About the Occultation

- S78 Rev 190 Saturn atmospheric & rings occultations
  - Atmospheric ingress, rings egress
  - Telemetry OFF, Ranging OFF, 2-way/3-way mode
  - Covered by Goldstone (uplink and partial ingress baseline support) and Canberra (uplink and downlink)

- From Essam Marouf:

Radio occultations on Cassini Rev 190 include an ingress atmospheric occultation of Saturn's southern polar region and an egress ring occultation that partially covers the ring system. Both occultations will be conducted in the 2-way mode using uplink reference signal from DSS-14 followed by an uplink transfer to DSS-45. The ingress atmospheric occultation probes high southern latitudes (~69.5 degrees measured at the top of the troposphere). The egress ring occultation will require locking the S/C transponder over the dense Ring B mixed with the atmosphere, a challenging task. The uplink frequency will be "ramped" to account for atmospheric Doppler to ensure that the uplink is received at the spacecraft transponder best-lock frequency, hence maximize lock chances. The ring opening angle is ~17.6 degrees. Measurements of the power, phase, and spectral broadening of three monochromatic downlink signals (Ka-, X-, and S-band) will provide high spatial resolution profile of the thermal structure of the neutral atmosphere, dispersive microwave absorptivity profiles of the neutral atmosphere, electron density profiles of the ionosphere, and profiles of probed ring radial structure and information about the structure physical properties. The profiles complement those from previous Cassini occultations, providing potential information about temporal and/or seasonal variability of the atmosphere, as well as variability of macro and micro structure of dense ring regions with ring longitude and opening angle, critical for characterization of ongoing dynamical processes.

DSN Antennas

- DSN Coverage

		Pre	BOT	EOT	Post					
13	140	0530	0630	1110	1125	DSS-14 CAS	RS190-RI/SA OCC	5711	1647	1A1
13	140	0720	0850	1645	1700	DSS-34 CAS	RS190-RI/SA OCC	5712	N750	1A1
13	140	0750	0850	1645	1700	DSS-45 CAS	RS190-RI/SA OCC	5712	0624	1A1

- DSS-14 will provide uplink for ingress atmospheric occ
- ~~DSS-45~~ DSS-34 will provide uplink for egress rings occ
- DSS-43 is down, so DSS-45 will be used instead ~~for uplink and~~ X & S downlink supports
    - Requested test DSS-43 track. Waiting to hear back from the DSN

- 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-14   DSS-45   DSS-34*

    X-RCP   X-RCP   X-RCP
    X-LCP

    S-RCP   S-RCP   K-RCP
    S-LCP

                                        *KLCP capability exists, but cable not connected

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

S78 Rev 190 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
14 2-way*	Elias	rsops1	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
45 3-way/14**	Elias/Aseel	rsops1	RSR1	RSR1A -> XRCP RSR1B -> SRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
45 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)
34 3-way/14***	Greogory	rsops2	RSR2	RSR2A -> XRCP RSR2B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 16, 50, 100 1, 16, 50, 100
34 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)

*   Start 1-way, then 2-way

**   Start 1-way, then 3-way w/ 14, and finally to ~~2-way~~ 3-way w/ 34

*** Start 1-way, then 3-way w/ 14, and finally to ~~3-way w/ 45~~ 2-way

- VSR is backup
- Danny – Check WVSR/VSR availability
- Aseel – VOCA
- Elias - Ops Room Displays
- RSSG will be in Ops Room at 10:15 pm on Sunday, May 19 (140/2215)

Predicts

- DSS-14 and DSS-45 uplink (ETX) predicts should compensate for Doppler shift due to Saturn's atmosphere on both ingress and egress
- NAV delivered an OD yesterday (Mon 5/13) for Rev 190 Live Update work
  - Another delivery is expected on Sat, 5/18
- After discussing with NOPEs, decided to use yesterday's OD delivery to generate predicts
- SPS will provide ETX soon
- RSS (Paul Schinder) will apply the Doppler shifts to the ETX files, modified file will be sent to the NOPEs less than 2 days after the ETX files are made available to RSS
- Elias and Danny will generate of the downlink predicts and do the usual predicts checks and comparisons
- 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 (unmodified) ETX
  - 1-way coherent:1-way predicts generated using PREDICTS and the Doppler file produced by Paul, offset in real-time to coherent downlink frequency
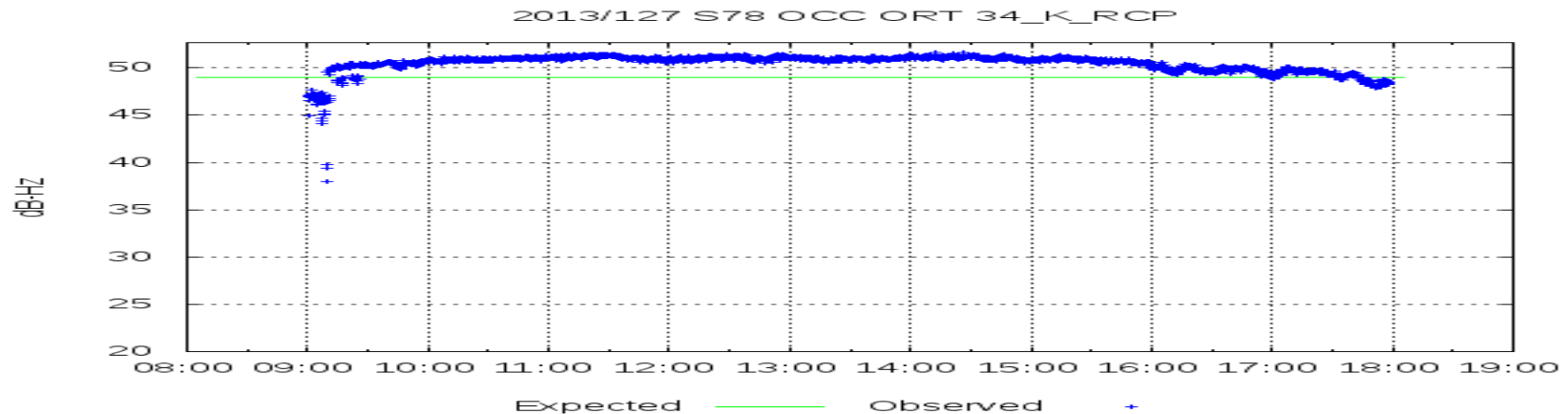 - 1-way (no offset): For the times when the DST is no in lock on the uplink

ORTs

Completed

ORT on DOY 127 (May 7) over DSS-34, X- and Ka-band

13 127 0730 0900 1800 1815 DSS-34 CAS   RS189-OCCORT MC 5699 N750   1A1

- Weather slightly overcast
- Station conducted on-point phase cal soon after BOT. Mono enabled 127/092612

2013/127 S78 OCC ORT 34_K_RCP

Upcoming

ORT on DOY 137 (May 17) over DSS-34, X- and Ka-band

13 137 0030 0200 1100 1115 DSS-25 CAS   RS190-OCCORT MC 5708 N748   1A1

13 137 0520 0650 1100 1115 DSS-34 CAS   RS190-OCCORT MC 5709 N750   1A1

- Shadow DSS-25

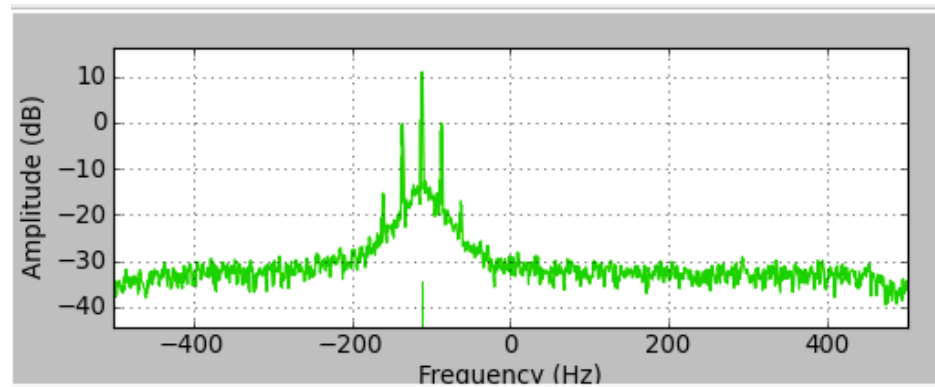Gregory to send monopulse data to David

Misc

Uplink Strategy

- DSS-14, 18 kW, ramped, sweep
- ~~DSS-45~~ DSS-34, 18 kW, ramped, NO sweep

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

DSS-45 Uplink Spurs

- Observed during Rev 189 on DOY 130 (above plot is for 55K)
- No DSS-45 Cassini track this week
- Will check if we can monitor another project's track

Plan for Cassini Specific 4th Order Pointing Models

- Important for DSS-34 to have good pointing models since we can't utilize monopulse at egress

Misc cont'd

Reminder that DSS-34 has new controller (Monopulse will not be disabled automatically when receivers go out of lock)
- Suggest to follow strategy that was used during Rev 189:
  Disable monopulse during ingress before we reach the upper Troposhere
  Make decision on whether or not to keep the offsets based on Mono corrections
  Have the option to clear offsets during occultation
  No monopulse during egress until time specified in detailed timeline

NOPEs - Equipment Status?

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