offset) 1, 2, 16, 50 1, 2, 16, 50 (with offset)

RSSG will be in Ops Room at 10:15 pm on Saturday, August 31 (244/0515)

Gregory: 10:15 pm – 6:00 am  
Aseel, Danny: 12:30 am – 8:00 am, 1:00 pm – 5:00 pm  
Elias: 5:00 am – 2:00 pm  
Dustin: 9:30 am – 5:00 pm

VSR is backup

Aseel – VOCA

Gregory & Elias - Ops Room Displays

Danny – Check WVSR/VSR availability & RSR/WVSR/VSR disk space

# Predicts

- DSS-43 and DSS-63 uplink (ETX) predicts should compensate for Doppler shift due to Saturn's atmosphere
- NAV's last OD delivery prior to the occultation was delivered on August 2
  - The same OD that was used for the previous occ (Rev 196 on DOY 220/Aug 8)
- When can SPS provide DSS-43 & DSS-63 ETX files?
- RSS (Paul Schinder) will apply the Doppler shifts to the ETX files. Modified files will be sent to the NOPEs within 24 hours after the ETX files are made available to RSS
- Elias, Danny and Dustin will start the work on the predicts as soon as the SPS ETX files are available
- RSS usually uses three sets of downlink predicts in the open-loop receivers:
  - #1: Coherent with atmospheric compensation: generated using Nicole's PREDICTs software and SPS nominal (unmodified) ETX
  - #2: 1-way coherent: 1-way predicts generated using PREDICTS and the Doppler file produced by Paul, offset in real-time to coherent downlink frequency
  - #3: 1-way (no offset): For the times when the DST is not in lock on the uplink

# ORTs

## Completed

ORT on DOY 232 (Aug 20 PDT) over DSS-55, X- and Ka-band

13 232 1045 1215 2100 2115 DSS-55 CAS RS196-OCCORT MC 5804 N750 1A1

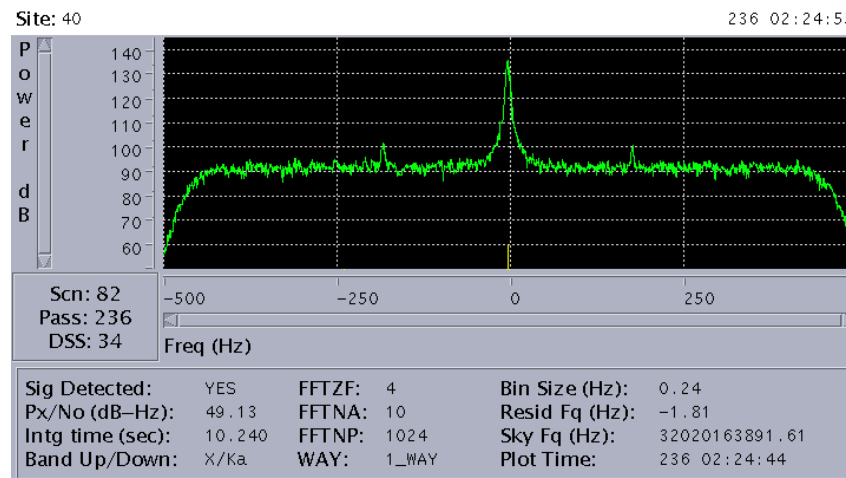
- Also prime TP
- Station conducted on-point phase cals
- High monopulse elevation corrections during the first part of the track, then high azimuth corrections

ORT on DOY 236 (Aug 23 PDT) over DSS-34, X- and Ka-band

13 236 0015 0145 1045 1100 DSS-34 CAS RS196-OCCORT MC 5808 N750 1A1

13 236 0045 0145 1045 1100 DSS-43 CAS TKG PASS 5808 N003 1A1Also prime TP

- DSS-43 prime
- RSRs problems during pre-cal (verify failed on every RSR. IFS was not properly set). Station fixed a few minutes after BOT. DR C109509
- DSS-34 Ka-band spur +/- 180 Hz from carrier. DR C109511



# ORTs cont'd

ORT on DOY 238 (Aug 25 PDT) over DSS-34, X- and Ka-band

13 238 0000 0130 1030 1045 DSS-34 CAS RS196-OCCORT MC 5810 N750 1A1

13 238 0030 0130 1030 1045 DSS-43 CAS TKG PASS 5810 N003 1A1

- DSS-43 prime
- Continue seeing Ka-band spur. DR C109513 opened (later closed and linked to DR C109511)

## Upcoming

ORT on DOY 243 (Aug 31 PDT) over DSS-25, X- and Ka-band

• 13 243 1730 1900 0400 0415 DSS-25 CAS RS197-OCCORT MC 5815 N748 1A1

• 13 243 1800 1900 0400 0415 DSS-14 CAS TKG PASS 5815 N003 1A1

- DSS-14 prime
- Acquire monopulse/pointing data
- Ends 1hr15min before beginning of occultation DSS-43 pre-cal

# Misc

## Uplink Strategy

- DSS-43, 18 kW, ramped, sweep
  - DSS-63, 18 kW, ramped, sweep
  - Used times according to view periods file:
    - DSS-43 transmitter OFF limit 244/11:26:48
    - DSS-63 transmitter ON limit 244/11:33:52
- NOPEs – Please verify times

DKF – Does not have the correct uplink or AOS/LOS times. Use times in RSS timeline

## Plan for DSS-34, DSS-55 and DSS-25 Cassini Specific 4th Order Pointing Model?

- Long occultation experiment. Crucial for all stations to have good pointing models since we can't utilize monopulse throughout

## New controller at all BWG stations

- Monopulse will not be disabled automatically when the receivers go out of lock
  - Pointing/monopulse strategy to take this into consideration
- Anomaly with Monopulse not getting re-enabled after multiple enables/disables
  - New directive in BM, but was missed once or twice during previous occ and station had to be reminded

## Reminder to stations to enable monopulse only when requested to do so by RSSG

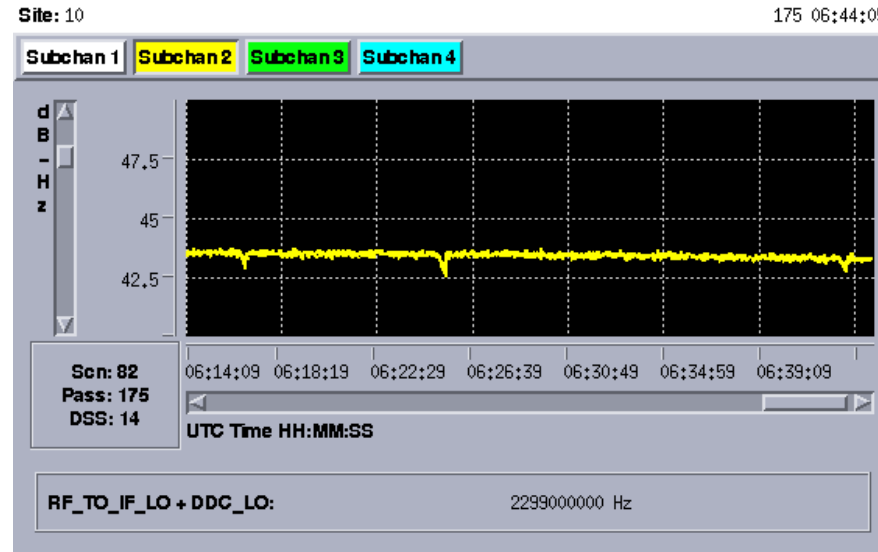
- Was enabled without RSSG request during previous occ



# Misc cont'd

NOPEs - Equipment Status?

DSS-14 S-band Dips



- Not seen during Rev 196 occ on DOY 220
- Watch for them

SNT

- Enable X only at DSS-34, DSS-55 and DSS-25 throughout
- Conduct SNT measurements