

Observation Overview

Thank you for a successful Rev 280 on June 22-23!

- S100 Rev 282 Saturn chord rings occultation
 - Telemetry OFF, Ranging OFF, 2-way/3-way mode
 - Covered by Canberra, Madrid, New Norcia
- This is an occultation only observation. The next combined gravity and occultation observations are on DOY 199-200 (July 18-19)
 - Last for RSS!

Science Highlights

- From Essam Marouf:

The Rev 282 RSS ingress/egress chord ring occultation is the seventh opportunity in a 'campaign' of eight Grand Finale (Proximal Orbits) Cassini radio occultations of Saturn's ring system (the short periapse ring occultation is not implemented on Rev 282). The campaign takes advantage of occultation track geometry that systematically sweeps across the ring system. Collectively, the set of occultation tracks were selected to capture a spread in: 1) Earth relative longitude, and 2) inertial ring longitudes. The first allows characterization of the virtual azimuthal ring asymmetry due to gravitational wakes, known to permeate the A and B rings. The second allows characterization of true azimuthal ring asymmetry driven by ring dynamics. Also unique about the campaign is that the rings are close to their maximum opening angle ($B \sim 26-27^\circ$) as seen from the Earth, possible only near the 2017 epoch of the Proximal Orbits. The large B -angle allows maximum possible penetration of the radio signals of optically thick features, especially Ring B. The same is true for regions of optical depth enhancements within the many density and bending waves known to populate Ring A and the few in Ring B, and for the confined optically thick ringlets across the ring system including the plateaus of Ring C. Radio occultations enjoy the advantage of three coherent observation frequencies (Ka/X/S bands) allowing not only profiling of ring structure but also constraining the structures physical properties.

DSN and ESA Antennas

- DSN Coverage

	Pre	BOT	EOT	Post									
17 187	1045	1145	1905	1920	DSS-43	CAS	RSS	RI	OCC	L3	7224	1647	1A1
17 187	1240	1410	1905	1920	DSS-35	CAS	RSS	RI	OCC	L3	7224	0681	1A1
17 187	1515	1600	2030	2045	DSS-74	CAS	RSS	RI	OCC	L3	7225	0142	1A1
17 187	1715	1845	0030	0045	DSS-55	CAS	RSS	RI	OCC	L3	7224	0676	1A1
17 187	1745	1845	0030	0045	DSS-63	CAS	RSS	RI	OCC	L3	7224	1647	1A1

- DSS-43, DSS-74 and DSS-63 will be providing the uplink
- Asked ESA to start the DSS-74 earlier. They kindly accommodated
 - New BOT: 1535
 - In the process of updating the 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

S100 Rev 282 Open-Loop Receivers Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
43 1-/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	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)
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	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)
74 1-/3-way	Aseel	rsops6/ psdg5	PRSR 134.159.181.84	PRSR -> XRCP	1, 2, 3, 4	1, 16, 50, 100
63 3-/2-way	Elias	rsops1	RSR1/RSR2	RSR1B -> XRCP RSR2A -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
63 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)

S100 Rev 282 Open-Loop Receivers Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
55 3-way	Elias	rsops2	RSR1/RSR2	RSR1A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
55 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)
55 3-way	Danny	rsops4	PRSR	PRSR -> KRCP	1, 2, 3, 4	1, 16, 50, 100

Don't record

DSN Open-Loop Receiver Status

Email from Danny on 5/18

Goldstone

RSR1 – Green (tone occurs at 0.5 MHz multiples near RF_TO_IF_LO + DDCL0)

RSR2 – Green with data rate != num_samples warnings

RSR3 – Green

VSR1A – "Orange" - DP Internal Error Error may occur; try restarting; reliability in question

VSR1B – "Red" - DP Internal Error Error may occur; try restarting; reliability in question

WVSR1 – Green w/ with fgain bug

WVSR2 – Green w/ with fgain bug

No PRSR

Canberra

RSR1 – Green

RSR2 – Green

VSR1 – Green

PRSR1 –Red

WVSR1 – Green w/ with fgain bug

WVSR2 – Green w/ with fgain bug

Madrid

RSR1A – Red but can be used by overriding dig vfy test

RSR1B - Green

RSR2A – Green

RSR2B – Digitizer test fails due to unknown cause. Can be used by overriding dig vfy test

VSR1 – Red

PRSR1 – Green

WVSR1 – Green w/ with fgain bug

WVSR2 - Green w/ with fgain bug

Real-Time Support

RSSG will be in Ops Room at 3:30am on Thursday, July 6 PDT (187/1030)

- Last L3 post-cal ends at 5:45 pm Thursday (188/0045)
- ~14 hours
 - Piece of cake! 😊

Predicts

- NAV OD was delivered on Monday, May 26, for S100 Live Update
 - NAV was willing to make a special delivery on Friday for RSS
 - Found out that frequency drift observed during periapse period on Rev 278 was due to using 3wk old OD to generate predicts
 - Rev 282 occultation not as sensitive to trajectory timing error
 - No need for additional work around 4th of July holiday
 - Will use Monday's OD for predicts generation
- Lu: Can you please ask SPS to provide uplink predicts today
- RSS will **not** be modifying the uplink predicts
- 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)
 - #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 when the DST loses lock (for example, dense ring regions)

ORTs

Completed

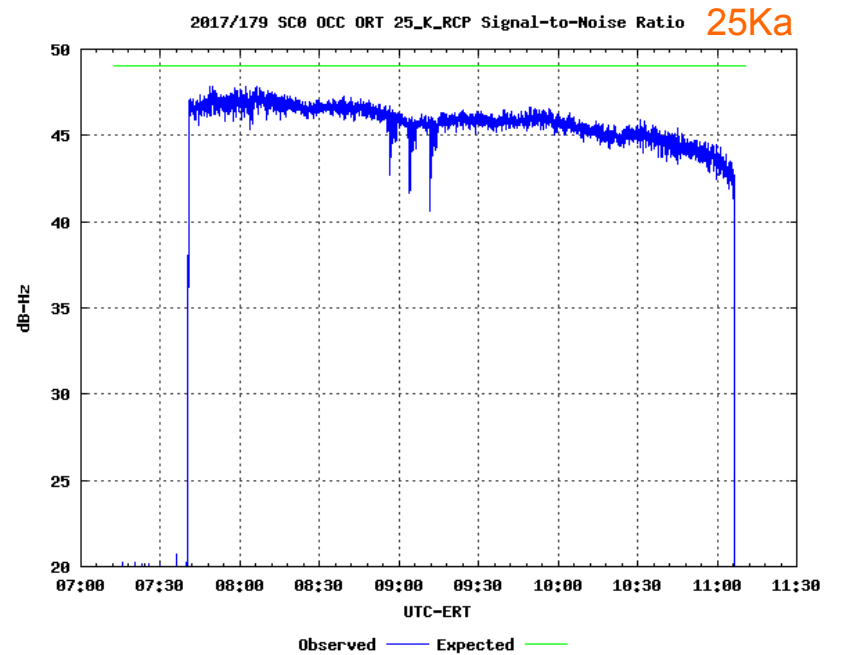
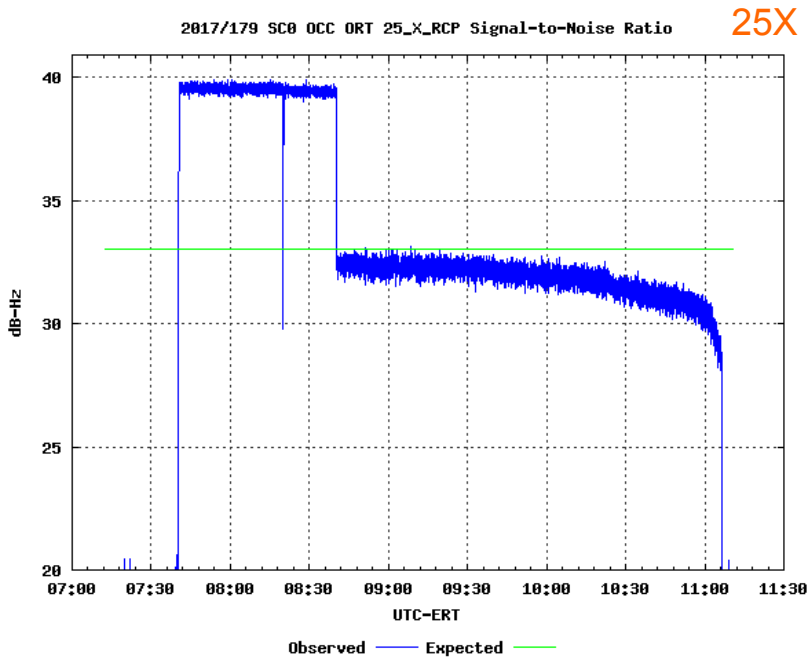
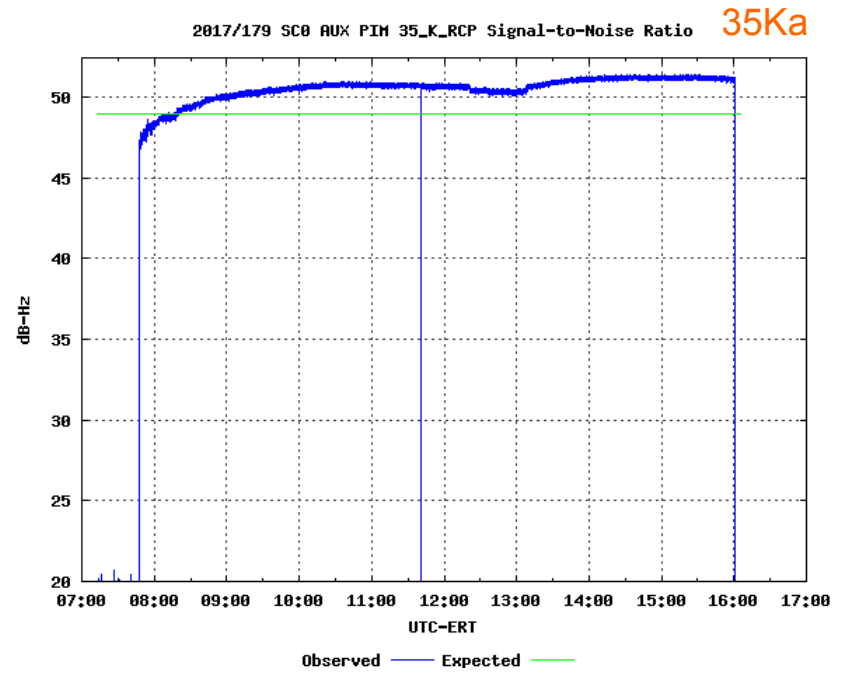
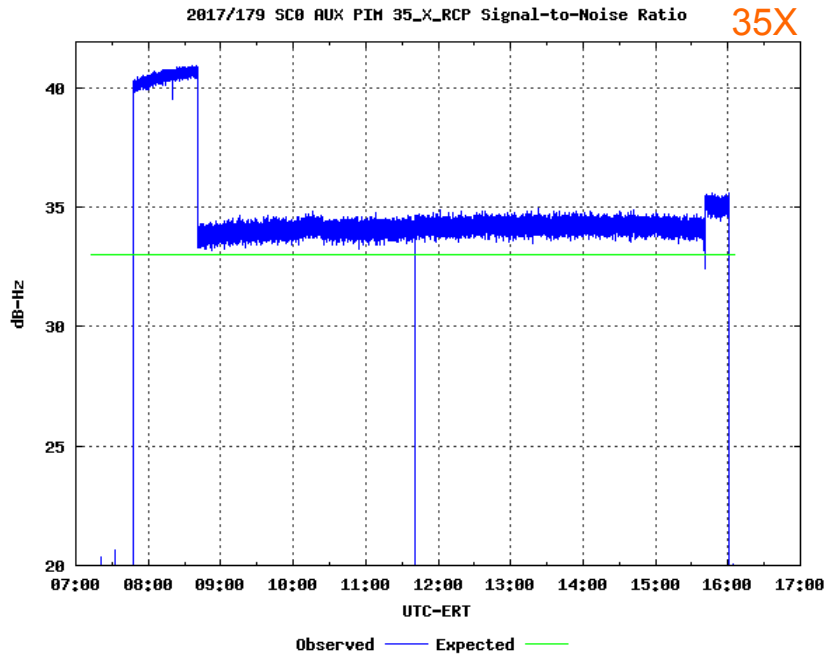
ORT + AUXPIM on DOY 179 (June 28) over DSS-25 and DSS-35, X- and Ka-band

17 179 0710 0840 1105 1120 DSS-25 CAS RSS OCCORT MC 7215 N748 1A1

17 179 0710 0840 1600 1615 DSS-35 CAS TP RSS AUXPIM 7216 N750 1A1

- DSS-35 prime
- Last AUXPIM in the mission
- Verified Monopulse
- Danny supported

ORTs Cont'd



ORTs Cont'd

Upcoming

ORT on DOY 180 (June 29) over DSS-25, X- and Ka-band [Not supporting Rev282](#)

17 180 0115 0245 1100 1115 DSS-25 CAS TP RSS OCCORT MC 7216 N748 1A1

- Also prime TP
- Verify Monopulse and conduct on-point phase cals
- Jay will be supporting

ORT on DOY 182 (July 1) over DSS-35, X- and Ka-band

17 182 1000 1130 1905 1920 DSS-35 CAS TP RSS OCCORT MC 7219 N750 1A1

- Also prime TP
- Verify Monopulse and conduct on-point phase cals
- Clement will be supporting

ORT on DOY 184 (July 3) over DSS-55, X- and Ka-band

17 184 1730 1900 0245 0300 DSS-55 CAS TP RSS OCCORT MC 7221 N750 1A1

- Also prime TP
- Verify Monopulse and conduct on-point phase cals
- Jay will be supporting

Misc

Uplink Strategy

- DSS-43, 18 kW, ramped, **sweep**
- DSS-74, 18 kW, ramped, no sweep
 - DSS-74 used to primarily close the uplink gap between Canberra and Madrid
- DSS-63, 18 kW, ramped, no sweep

Subreflector moving at all stations

Monopulse

- Per timeline
 - Stations to enable and disable Monopulse only when requested by RSS
- Rising stations - Wait for ~10 degrees elevation to enable Monopulse

4th Order Blind Pointing Models

- Recent data sent to David Rochblatt
- DSS-55:
 - Huge jump in signal power when Monopulse was first enabled during Rev 280
 - 16.5 dB at Ka-band and 2.8 dB at X-band!
 - Sent email to David but have not heard back

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

Misc Cont'd

Timeline

- There will be a v2 by tomorrow

NOPEs - Equipment Status?

- DSS-43 dichroic plate extended? Impact to observation?
- DSS-43 S-band spur – Will check if it crosses the recording bandwidths
- Others?