About the Occultation

- S97 Rev 253 Saturn rings occultation
  - Telemetry OFF, Ranging OFF, 2-way/3-way mode
  - Covered by Madrid, Goldstone and Malargue

- From Essam Marouf:

The Rev 253 RSS ring occultation is the last in a sequence of five chord occultations that sample different ring longitudes (Revs 247, 248, 250, 251, and 253), and the second of two PIE chord occultations on the F-Ring orbits (Revs 251 and 253). The Rev 251 chord captures the full ring systems both on the inbound and outbound sides. The inbound part is close to the upper atmosphere hence will likely be impacted by interference from Saturn's ionosphere. Furthermore, the occultation occurs near solar conjunction, hence may be impacted by solar plasma along the path. This is especially true for S-band and to some extent X-band as well, which makes Ka-band a primary signal for this occultation. The ring opening angle is 26.8°, close to its maximum value as seen from Earth. The large opening angle allows profiling of ring features of large optical depth within the A- and B-Rings. The chord geometry allows characterization of the rings azimuthal asymmetry, both virtual (due to gravitational wakes) and actual (due to dynamical interactions with the satellites). Collectively, the group of five RSS chord ring occultations, including the one on Rev 253, will provide valuable information about azimuthal variability of ring structure and physical properties of resolved features.

DSN and ESA Antennas

- DSN Coverage

		Pre	BOT	EOT	Post						
16	354	0825	0925	1530	1545	DSS-63	CAS	RS R253 RIOCC L3 7024	1647	1A1	
16	354	1050	1220	1530	1545	DSS-55	CAS	RS R253 RIOCC L3 7024	N750	1A1	
16	354	1155	1240	2000	2015	DSS-84	CAS	RS R253 RI OCC 7024	0142	1A1	
16	354	1320	1450	2255	2310	DSS-25	CAS	RS R253 RIOCC L3 7024	0683	1A1	
16	354	1350	1450	2255	2310	DSS-14	CAS	RS R253 RIOCC L3 7024	1647	1A1	
16	354	1950	2050	0745	0800	DSS-43	CAS	TP RS R253 RIOCC 7025	1645	1A1	Downlink pass

- Occultation experiment is immediately followed by downlink/SCE pass over DSS-43
  - Spacecraft continues to be Earth pointed

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

DSS-84 PRSR is at Malargue, but not yet installed

PRSR at Canberra is red

VSR at Madrid is red

S97 Rev 253 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
63 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
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	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)
14 3-way	Carlyn	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	Jay	rsops3	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)

S97 Rev 253 Open-Loop Assignment cont'd

RSSG will be in Ops Room at 12:15 am PST on Monday, December 19 (354/0815)

Aseel – VOCA
Elias – Ops Room Displays
Danny – Check WVSR/VSR availability and disk space

Backup Receivers
- VSR at Canberra
- PRSR at Madrid

Predicts

- Last NAV OD delivery prior to occultation?
- Which delivery to use for predicts generation?
- Uplink (ETX) predicts will **not** be modified by RSS
- 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)
  - #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 343 (December 8) over DSS-25, X- and Ka-band   Completed
16 343 1610 1740 2310 2325 DSS-25 CAS   RSS OCCORT MC   7013 N748   1A1
- Also prime TP
- Monopulse enabled and worked nominally
    - Pointing data acquired

ORT on DOY 344 (December 10) over DSS-55, X- and Ka-band   Completed
16 344 0715 0845 1205 1220 DSS-55 CAS   RSS OCCORT MC   7014 N750   1A1
- Also prime TP
- Transmitter ON at BOT to acquire more 2-way data
- Monopulse enabled and worked nominally
    - Pointing data acquired

ORT on DOY 346 (December 11) over DSS-25, X- and Ka-band   Completed
16 346 1935 2105 2330 2345 DSS-25 CAS   RSS OCCORT MC   7016 0683   1A1
- Also prime TP
- Short pass. 1-way throughout
- Monopulse enabled and worked nominally
    - Pointing data acquired

ORTs Cont'd

Also SCE#13 tracks over DSS-14 that allowed us to verify X- and S-band signals
16 348 2015 2115 2345 0000 DSS-14 CAS   TP RSS SCE13   7018 1647   1A1 Completed
16 351 1415 1515 2315 2330 DSS-14 CAS   TP RSS SCE13   7021 1647   1A1 Upcoming

Misc

Uplink Strategy
- DSS-63, 18 kW, ramped, sweep
- DSS-14, 18 kW, ramped, no sweep during transfer, sweep after uplink gap
- Very short overlap in uplink between Madrid and Goldstone
  - Only 51 seconds
    - DSS-14 transmitter on limit: 354/15:13:55 ERT
    - DSS-63 transmitter off limit: 354/15:14:46 ERT
  - Last time we can do an uplink transfer from M to G during an RSS observation
- No ESA uplink

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

Plan for updating DSS-55 and DSS-25 Cassini Specific 4th Order Pointing Model?
- DSS-55 model was last updated prior to Rev 248 occultation on Nov 12/DOY 317
- DSS-25 model was last updated?
  - Last time we used DSS-25 during an occultation was for Rev 248 on Nov 12/DOY 317

NOPEs - Equipment Status?

There will be a v2 of timeline and figure