About the Occultation

- S75 Rev 171 Saturn atmospheric occultation
  - Ingress only
  - Telemetry OFF, Ranging OFF, 2-way/3-way mode
  - Covered by Madrid and Goldstone

- From Essam Marouf:

  An ingress atmospheric occultations is to be completed on Cassini Rev 171. It probes mid-southern latitude of 44.2 degrees . The occultation will be carried out in 2-way and 3-way configurations using X-band uplink signal from DSS-63 to provide a reference signal to replace the one usually provided by the Cassini UltraStable Oscillator (USO). The S/X/Ka band downlink signals will be observed at the setting DSN Madrid complex and the rising Goldstone complex. The occultation will provide electron density profiles of the ionosphere, high spatial resolution profile of the thermal structure of the neutral atmosphere, and dispersive microwave absorptivity profiles of the neutral atmosphere. Comparison of results with those from other occultations completed earlier in the Cassini Mission will provide information regarding temporal and/or seasonal variability of the atmosphere

DSN Antennas

- DSN Coverage

		Pre	BOT	EOT	Post						
12	246	0845	1015	2000	2015	DSS-55	CAS	TP RS171-SAOCC	5451	N777	1A1
12	246	1110	1210	2000	2015	DSS-63	CAS	TP RS171-SAOCC	5451	1635	1A1
12	246	1605	1735	2040	2055	DSS-26	CAS	TP RS171-SAOCC	5451	N750	1A1
12	246	1635	1735	2040	2055	DSS-14	CAS	TP RS171-SAOCC	5451	1647	1A1

- 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

- 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)

**Either RCP or LCP

  - LCP data are enhancement. Prime are RCP
  - Only RCP will be recorded
    - 2-way/3-way and 1-way modes

S75 Rev 171 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
63 (2-way)	Elias/ Don	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/ Don	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)	Aseel/Elias	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)
26 (3-way)	Aseel/Elias	rsops1	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, 2, 16, 50 1, 2, 16, 50 (with offset)

S75 Rev 171 Open-Loop Assignment Cont'd

- Not final
  - May not need to record "2-way" and "3-way" on RSRs since this is atmospheric only occ. Preferred predicts are 1-way with offset

- Danny – Checked WVSR/VSR availability, and one WVSR at each complex is in conflict (supporting JUNO VLBI)
  - At Madrid, wait until JUNO support is complete
  - At Goldstone, use VSR

- Aseel - VOCA

- Don - Ops Room Displays

- RSSG will be in Ops Room at 1:30 am on Sunday, September 2 (246/0830)
  Two shifts: Don 1:30 am – 6:15 am
          Aseel/Danny/Elias 5:45 am – 12:30 pm

ORTs

ORT on DOY 229 (August 16) over DSS-26, X- and Ka-band

12 229 1730 1900 0400 0415 DSS-26 CAS   SEQ RS-OCCORT MC 5434 0681   1A1

- Per David Rochblatt's instructions, station entered the following directive: AP TMO 00000
    - Workaround for 1-second time delay affecting all antenna servo controllers
- An on-point phase cal was performed, following a new procedure, but the OE reported that it was not done correctly and a second on-point phase cal was performed
- A ~3.2 dB jump in Ka-band power was observed a few seconds before the station reported monopulse enabled time
- Large monopulse AZ corr (~10) and EL Corr (~3) values
- Another on-point phase cal was conducted at the switch to 2-way

ORT on DOY 233 (August 20) over DSS-26, X- and Ka-band

12 233 1730 1900 0400 0415 DSS-26 CAS   RS170-OCCORT MC 5438 N750   1A1

- Did station enter: AP TMO 00000?
- No on-point phase cal was needed
- No jump in power was observed when monopulse was enabled in 1-way. 2 dB jump was observed when monopulse was enabled in 2-way mode
- Large values of Az Corr (reaching ~ 15) and El Corr (reaching ~ 4)

ORT on DOY 237 (August 24) over DSS-63 and DSS-14, X- and S-band

12 237 1745 1845 2030 2045 DSS-63 CAS   SEQ RS171-OCCORT 5442 1639   1A1

12 237 2000 2100 0345 0400 DSS-14 CAS   SEQ RS171-OCCORT 5442 1647   1A1

- Verified X and S-band singals
- Fluctuations at DSS-63?

ORTs cont'd

ORT on DOY 239 (August 26) over DSS-55, X- and Ka-band

12 239 0930 1100 2000 2015 DSS-55 CAS   RS171-OCCORT MC 5444 N750   1A1

- Two on-point phase cala were performed in 1-way mode. A 3 dB improvement with monopulse
- Monpulse small accum AZ corr (less than 1). High accum EL corr (-7, -8, later –12, -13)
- Some Ka-band fluctuations at beginning of pass, most likely due to low elevation angles (less than 15 degrees). Improved as EL increased

ORT on DOY 241 (August 28) over DSS-55, X- and Ka-band

12 241 1315 1445 1945 2000 DSS-55 CAS   RS171-OCCORT MC 5446 N750   1A1

- Report by Danny?

Predicts

- As with previous atmospheric occultations, Uplink (ETX) predicts should compensate for Doppler shift due to Saturn's atmosphere
- RSS will apply the Doppler shifts to an ETX file provided by the DSN and send it back to SPS
  - They would then introduce the augmented file into the dataflow, so it goes to the station and is used in the uplink controller
- When will SPS predict be available? (Today?)
- RSS to send predicts back to SPS by Thu morning?

Misc

Uplink: 18 kW – Ramped

DKF – Does not have accurate AOS/LOS and uplink times. Use times in RSS timeline

Plan for Cassini Specific 4th Order Pointing Models?
- Don to send data to David
- Enter "AP TMO 00000" at DSS-26?
- What about DSS-55?
- Monopulse offsets were high at both stations

DSS-63 X-band fluctuations
- First observed during occultation on DOY 225 (see page 9)
- Only two DSS-63 tracks since then: DOY 227 (no open-loop data recorded) and DOY 237 ORT
- Plotted closed-loop data from DOY 237 (see page 10). Possible fluctuations.
- Jack forwarded email to Madrid

SNT
- Enable X only at DSS-34 throughout
- Conduct SNT measurements

Open-loop Recording bandwidths
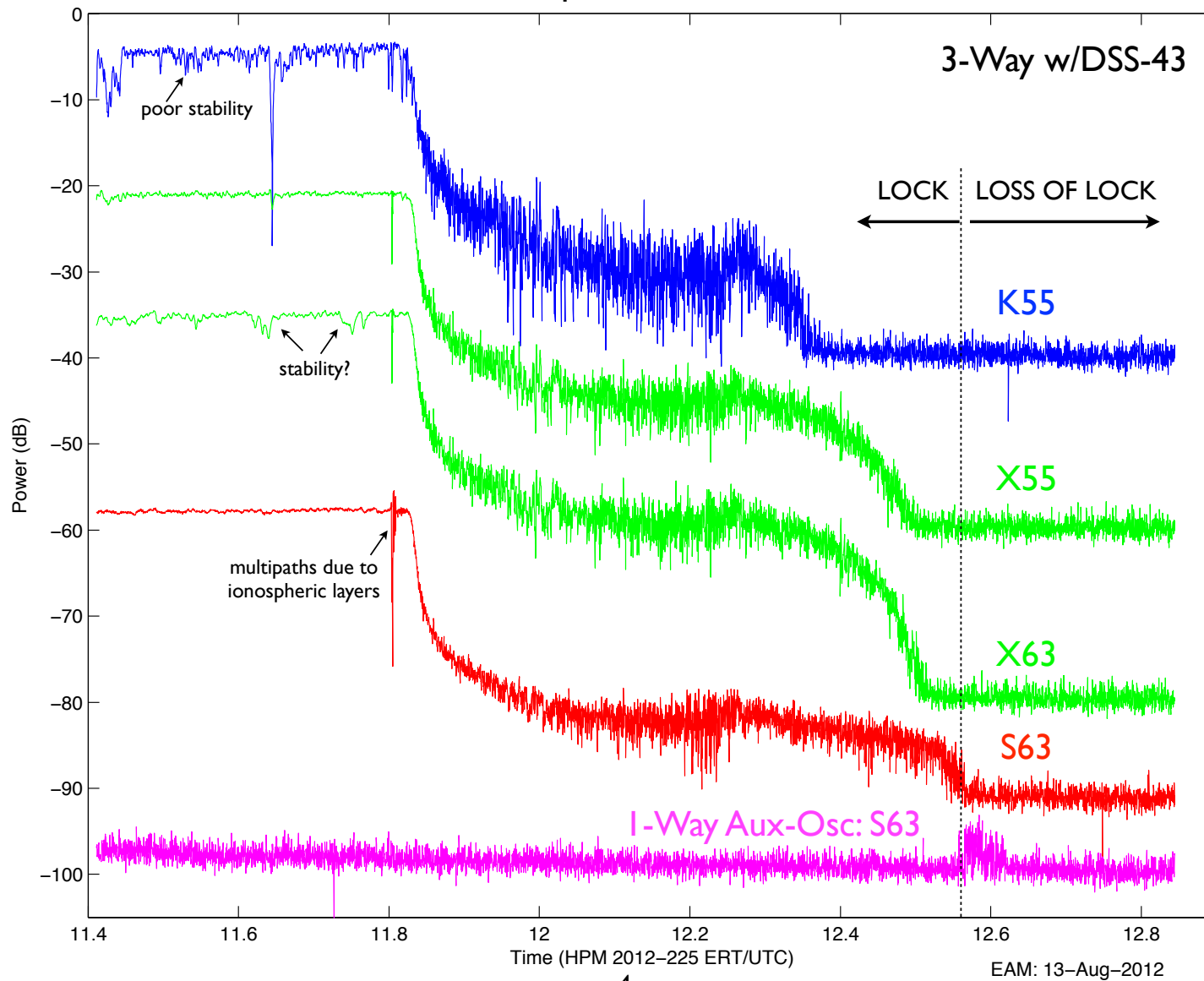- All except Ka-band 1-way: 1, 16, 50, 100 KHz
- Ka-band 1-way: 1, 2, 16, 50 KHz

Fig. 1

DSS-63 DOY 227 Closed-Loop Data

Cassini DSS-63 X-Band Signal-to-Noise Ratio (Closed-Loop)