

S90 Rev 220 Dione D5 Gravity Observation

- Telemetry ON, Coherent mode (2-way and 3-way)
- Covered by all complexes
 Canberra -> Madrid -> Goldstone
- Three segments: Inbound, Closest Approach, Outbound

- Science Highlights (From Paolo Tortora)

D5 is the last gravity flyby of Dione the Cassini mission. The goal of gravity science at Dione is the determination of the quadrupole field (J2, C22). Dione's flybys named D3, carried out in late 2011, and D4, carried out in July 2015, were the only ones completed so far with tracking at closest approach. During both flybys the spacecraft acceleration was clearly detected in Doppler data and allowed a preliminary determination of Dione's quadrupole gravity field. The analysis of Doppler data acquired so far suggests that Dione's interior is not compatible with the condition of hydrostatic equilibrium. However, the addition of new Doppler data is crucial for a reliable determination of the quadrupole field. Data from D5 are expected to further reduce the current uncertainties and to test the robustness of current solution.

DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post							
15	228	2000	2130	0615	0630	DSS-25 CAS	RSS DI GSE	6532 N748	1A1	GSE	
15	228	2030	2130	0615	0630	DSS-14 CAS	TKG PASS	6532 N003	1A1	GSE	
15	229	0545	0715	1345	1400	DSS-35 CAS	TP RSS DI GRV L3	6533 N750	1A1	D5 Gravity	
15	229	1245	1415	2230	2245	DSS-55 CAS	TP RSS DI GRV L3	6533 N750	1A1	D5 Gravity	
15	229	1950	2120	0430	0445	DSS-25 CAS	TP RSS DI GRV L3	6533 N748	1A1	D5 Gravity	
15	230	1950	2120	0615	0630	DSS-25 CAS	RSS DI GSE	6534 N748	1A1	GSE	
15	230	2035	2135	0245	0300	DSS-14 CAS	TKG PASS	6534 N003	1A1	GSE	

This is a DSN Level 3 activity

First time using DSS-35 during a gravity observation

- 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

S90 D5 Open-Loop Assignment

DSS Prdx Mode	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
35 2-way	Elias/?	rsops1	RSR1	RSR1A -> XRCP RSR1B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 8, 16, 50 1, 8, 16, 50
55 2-way	Aseel/?	rsops1	RSR1	RSR1A -> XRCP RSR1B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 8, 16, 50 1, 8, 16, 50
25 3-way then 2-way	Dustin/?	rsops1	RSR1	RSR1A -> XRCP RSR1B -> KRCP	1, 2, 3, 4 1, 2, 3, 4	1, 8, 16, 50 1, 8, 16, 50

RSSG will be in Ops Room at 10:30 pm on Sunday, August 16 (229/0530)

Backup receivers:

RSR2

Danny will be supporting GSEs

ORTs

Completed

ORT on DOY 202 (July 20 PDT) over DSS-35, X- and Ka-band

15 202 0400 0530 1435 1450 DSS-35 CAS TP DSNMONCAL ORT 6506 N750 1A1

- Verified monopulse, conducted on-point phase cals, and acquired pointing data

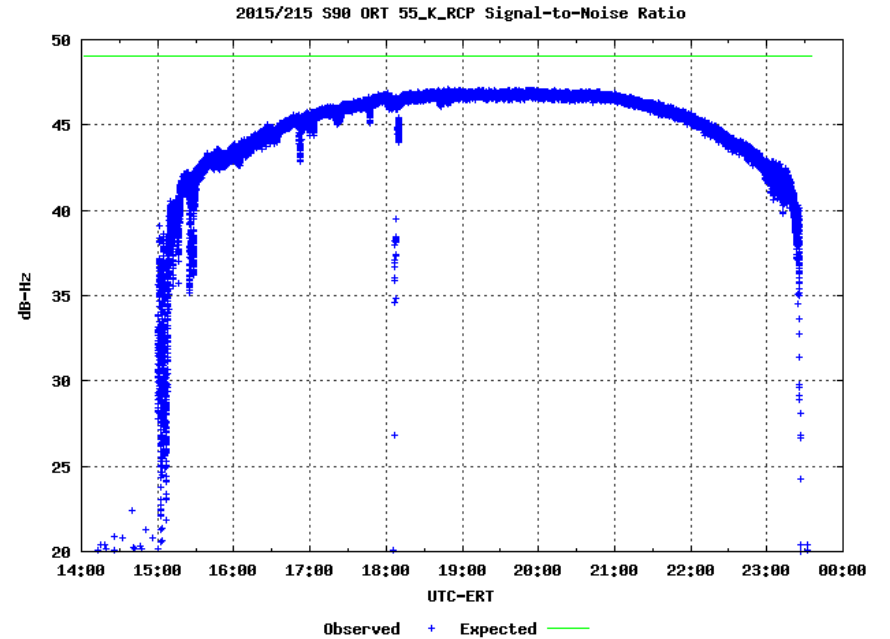
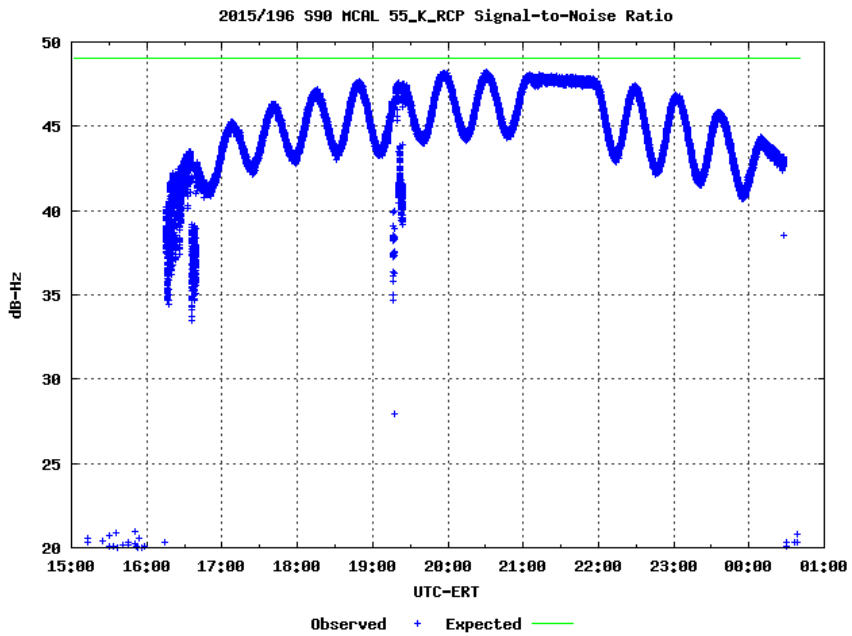
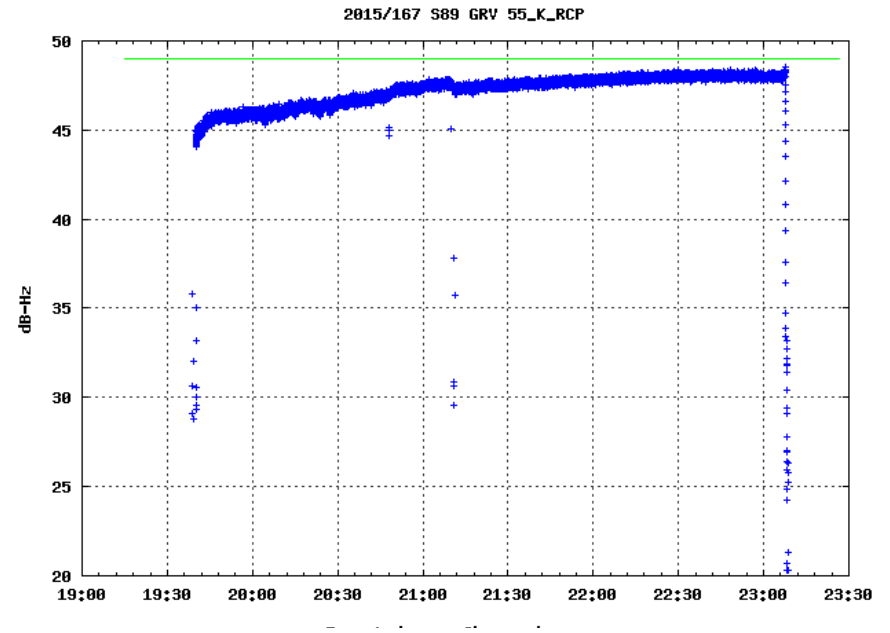
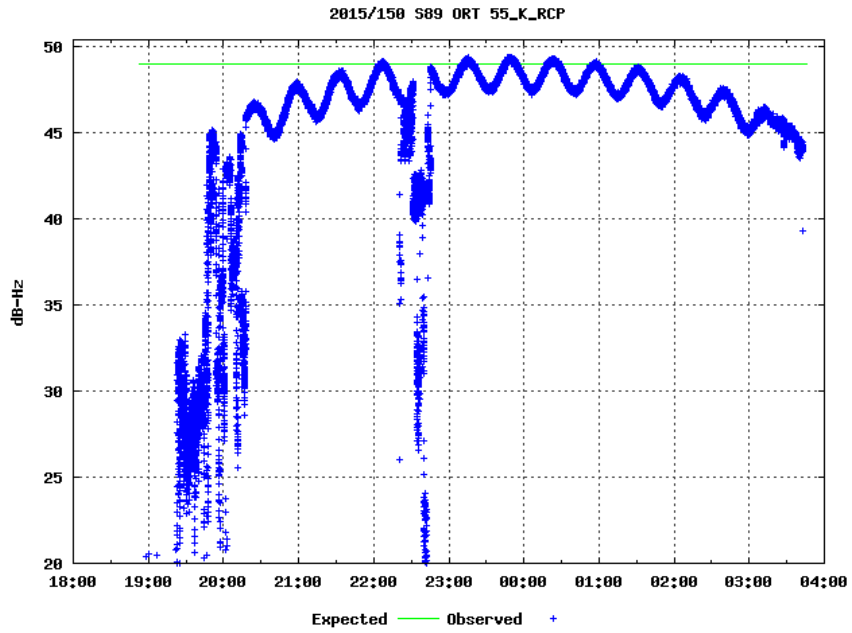
ORT on DOY 215 (August 3 PDT) over DSS-55, X- and Ka-band

15 215 1330 1500 2325 2340 DSS-55 CAS RSS GRVORT MC 6519 N750 1A1

- Verified monopulse, conducted on-point phase cals, and acquired pointing data
- Raining at BOT, high SNT
- Station conducted on-point phase cal 20 minutes into track after weather improved
- Good overall performance, but Ka-band Pc/No slightly lower than recent DSS-55 supports
 - DOY 150, max EL 31.3, Pc/No 49.3
 - DOY 167, max EL 31.4, Pc/No 48.1
 - DOY 196, max EL 31.8, Pc/No 48
 - DOY 215, max EL 31.8, Pc/No 46.8
- Spoke briefly with David Rochblatt. Manuel is on travel until after D5. Will not do anything before D5

DSS-55 Recent Supports

Ka-band Post-Pass Power Plots



ORTs Cont'd

ORT on DOY 216 (August 4 PDT) over DSS-25, X- and Ka-band

15 216 2045 2215 0700 0715 DSS-25 CAS TP RSS GRVORT MC 6520 N748 1A1

- Verified monopulse, conducted on-point phase cals, and acquired pointing data
- High winds.
- Monopulse disabled for about 5 hours until winds subsided

Upcoming

ORT on DOY 223 (August 10 PDT) over 35, X- and Ka-band

15 223 0230 0400 1300 1315 DSS-35 CAS TP RSS GRVORT MC 6527 0681 1A1

- Verify monopulse, conduct on-point phase cals, acquire pointing data

Misc

RS Support schedule:

- GSEs will be partially supported and then scripted
- Prime D5 gravity fully supported

Downlink Predicts

- Use SPS Predicts
 - RSS will not be generating predicts
- Last NAV delivery before flyby on ?

Uplink Plan

- Ramped predicts
 - Based on analysis by Sandy, unramped predicts not during Inbound GSE
- Per SOE/DKF

Timeline

- Per SOE/DKF

Equipment status?

- NOPEs? (DSS-35, DSS-55, DSS-25)

Misc Cont'd

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
 - Dustin sent data from recent ORTs to David Rochblatt. One more remaining
- During C/A segment, DSS-25 elevation is 6.73 degrees at BOT (21:20)
 - 10 degrees elevation at 21:38 ERT

Spacecraft biases around D5 (thruster firing)

All while spacecraft not Earth-pointed

- Before Inbound GSE, during DSS-35 Pre-Cal
228/20:00 ERT, 1hr30min
- At end of Outbound GSE, during DSS-25 track
231/05:35ERT, 37 min

SNT – Enable throughout

AWVR

- Elias: Schedule AWVR at Madrid and Goldstone