

S88 T110 Titan LGA Gravity Observation

- S88 Rev213 T110 Titan LGA Gravity Observation
 - X-band only
 - C/A 075/15:49:32 ERT, Altitude 2275 km
 - Telemetry OFF, Ranging OFF, Coherent mode (2-way and 3-way)
 - Covered by Goldstone and Canberra
 - 70-m antenna coverage is required

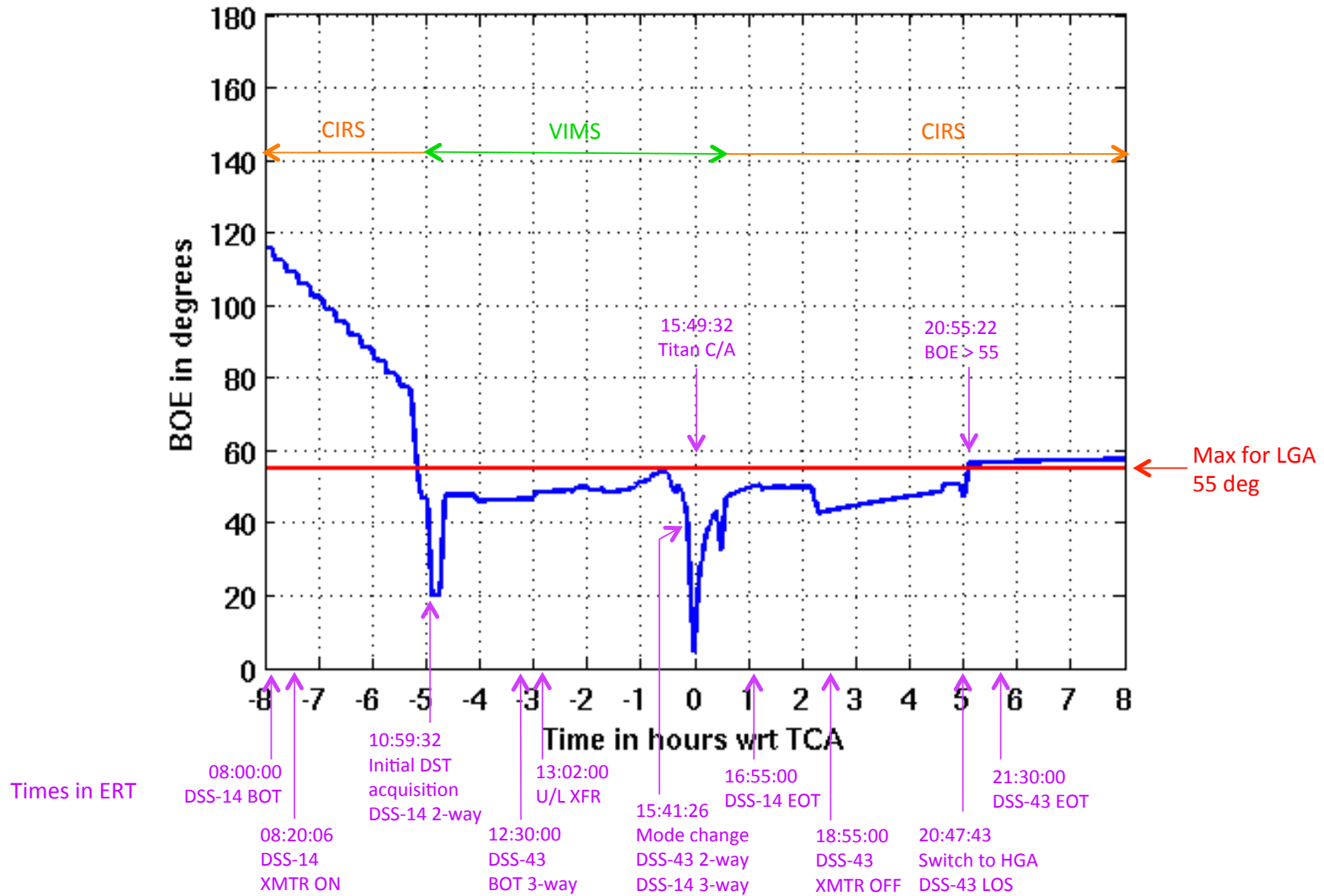
- Science Highlights

T110 is the first ever Titan flyby when the Cassini spacecraft will switch to the low gain antenna (LGA1) to allow Radio Science to acquire gravity data while the spacecraft is pointed for other science purposes. In 2010, RS demonstrated that adequately-precise Doppler tracking data can be obtained through LGA1 and up to 55 degrees off boresight. T110 provides unique coverage of Titan's high latitude regions that have never been mapped before for gravity. High latitude coverage is useful for the measurement of J3 and especially J4. J4 provides crucial clues to the nature of the discrepancy between the physical shape and the gravitational shape of Titan. J4 >> J2 points to tidal dissipation!

RSS Criteria for LGA Observation

- Boresight Off Earth (BOE) angles below 55 degrees for duration of observation
- BOE < 20 degrees during DST initial acquisition
- Sun-Earth-Probe (SEP) angles over 40 degrees (~110 degrees)
- Spacecraft attitude control on reaction wheels
- Ground antenna coverage by 70-m antennas (DSS-14 and DSS-43)
- Ground station elevation angles sufficiently high

T110 Boresight Off-Earth Angles



DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post						
15 074	1315	1415	2315	2330	DSS-43 CAS	T/P HGA TO LGA	6378	1740	1A1	

Switch from HGA to LGA1 during last 15 minutes of the track

15 075	0700	0800	1655	1710	DSS-14 CAS	T110 RSS LGA L3	6378	1740	1A1	
15 075	1130	1230	2130	2145	DSS-43 CAS	T110 RSS LGA L3	6379	1740	1A1	

Actual observation on LGA1

Switch back to HGA at end of observation

DSN Level 3 activity

15 076	1445	1545	0045	0100	DSS-43 CAS	TKG PASS	6380	N003	1A1	
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Confirm switch back to HGA

- Receivers scheduled

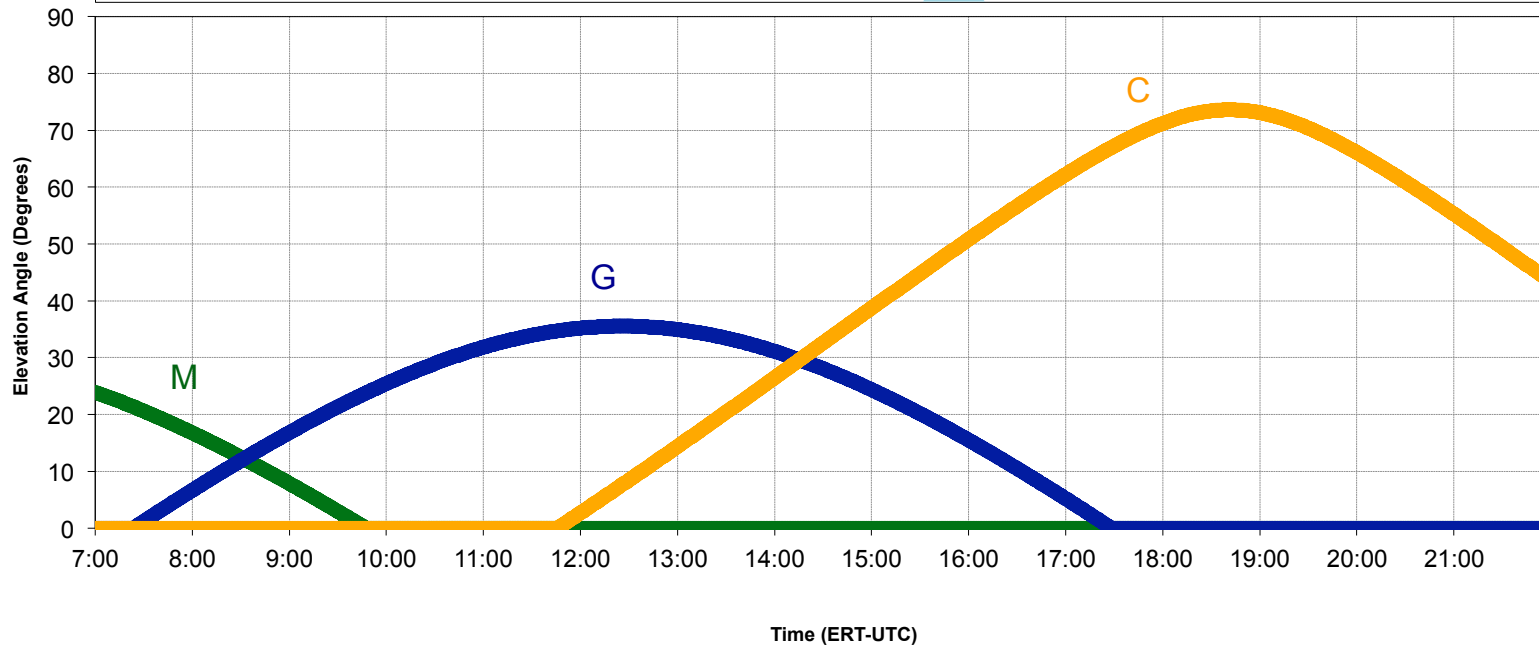
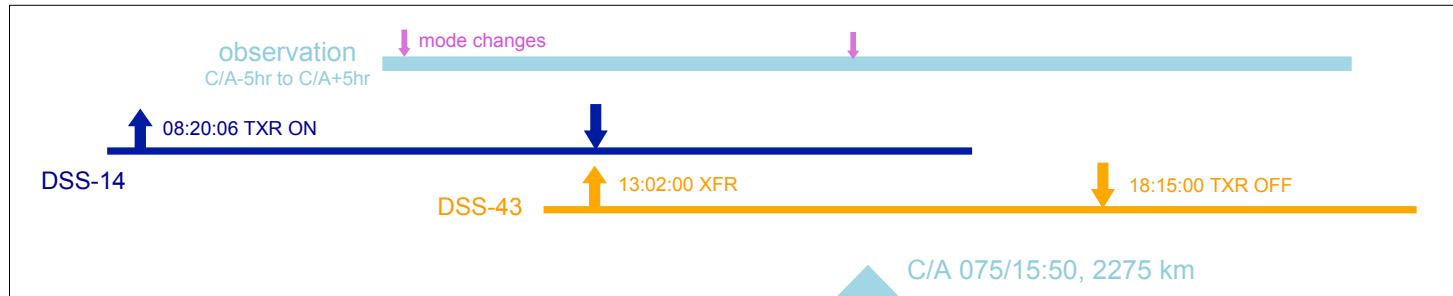
- On DOY 074 and 075: 2 closed-loop receivers per antenna
 - To be configured using a narrow and wide carrier loop bandwidth
- Open-loop receivers
- RCP only

- Open-loop data are prime. Closed-loop data are backup

- During 2010 test, closed-loop receiver with narrow carrier loop bandwidth maintained lock throughout the observation

S88 Rev213 T110 RSS LGA Titan Gravity 2015 075 / March 16, 2015 PDT

OWLT ~1:20
RTLT ~2:40



S88 T110 Open-Loop Assignments

DSS	Operator	Station	Open-loop Receiver	Channels	Subchannels	Bandwidths KHz
14		rsops1	RSR1	RSR1A -> XRCP RSR1B -> XRCP	1, 2, 3, 4 1, 2, 3, 4	1, 8, 16, 50 coherent 1, 8, 16, 50 1-way
43		rsops1	RSR2	RSR2A -> XRCP RSR2B -> XRCP	1, 2, 3, 4 1, 2, 3, 4	1, 8, 16, 50 coherent 1, 8, 16, 50 1-way

RSSG will be in Ops Room at 11:45 pm on Sunday, March 15th (075/0645)

Tracks on DOY 074 and 076 will also be monitored

Misc

Uplink Plan

- 18 kW
- Ramped uplink predicts throughout
 - Unramped were used during 2010 test
- Sweep DSS-14 uplink. No sweep during uplink transfer from DSS-14 to DSS-43
- Per SOE/DKF
- Telecom will be monitoring the SPE and plan to update BLF a week before the observation
 - SPE has been quite erratic lately
- Contingency plan?

70-m Pointing

- DSS-43 will enable Conscan during track prior to T110
- | | | | | |
|----------------------------|------------|----------|-----------|-----|
| 15 066 1345 1445 2345 0000 | DSS-43 CAS | TKG PASS | 6370 N003 | 1A1 |
| 15 071 1155 1300 2330 2345 | DSS-43 CAS | TKG PASS | 6375 N003 | 1A1 |
| 15 074 1315 1415 2315 2330 | DSS-43 CAS | TKG PASS | 6378 N103 | 1A1 |
- Disable before switch to LGA1 15 minutes before EOT
- There are no DSS-14 tracks between now and T110

Misc Cont'd

Open-loop receivers

- FFT parameters
 - One RSR with fast FFTs and another with slower FFTs?
- One RSR configured 1-way in case DST goes out of lock
- Fgain – what to set value to?
- Displays on big screen in ops room (movie)

Closed-loop receivers

- Ensure two are scheduled
 - DKF may not have required entries
- Configuration during initial acquisition, Closest Approach

SNT

- Enable or disable?
- Will check what was done during 2010 test

Equipment status?

- NOPEs? (DSS-14, DSS-43)