Subject: Can you please include this in the ops archive
Date: Wednesday, November 30, 2016 at 8:19:54 AM Pacific Standard Time
From: Anabtawi, Aseel (332K)
To: Gao, Jay L (332C)

I used to send such reports regularly, but just got too busy.

Please use the version below. It's the one I forwarded to the project, which is slightly edited from the one I sent to the team.

Thanks!

From: Aseel Anabtawi <aseel.anabtawi@jpl.nasa.gov>
Date: Tuesday, November 29, 2016 at 11:50 PM
To: "RSS@cdsa.jpl.nasa.gov" <RSS@cdsa.jpl.nasa.gov>
Cc: "Lee, Carlyn-Ann B (332H)" <Carlyn-Ann.Lee@jpl.nasa.gov>
Subject: S97 Rev 250 RSS Chord Rings Occultation Completed - Ops Report

Dear All,

Our Rev 250 Saturn rings chord occultation took place on DOY 333. It started the afternoon of Sunday, November 27th PST, and completed early Monday morning.

- The observation was covered by Canberra's DSS-43 (70-m, X&S) and DSS-34 (34-m, X&Ka), Madrid's DSS-63 (70-m, X&S) and DSS-55 (34-m, X&Ka), and ESA's New Norcia DSS-74 (X&S).

- We normally use DSS-35 at Canberra, but it's down from Nov 20 to Dec 16 (DOY 321-351) for the AZ encoder cover replacement, so DSS-34 was used instead.

- DSS-43 started the uplink. It was then transferred to ESA's DSS-74, and then from DSS-74 to DSS-63. Without DSS-74, we would've had a 30min gap in uplink due to transmitter elevation limits at Canberra and Madrid (uplink transfers from Canberra to Madrid are not possible).

- All uplink transfers were successful (to be confirmed by telemetry data).

- DSS-43 was 10 minutes late in turning the transmitter on at the beginning of the observation. RTLT later, this impacted the ingress coherent baseline (10 minutes shorter than planned). DR# C112447 was opened.

- DSS-43 enabled Conscan during the Earth-pointed period that immediately preceded the observation to check the pointing. The offsets were small and were cleared when Conscan was disabled.

- The New Norcia track was the last scheduled ORT. We will now begin the official science supports, starting with the track next week to support the Rev 251 rings occultation. Even though the ESA tracks to date have been ORTs, we've used New Norcia for prime uplink during this occultation and the occultation on November 12/DOY 317 (Rev 248).

- As with previous observations that included uplink from ESA, and since we cannot generate DSN 3-way predicts with ESA, we flagged our open-loop receivers for 2-way/3-way with DSN during the times when they were 3-way with DSS-74. The same was done with the closed-loop receivers. The reason we cannot generate 3-way predicts with ESA is that ESA doesn't generate their uplink predicts ahead of time, like the DSN does, so we don't have the ETX/uplink file that is needed to generate 3-way predicts.

- The Portable Radio Science Receiver (PRSR) was successfully installed and tested at New Norcia, but we are still working on the IP configuration and getting through the ESA firewall. We are getting closer, but still unable to remotely access the PRSR at this time.

- As expected, The DST intermittently lost lock in the dense Ring B.

- There was a problem with RSR1B at Madrid not interfacing with the IF switch. We asked the station to investigate it during pre-cal. They tried rebooting the RSR and changing the RSR attenuation, but neither fixed the problem. DR# M109682 was opened. The plan was for DSS-63's S-band prime data to be recorded on RSR1B. The Madrid VSR (VLBI Science Receiver) and PRSR, which would've been backup receivers, were red. We modified the plan for the WVSR (Wide VLBI Science Receiver) to include the DSS-63 S-band recordings that were originally on RSR1B.

- There's a known WVSR software bug that could potentially impact the data quality (data clipping), in particular the narrow bandwidth data (1 KHz). It requires that the recording fgain value be adjusted after a signal is acquired. For the prime DSS-63 S-band recording, we changed the fgain value after the track started and a signal was acquired, but it was during Ring B and the signal was weak. We expected to have to re-set it again after we exited Ring B and a strong signal was acquired, but we did not get any data clipping error messages so we kept the fgain setting as is. We'll know after Essam's quick look analysis if the data quality was impacted.

- After we exited Ring B and the signal strength increased, we got data clipping error messages on RSR1A, which was recording DSS-63 X-band prime data. This was unexpected because the fgain value was set correctly and the RSR doesn't have the software bug that the WVSR has. We increased the fgain value and then changed it back to the original value, and the error messages stopped. We expect that this was due to the station changing the RSR attenuation during pre-cal (in an attempt to fix the problem with RSR1B) after we had already completed configuring RSR1A (the attenuation change impacts both sides of the RSR). We likely had to to re-enter the fgain value after the attenuation change was made. We don't normally change fgain values during a recording, but the data were clipping and we had to correct it. We recorded backup data on the WVSRs, so we hopefully have at least one good data set.

- Graham Baines at CDSCC updated the DSS-34 fourth order pointing model prior to the observation. He used the pointing data that were acquired during the one DSS-34 ORT on November 24th/DOY 329. When Monopulse was first enabled, no jump in Ka-band signal power was observed, but the Monopulse correction values were high and fluctuating. Graham was also monitoring the Monopulse performance in real-time from CDSCC. At his recommendation, manual offsets of +2 mdeg in elevation and +1 mdeg in cross-elevation were entered. When Monopulse was last disabled before entering Ring B, the Monopulse corrections (now smaller) were kept in the

system, in addition to the offsets that were manually entered.

- The DSS-55 fourth order pointing model was last updated prior to the Rev 248 occultation on November 12, and the pointing during that occultation was good. It was not updated prior to the Rev 250 occultation because no new pointing data were acquired (no opportunities for an ORT). When Monopulse was enabled shortly before the end of the observation, no jump in Ka-band signal power was observed, but the Monopulse correction values were high, probably an indication that the model had degraded.

Aside from the two problems mentioned above, the observation completed successfully.

The science highlights, provided by Essam, are included below.

The shifts for this observation were long and tiring. Many thanks to Elias, Danny and Carlyn for their hard work.

Regards,
Aseel

The Rev 250 RSS ring occultation is the third in a sequence of five chord occultations that sample different ring longitudes (Revs 247, 248, 250, 251, and 253). They capture in full or in part the A- and B-Rings, as well as the Cassini Division. The Rev 250 chord, in particular, captures the full A-Ring and Cassini Division and the outer ~60% of the B-Ring. The sequence of occultations occurs near the end of the the IN-2 orbits and the start of the F-Ring Orbits when the ring opening angle is 26 to 27 degrees, 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 5 RSS chord ring occultations, including the one on Rev 250, will provide valuable information about gravitational wakes in the A- and B-Rings and the host of density waves populating the A-Ring. Measurements at three radio wavelengths (0.94, 3.6, and 13 cm; Ka-, X-, and S-bands) will be collected throughout the observation period and will help provide information about physical properties of profiled ring structure.