S73 Rev165 E19 Enceladus Gravity Observation

- Telemetry ON, Coherent mode (2-way and 3-way)
- Covered by all complexes
  - Madrid -> Goldstone -> Canberra

- Science Highlights (From Luciano Iess)

  The goals of gravity science at Enceladus are the determination of the quadrupole field (J2, C22) and the detection of a gravity anomaly at the south pole. The analysis of E9 (Apr, 2010) and E12 (Nov, 2010) gave already concurrent indications of a differentiated interior and a negative mass anomaly at the south pole. However the estimates are still too uncertain for unequivocal, quantitative conclusions about the interior of the satellite. Data from E19 are expected to reduce very significantly the current uncertainties and provide answers to fundamental questions such as the degree of differentiation, the presence of a diapir at the south pole and possible reorientation events. Many of the answers we are seeking about the interior and the evolution of Enceladus rely on the success of the upcoming encounter. As the last gravity flyby of the tiny moon, E19 is a truly special event for RSS

DSN Antennas

- DSN Coverage

		Pre	BOT	EOT	Post						
12	122	0045	0215	1115	1130	DSS-25 CAS	TP RS165-ENGSE	5326 N748	1A1	GSE
12	122	0115	0215	1115	1130	DSS-14 CAS	TKG PASS	5326 N003	1A1	GSE
12	122	2200	2330	0405	0420	DSS-55 CAS	RS165-E19 GRAV	5327 N750	1A1	E19 Gravity
12	123	0030	0200	1150	1205	DSS-25 CAS	RS165-E19 GRAV	5327 N748	1A1	E19 Gravity
12	123	0550	0720	1845	1900	DSS-34 CAS	RS165-E19 GRAV	5328 N750	1A1	E19 Gravity
12	124	0100	0200	1100	1115	DSS-14 CAS	T/P E19PB	5328 N003	1A1	GSE
12	124	0300	0430	1100	1115	DSS-25 CAS	RS165-EN GSE	5328 N748	1A1	GSE

- Receivers scheduled
    - 2 closed-loop receivers per BWG antenna
    - Open-loop receivers
    - Closed-loop data are prime. Open-loop data are backup
    - LCP not required. Only RCP

RSR/VSR/WVSR Assignment

DSS	Operator	RS Ops Machine	Open-Loop Receiver	RSR Assignment
55	Aseel/Don	rsops1	RSR2	RSR2A -> XRCP
				RSR2B -> KRCP
25	Aseel/Don	rsops1	RSR2	RSR2A -> XRCP
				RSR2B -> KRCP
34	Elias/Danny	rsops1	RSR2	RSR2A -> XRCP
				RSR2B -> KRCP

RSSG will be in RS Ops Room at 2:30 pm on Wednesday May 1 (122/2130)

DON: 5:30 PM – 10:30 PM (Tue) For GSE

ASEEL: 2:30 PM – 8:30 PM (Wed)

DON: 7:00 PM – 2:00 AM (Wed-Thu)

ELIAS: 1:00 AM – 6:30 AM (Thu)

ASEEL: 2:00 AM – 5:00 AM (Thu)

DANNY: 6:00 AM – 12:00 PM (Thu)

DON: 5:30 PM – 10:30 PM (Thu) For GSE

ORTs

Completed

ORT on DOY 100 (Apr 9) over DSS-55, X- and Ka-band

12 100 0215 0345 1250 1305 DSS-25 CAS   RS164-DSNMONCAL 5304 N748   1A1

12 100 0215 0345 0540 0555 DSS-55 CAS   RS164-GRVORT1 MC 5304 N750   1A1

- DSS-55 to verify monopulse, conduct monopulse on-point phase cals as needed, acquire pointing data
- Also DSNMONCAL over DSS-25 (prime pass)
    - Pointing data available from this pass as well
- Both stations performed on-point phase cals and then enabled monopulse
    - Monopulse nominal

DSNMONCAL on DOY 107 (Apr 16) over DSS-34, X- and Ka-band
12 107 0800 0930 1605 1620 DSS-34 CAS   RS164-DSNMONCAL 5312 N750   1A1

- Pointing data available (on-point phase cals were performed in 1-way and 2-way mode)

ORT on DOY 114 (Apr 23) over DSS-25 and DSS-55, X- and Ka-band
12 114 0115 0245 1150 1205 DSS-25 CAS   RS164-GRVORT2 MC 5318 N748   1A1

12 114 0115 0245 0440 0455 DSS-55 CAS   RS164-GRVORT2 MC 5318 N750   1A1DSS-25 to

- To verify monopulse, conduct monopulse on-point phase cals as needed, acquire pointing data
- DSS-25 prime. Nominal support
- DSS-55 problematic monopulse that seemed to cause tracking problems. DR M106725

Tonight

ORT on DOY 117 (Apr 26) over DSS-34, X- and Ka-band
12 117 0715 0845 1730 1745 DSS-34 CAS   RS165-GRVORT1 MC 5322 N750   1A1

- DSS-34 to verify monopulse, conduct monopulse on-point phase cals as needed, acquire pointing data

Misc

Support schedule:
- GSEs will be partially supported and then scripted
- David Rochblatt real-time support not required since there will be no Monopulse offsets decisions during experiment. Need to have good pointing models in case monopulse is problematic

SPS Predicts – Ramped
- Based on analysis by Telecom, unramped predicts not possible except during Inbound GSE and part of Inbound segment

Equipment status?

Is DSS-34 monopulse phase stability problem resolved?

Pointing Plan
- Enable monopulse throughout gravity observation. If problematic, stay with blind pointing
  - Are 4th-order pointing models good? Need good models in case monopulse is problematic
  - Don to send data to David Rochblatt from recent ORTs
- There should be no monopulse enables at low Elevation angles (less than 10 degrees)

SNT - Enable at all throughout

RSSG: Ensure AWVR units at Goldstone and Madrid are ready

Changes from SOE/DKF

- Changes to reduce uplink transfers and tracking mode changes (preferred for data analysis)
- Discussed with Dave Doody, and plan is to make them in real-time
- Changes are reflected in RSS timeline

In 1st segment:

Remove uplink transfer and keep uplink over DSS-55

! 082 55 10348 123 021000   D55   U/L TRANSFER, FROM 55, TO 25, 18.0KW/LOW, X
! 082 25 10348 123 021000   D25   U/L TRANSFER, FROM 55, TO 25, 18.0KW/LOW, X

Transmitter OFF will be over DSS-55

! 082 25 10430 123 032307 TRK D25   TXR OFF, LOW, X

No mode changes here. DSS-25 continues to track in 3-way mode

! 082 25 10448 123 043545 TRK D25   ACQ D/L, 2W//   , X/CH. 25
! 082 25 10449 123 043545 TRK D25   ACQ D/L, 2W//CAR, K/CH. 25

In 2nd segment:

Remove uplink transfer and keep uplink over DSS-25

! 082 25 10605 123 073000   D25   U/L TRANSFER, FROM 25, TO 34, 18.0KW/LOW, X
! 082 34 10605 123 073000   D34   U/L TRANSFER, FROM 25, TO 34, 18.0KW/LOW, X

Transmitter OFF will be over DSS-25

! 082 34 10836 123 094837 TRK D34   TXR OFF, LOW, X

No mode changes here. DSS-25 continues to track in 2-way mode, and DSS-34 in 3-way mode

! 082 25 10838 123 095546 TRK D25   ACQ D/L, 3W/34/   , X/CH. 25
! 082 34 10839 123 095546 TRK D34   ACQ D/L, 2W//   , X/CH. 25
! 082 25 10840 123 095546 TRK D25   ACQ D/L, 3W/34/CAR, K/CH. 25
! 082 34 10841 123 095546 TRK D34   ACQ D/L, 2W//CAR, K/CH. 25

Changes from SOE/DKF cont'd

- Since no uplink transfer is required early during DSS-34 track, can BOT track later
- Can be done in real-time, but want to make the change soon in case maintenance can use the time
- Talked to Lu about it
  - A new DKF is not required
  - No issue for predicts generation since pass in schedule will be shorter than DKF
  - Ask Karen to notify the DSN Scheduling group to apply "SPS adaptation"
- Still working out details with sequence leads and DSN Scheduler to try to eliminate the need for regeneration of SEG products (SFOS, SOE, DKF)

In 2nd segment:

Change DSS-34 DOY 123 pre-cal to 0710 and BOT to 0840

! 082 34 10505 123 055000 TRK D34   SPEC ADVISORY [BEGIN PRE-CAL]

! 082 34 10594 123 072000 TRK D34   BOT