About the Occultation

- S78 Rev 186 Saturn atmospheric occultation
  - Ingress only
  - Telemetry OFF, Ranging OFF, 2-way/3-way mode
  - Covered by Madrid and Goldstone

- From Essam Marouf:

  A PIE 2-way ingress atmospheric occultation of Saturn southern polar region is to be implemented on Cassini Rev 186. It's one of only two in the Cassini Solstice Mission that probe high southern latitudes. The other is a future occultation on Rev 189. The two probe latitudes of about 64.5 and 67.9 degrees south, respectively. An uplink X-band signal from DSS-63 will provide the reference signal for the Rev 186 occultation. Measurements of signal frequency and power will provide high spatial resolution profile of the thermal structure of the neutral atmosphere, dispersive microwave absorptivity profiles of the neutral atmosphere, and electron density profiles of the ionosphere. Comparison of results with those from other occultations completed earlier in the Cassini Mission will provide important information regarding temporal and/or seasonal variability of the atmosphere, especially for the high southern latitudes regions. Measurements at three radio wavelengths (0.94, 3.6, and 13 cm; Ka-, X-, and S-bands) will be collected throughout the observation period.

DSN Antennas

- DSN Coverage

		Pre	BOT	EOT	Post						
13	101	2350	0050	0610	0625	DSS-63	CAS	TP	RS186-RIOCC	5673	1639	1A1
13	102	0130	0300	0600	0615	DSS-55	CAS	TP	RS186-RIOCC	5673	N750	1A1
13	102	0235	0405	0645	0700	DSS-25	CAS	TP	RS186-RIOCC	5673	N748	1A1
13	102	0305	0405	0645	0700	DSS-14	CAS	TP	RS186-RIOCC	5673	1647	1A1

- DSS-63 will be providing the uplink throughout

- 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

*Either RCP or LCP

- Antennas Band and Polarization Capabilities

DSS-63	DSS-55*	DSS-14	DSS-25**
X-RCP X-LCP	X-RCP X-LCP	X-RCP X-LCP	X-RCP X-LCP
S-RCP S-LCP	K-RCP K-LCP	S-RCP S-LCP	K-RCP

*Either KLCP (switch 43 in B position)
or monopulse (switch 43 in A position)

  - Only RCP will be recorded
    - 2-way/3-way and 1-way modes

S78 Rev 186 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 (3-way w 2)	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 (3-way w 2)	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	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 (3-way w 2)	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	Gregory	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 (3-way w 2)	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)

S78 Rev 186 Open-Loop Assignment Cont'd

- VSR is backup
- Danny – Check WVSR/VSR availability
- Aseel - VOCA
- Elias - Ops Room Displays
- RSSG will be in Ops Room at 4:30 pm on Thursday, April 11 (101/2330)

ORTs

Completed

ORT on DOY 089 (March 30) over DSS-25 and DSS-34, X- and Ka-band

13 089 0345 0515 1415 1430 DSS-25 CAS RS185-OCCORT MC 5660 N748 1A1

- Verified X- and Ka-band signals
  - Both looked good
  - Weather clear
- Monopulse nominal
  - Some high EL corrections
  - Monopulse disabled, but offsets not cleared, around coherency change
- Monopulse data sent to David Rochblatt

Upcoming

ORT on DOY 097 (April 7) over DSS-55, X- and Ka-band

13 097 1945 2115 0545 0600 DSS-55 CAS RS186-OCCORT MC 5669 N750 1A1

- Also shadowing DSS-54 RTS track
  - Which controller? Need 1-sec offset?
- Verify X- and Ka-band signals. Verify monopulse

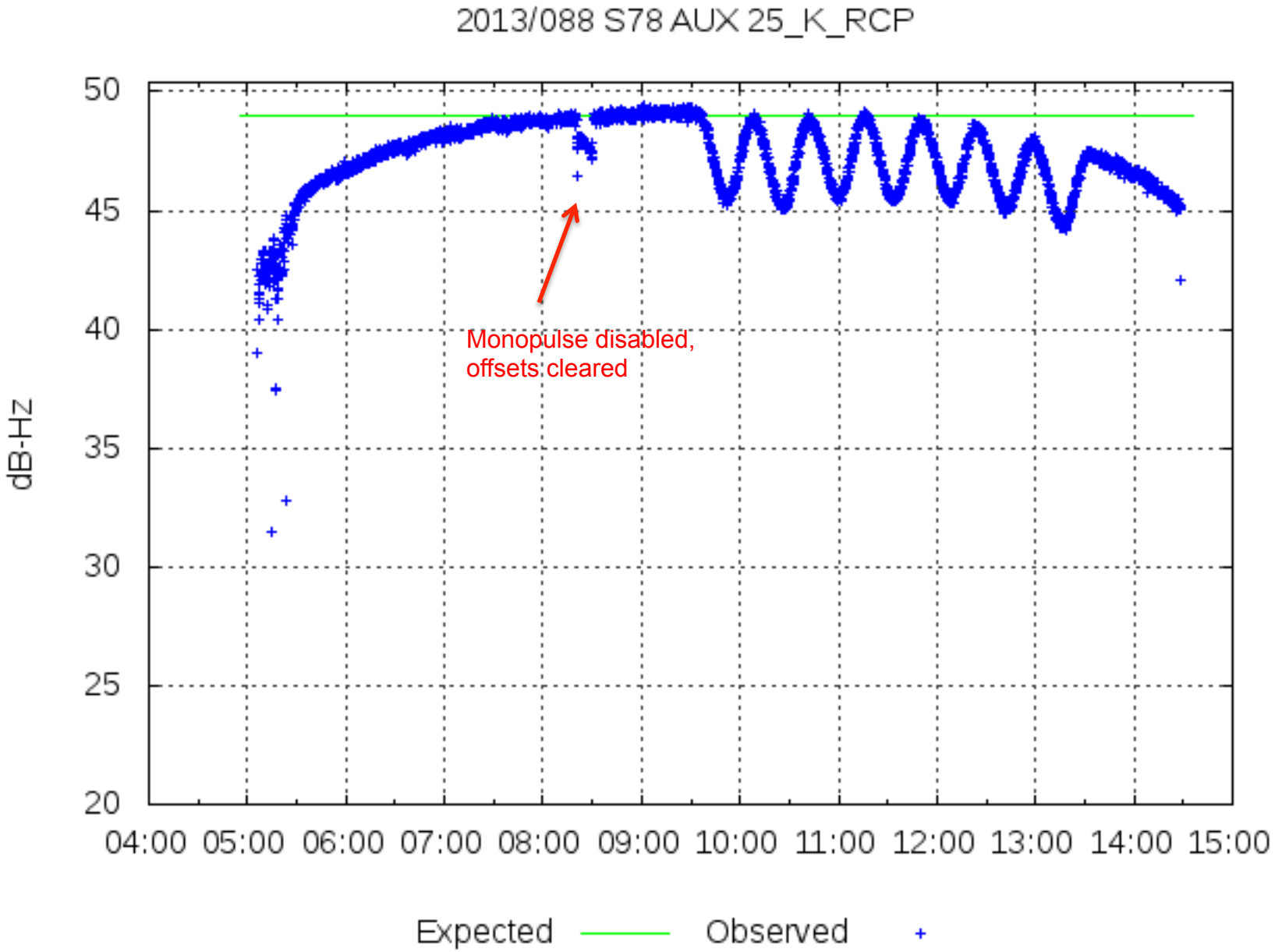
Note:

Monopulse data from this track were also sent to David:

AUXPIM on DOY 088 (March 29) over DSS-25, X- and Ka-band

13 088 0405 0535 1430 1445 DSS-25 CAS TP RS185-AUXPIM 5659 N748 1A1

- When monopulse offsets were cleared at the switch from 1-way to 2-way, ~2-3 dB drop in Ka-band power


2013/088 S78 AUX 25_K_RCP
dB-Hz
50
45
40
35
30
25
20
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
Monopulse disabled,
offsets cleared
Expected
Observed

Predicts

- Uplink (ETX) predicts should compensate for Doppler shift due to Saturn's atmosphere
- NAV will deliver the final OD on Monday, 4/8, ~12 pm PDT
- RSS (Paul Schinder) will apply the Doppler shifts to the ETX file, and expects to send the modified file to the NOPEs on Tuesday morning
- Elias and Danny will generate the downlink predicts on Monday and Tuesday and will do RSS and DSN predicts comparisons
  - **Include comparing RSS modified predicts with SPS unmodified predicts, and comparing against Essam's timeline to ensure that the modifications start at the right time**
- RSS will be using three sets of downlink predicts in the open-loop receivers:
  - Coherent with atmospheric compensation: generated using Nicole's PREDICTs software and SPS nominal ETX (preferred for rings occs)
  - 1-way coherent:1-way predicts generated using PREDICTS and the Doppler file produced by Paul, with the 1-way to 2-way/3-way offsets applied in real-time (preferred for atmospheric occs)
  - 1-way (no offset): when the DST is not in lock on the uplink

- **Rev 186 Uplink strategy: 18 kW, ramped, sweep**

Optimizing the Uplink

- Aberration correction was used to optimize Cassini Ka-band uplink over DSS-25
- DSS-25 has two feeds. Antenna has capability to optimize both uplink and downlink
- To optimize uplink over other antennas, have to steer whole antenna
  - Would degrade downlink
- Recently, MSL optimized uplink to LGA and accepted degradation to downlink
- Could we optimize uplink during Cassini occultations?
- Possibly an option if uplink period ends before downlink period starts
  - Rev 186 Occ is such a case
- Help probe deeper in atmosphere or rings?
- Risks?
- Discussed briefly with David Rochblatt yesterday. He'll provide more info today

Misc

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

- Note: Possible update to timeline after this weekend's live update

Plan for Cassini Specific 4th Order Pointing Models

- Plan is to utilize monopulse as much as possible, but need good pointing models in case monopulse is problematic
  - Note low elevation angles
- Recent pointing problems at DSS-55 – Check during ORTs this Sunday
- DSS-25 pointing model?
  - High EL corrections during ORT
- Danny to send DSS-55 pointing data to David after DOY 097 ORT

NOPEs - Equipment Status? (DSS-63, DSS-55, DSS-14, DSS-25)

SNT

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