

About the Occultation

- S99 Rev 270 Saturn rings and atmospheric ingress occultations
 - The last atmospheric occultation in the mission!
 - Telemetry OFF, Ranging OFF, 2-way/3-way mode
 - Covered by Madrid (uplink only), Goldstone and Canberra. Malargue track added today

- From Essam Marouf:

The Rev 270 RSS observations include an ingress ring occultation followed by an ingress atmospheric occultation. The latter is the last during the Cassini Mission lifetime. It probes near-equatorial latitude of -16.5° , important for characterization of the impact of Saturn's fast equatorial winds on thermal structure of the atmosphere. The thermal structure is profiled using measurements of the Doppler shift caused by refractive ray bending in the atmosphere.

Comparison with other near-equatorial occultations early in the Cassini mission help characterize likely temporal/seasonal variations of the atmosphere. Signal power measurements yield profiles of the microwave gaseous absorptivity and constrain abundance of responsible gaseous species. The ingress ring occultation is the third in a sequence that sample different ring longitudes (Revs 266, 268, and 270) and about the same ring opening angle of 26.4 degrees. It probes the full ring system. The large opening angle allows profiling of large optical depth ring features. Comparison of the structure observed at multiple Earth relative and inertial longitudes help characterize the rings azimuthal asymmetry, both virtual (due to gravitational wakes) and actual (due to dynamical interactions with the satellites). Collectively, the group of 3-frequency RSS ring occultations, including the one on Rev 270, provide information about azimuthal variability of ring structure and physical properties of resolved features.

DSN and ESA Antennas

- DSN Coverage

	Pre	BOT	EOT	Post								
17 110	0520	0620	0805	0820	DSS-63	CAS	RSS 270	OCC L3	7146	1647	1A1	
17 110	0625	0725	1530	1545	DSS-14	CAS	RSS 270	OCC L3	7146	1647	1A1	
17 110	0730	0900	1530	1545	DSS-26	CAS	RSS 270	OCC L3	7146	N750	1A1	
17 110	1010	1140	1750	1805	DSS-35	CAS	RSS 270	OCC L3	7147	N750	1A1	
17 110	1025	1125	0015	0030	DSS-43	CAS	RSS270	OCC L3 TP	7147	1647	1A1	
17 110	0815	0900	1330	1345	DSS-84	CAS						

- DSS-43 track continues after the RSS observation for telemetry support
- DSS-63 and DSS-14 will be providing the uplink for the occultations
- DSS-43 will be providing the uplink for the downlink period that follows
- DSS-84 track added today. Not in schedule

Receivers scheduled

- 2 closed-loop receivers per antenna
- Open-loop receivers (RSRs, WVSRs, VSRs, PRSRs)
- 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

S99 Rev 270 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
14 1-/3-/2-way	Elias	rsops2	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)
26 1-/3-way	Elias	rsops2	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
26 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, 16, 50, 100 1, 16, 50, 100 (with offset)
84 3-way	Aseel	rsops6/ psdg5	PRSR 168.96.250.72	PRSR -> KRCP	1, 2, 3, 4	1, 16, 50, 100 (3-way)
43 3-/2-way	Clement	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	Jay	rsops5	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)
35 1-/3-way	Clement	rsops1	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
35 1-way	Jay	rsops5	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, 16, 50, 100 1, 16, 50, 100 (with offset)

S99 Rev 270 Open-Loop Assignment Cont'd

RSSG will be in Ops Room at 10:15 pm on Wednesday, April 19 (110/0515)

Aseel – VOCA

Elias – Ops Room Displays

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

Receiver Status and Backup Receivers

Goldstone

- No PRSR
- VSR status?
- RSR3 is backup

Canberra:

- As of this morning, RSR2 was offline
- PRSR is red
- VSR is backup

Malargue

- PRSR is green and working

Predicts

- Which OD to use for predicts generation?
 - The special OD that was delivered for the RSS Live Update yesterday (April 10) will be used for predicts generation
 - Lu: Please ask SPS to provide uplink predicts by tomorrow
 - OD for OTM-469 will be delivered on Monday, April 17, but too late to use for predicts generation
- Two stations will be providing the uplink for the occultations, but only DSS-14 predicts will be modified by RSS to compensate for the Doppler shift due to Saturn's atmosphere
 - DSS-26 backup for uplink
- Elias and Danny will generate and verify the open-loop downlink predicts
- RSS usually uses three sets of downlink predicts in the open-loop receivers for
- Occultations:
 - #1: Coherent (2-way/3-way) with atmospheric compensation: generated using Nicole's PREDICTs software and SPS nominal (unmodified) ETX
 - #2: 1-way coherent: 1-way predicts offset in real-time to coherent downlink frequency
 - #3: 1-way (no offset): For 1-way baseline and the times when the DST loses lock

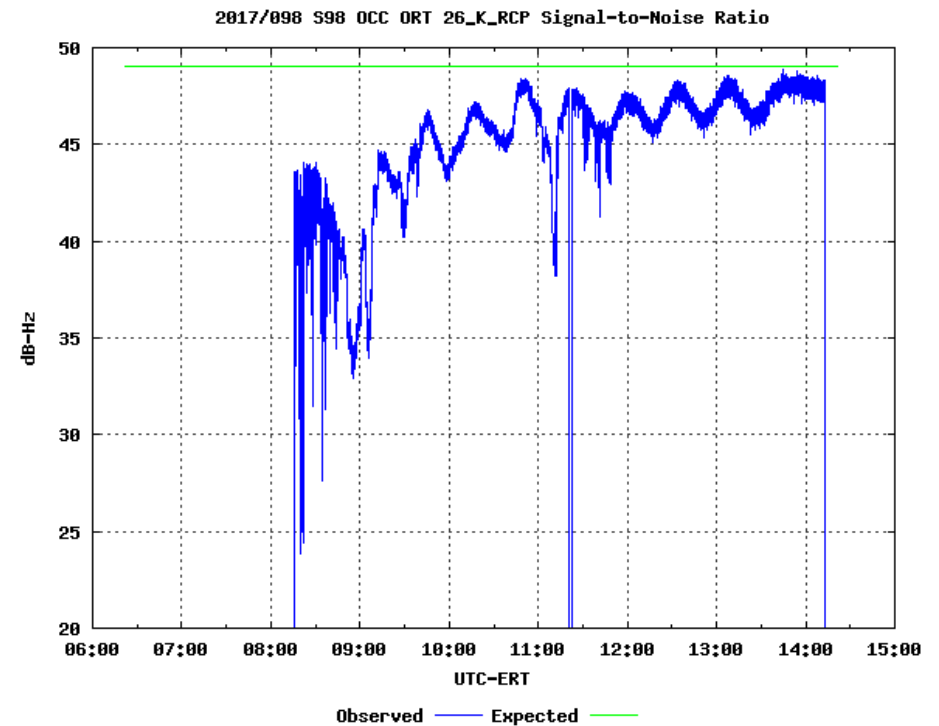
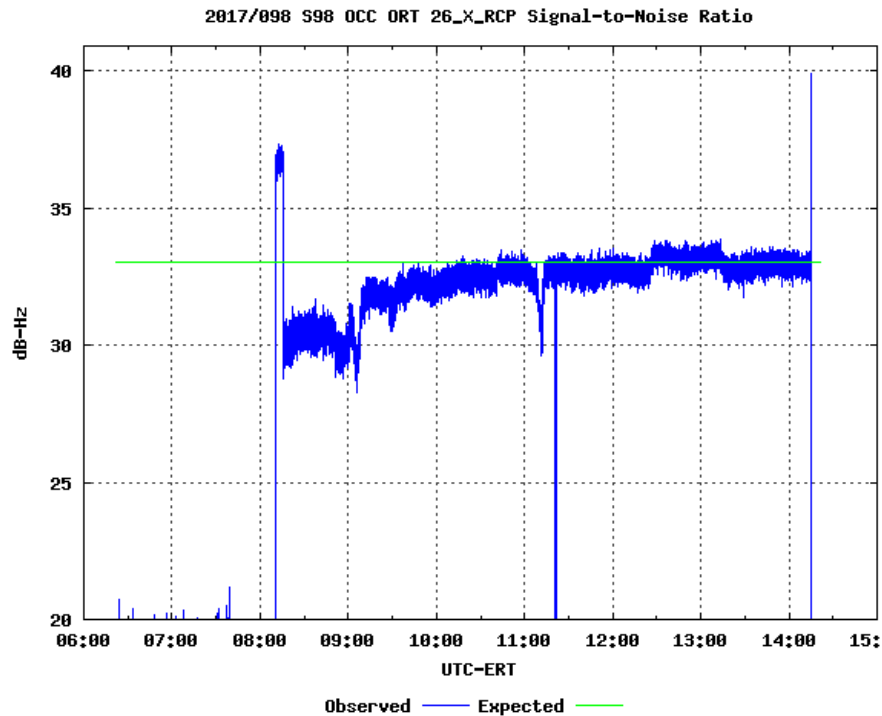
ORTs

ORT on DOY 098 (April 8) over DSS-26, X- and Ka-band

Completed

17 098 0645 0815 1415 1430 DSS-26 CAS TP SEQ RSSORT MC 7134 N750 1A1

- Also prime TP
- Monopulse on-point phase calibrations performed
- Pointing data acquired and sent to David for assessment



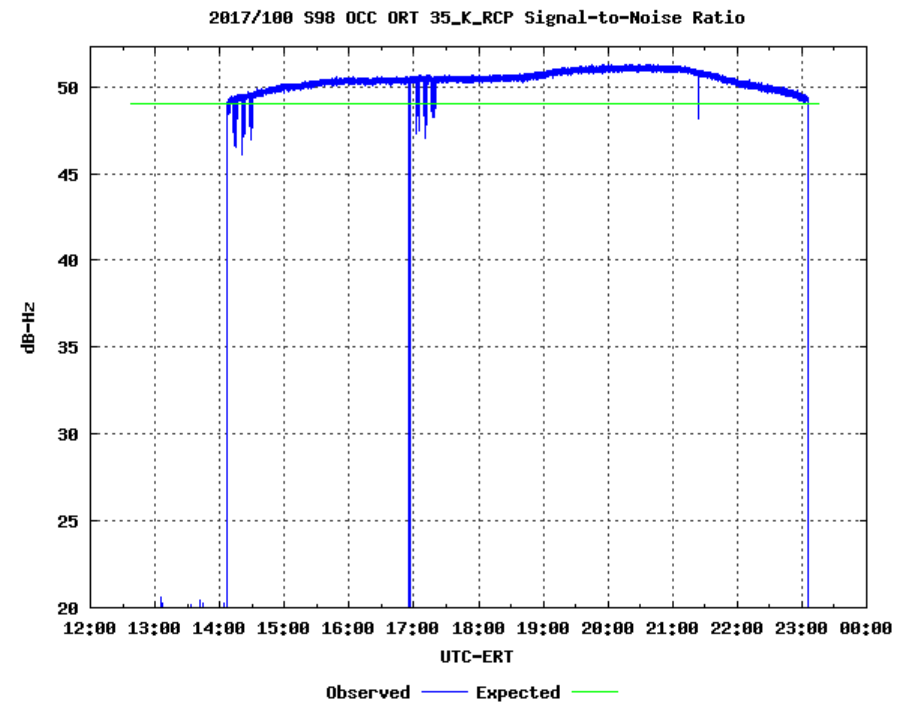
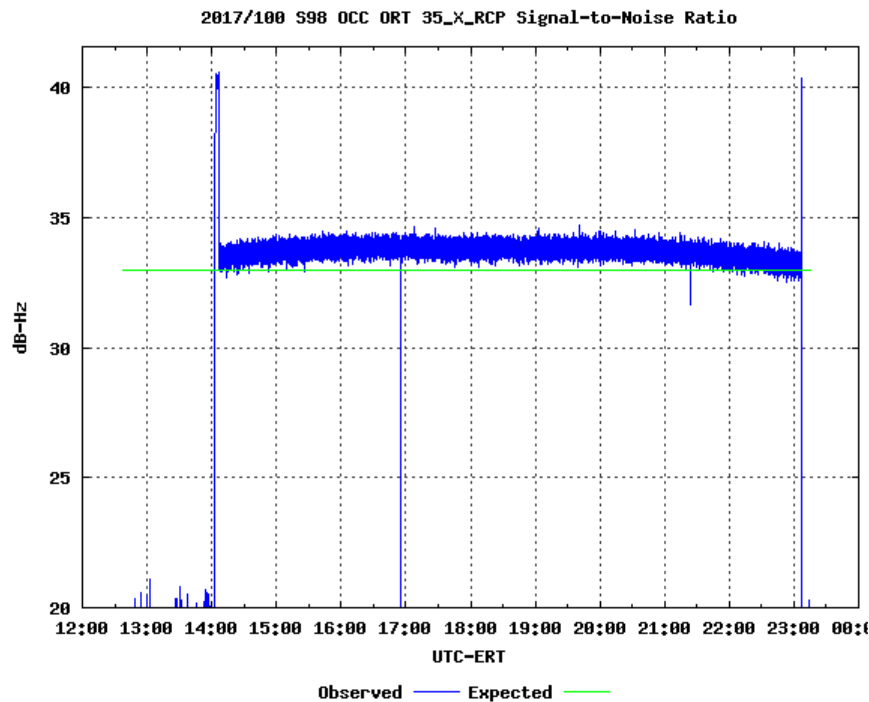
ORTs cont'd

ORT on DOY 100 (April 10) over DSS-35, X- and Ka-band

Completed

17 100 1235 1405 2310 2325 DSS-35 CAS TP RSS OCCORT MC 7137 N750 1A1

- Also prime TP
- 0.3 dB improvement in Ka-band signal power when Monopulse was first enabled. Also signal more stable
- Monopulse on-point phase calibrations performed
- Pointing data acquired and were sent to David for assessment



ORTs cont'd

Upcoming

ORT on DOY 105 (April 15) over DSS-35 and DSS-26, X- and Ka-band

17 105 1220 1350 1615 1630 DSS-26 CAS RSS OCCORT MC 7141 N750 1A1

17 105 1220 1350 2255 2310 DSS-35 CAS TP RSS OCCORT MC 7142 N750 1A1

- DSS-35 also prime TP
- Verify Monopulse
- Acquire pointing data

Misc

Uplink Strategy

- DSS-63, 18 kW, ramped, sweep
- DSS-14, 18 kW, ramped, no sweep
- Uplink transfer between Madrid and Goldstone not possible
 - ~2min gap in uplink due to transmitter elevation limits
 - DSS-63 transmitter off limit: 110/07:46:34 ERT
 - DSS-14 transmitter on limit: 110/07:48:31 ERT
 - Timeline has DSS-63 stopping the uplink at 074600, and DSS-14 starting at 074900
- DSS-43, 18 kW, ramped, sweep (per DKF)
 - For downlink period following the occultation

Asked ESA for additional Malargue Ka-band tracks before we begin the crucial proximal supports

- Delay in starting good recording during Rev 268 occultation on April 6
 - RF to IF downconversion
 - Issue resolved, but want to ensure there are no other issues
- This morning, ESA sent available times and found two opportunities
 - DOY 110 and DOY 113
- Request both with DOY 110 being higher priority. Waiting for confirmation from ESA
- Timeline shows added DSS-84 track
- Track is not in schedule

Misc Cont'd

DKF – Does not have the correct uplink or AOS/LOS times. Use times in RSS timeline
Follow DKF after RSS observation is complete

Plan for updating DSS-26 and DSS-35 Cassini Specific 4th Order Pointing Model?

- Pointing data sent to David
- One additional set for each antenna will be sent after April 15th ORTs

NOPEs - Equipment Status?