

# About the Occultation

- S79 Rev 196 Saturn rings occultation on DOY 220 (August 8 PDT)
  - Chord rings occultation
  - Telemetry OFF, Ranging OFF, **2-way/3-way mode**
  - Covered by Madrid (uplink and downlink) and Goldstone (uplink and downlink)

- From Essam Marouf:

The Rev196 radio occultation is a chord ring occultation that captures full Rings A and B, and small part of outer Ring C. It's a very distant occultation conducted when Cassini is over 2 million km (~35.2 times the radius of Saturn) behind the rings. Cassini is in the part of its orbit in which it moves slowly in the sky (near orbit apoapse), so the geometric ring occultation extends over a period exceeding 6 hrs. The ring opening angle  $B = 17.5$  degrees. As was the case for its closer sister chord occultations on Revs 193 and 194, the Rev196 chord geometry allows separation and characterization of two distinct types of ring optical depth profile longitudinal asymmetry. The first is 'real' (dynamical) and is primarily due to resonant interactions with Saturn's external and ring-embedded satellites. The second is 'virtual' and is primarily due to the different geometry of observing 'cylindrical-like' structures known to exist across most of Rings A and B (gravitational wakes). The slow Rev196 occultation allows long integration time to improve signal-to-noise ratio, hence allows more reliable profiling of ring structure of large optical depth features. Collectively, the Revs 193, 194, and 196 ring chord occultations provide one of the rare opportunities in the Cassini tour so far where measurements over nearly identical longitudes and ring opening angle are captured over full Rings A and B, facilitating the asymmetry investigation above. The three occultations will add to others already completed to help characterize both the macro and micro structure of the rings and the physical properties of such structure. The occultation will be conducted in the 2-way configuration with the reference X-band uplink signal provided by DSS-65 followed by an uplink transfer to DSS-14. The downlink signals will be observed by the Madrid stations DSS-55 and DSS-65 during the ingress part of the chord and by the Goldstone stations DSS-25 and DSS-14 during the egress part of the chord. The Rev 196 occultation will be the last major ring occultation in the Cassini Mission until June 2016.

# DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post							
13 220	1200	1300	2205	2220	DSS-65	CAS	TP	RS195-RIOCC	5792	0618	1A1
13 220	1330	1500	2200	2215	DSS-55	CAS	TP	RS195-RIOCC	5792	N750	1A1
13 220	1830	2000	0140	0155	DSS-25	CAS	TP	RS195-RIOCC	5792	N748	1A1
13 220	1900	2000	0140	0155	DSS-14	CAS	TP	RS195-RIOCC	5792	1647	1A1

- DSS-63 is down for maintenance. DSS-65 will provide partial uplink and S-band X-band supports instead

- Requested a DSS-63 demo track that the DSN initially accommodated, but later deleted due to scheduled downtime work

13 220	1155	1300	2125	2140	DSS-63	CAS	RTS	RS DEMO	5792	1937	1A1
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- Will check with NOPEs next week if the work is ahead of schedule and the track can be re-instated

- DSS-14 will provide partial 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

# S79 Rev 196 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
65 2-way	Gregory	rsops2	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
65 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	rsops3	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	Gregory/ Danny	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)
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)

# S79 Rev 196 Open-Loop Assignment Cont'd

- Danny – Check WVSR/VSR availability
- VSR is backup
- Aseel - VOCA
- Elias - Ops Room Displays
- RSSG will be in Ops Room at 4:45 am on Thursday, August 8 (220/1145)

Gregory	4:45 am – 3:00 pm
Elias	6:00 am – 4:30 pm
Aseel, Danny	7:30 am – 8:00 pm
Dustin*	11:00 am – 8:00 pm

\*(assuming no DSS-63 track)

# Predicts

- No need to modify the uplink predicts (ETX) since no atmospheric occultations are included
- NAV's last OD delivery prior to the occultation will be on Friday, August 2
  - Originally scheduled for Monday, August 5
- Elias and Danny will start the work on the predicts on Monday
- RSS usually uses three sets of downlink predicts in the open-loop receivers:
  - #1: Coherent (no atmospheric compensation this time): generated using Nicole's PREDICTs software and SPS nominal (unmodified) ETX
  - #2: 1-way coherent: 1-way predicts generated using PREDICTS (no Doppler file from Paul this time), 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
  - Will acquire set #2 as backup

# ORTs

## Completed

ORT on DOY 201 (July 20 PDT) over DSS-55, X- and Ka-band

13 201 1220 1350 2300 2315 DSS-55 CAS RS195-OCCORT MC 5773 N750 1A1

- Also prime TP
- Verified X- and Ka-band signals
- Low signal levels at beginning of track
  - Station suspected pointing problems
- High monopulse corrections
  - Ka-band partly impacted by weather

ORT on DOY 208 (July 27 PDT) over DSS-55, X- and Ka-band

13 208 1155 1325 1600 1615 DSS-55 CAS T93PB/RSORT MC 5780 N750 1A1

- Also prime TP
- Verified X- and Ka-band signals
- High monopulse corrections
  - Ka-band partly impacted by weather

## Upcoming

ORT on DOY 215 (August 3 PDT) over DSS-25, X- and Ka-band

13 215 1915 2045 0545 0600 DSS-25 CAS RS195-OCCORT MC 5787 N748 1A1

- Also prime TP
- Acquire monopulse/pointing data

# Misc

## Uplink Strategy

- DSS-65, 18 kW, ramped, sweep
- Transfer to DSS-14, 18 kW, ramped, no sweep

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

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

- During DSS-55 ORTs: large offsets were observed. Partly due to weather
  - The pointing model was not recently updated
  - Dustin already sent DOY 201 and 208 monopulse data to David
    - Will send DSS-25 DOY 215 data after ORT completes
- Long occultation experiment. Important for both stations to have good pointing models since we can't utilize monopulse throughout

## New controller at all BWG stations

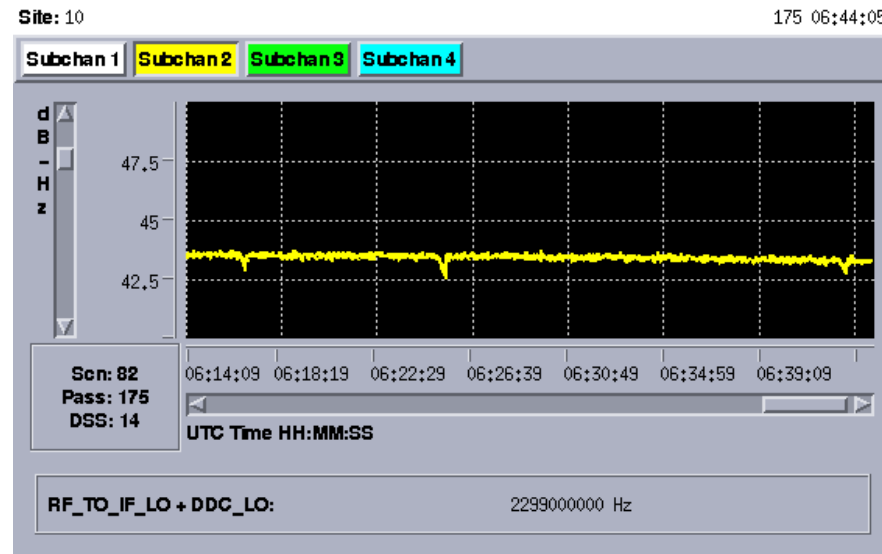
- Monopulse will not be disabled automatically when the receivers go out of lock
  - Pointing/monopulse strategy to take this into consideration
- Anomaly with Monopulse not getting re-enabled after multiple enables/disables
  - Station has to enable monopulse on the downlink channel
  - Occurred during Rev 193 and 194 occultations over DSS-34
  - Need to monitor closely
  - Add a note in BM?

# Misc cont'd

NOPEs - Equipment Status?

DSS-14 S-band Spurs

- Any updates?



SNT

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