

September 28, 2005

TO: D. Morris

FROM: N. Lacey

SUBJECT: SOHO Helioseismology Observation (HSO) in 2009

The Resource Allocation Planning Services was task to perform a loading study to determine the ability of the Deep Space Network (DSN) to support the annual SOHO HSO Event in 2009 without the availability of the 26 meter subnet and with the capability of S-band uplink at DSS-45 and DSS-65. The SOHO HSO event requires 60 days of continuous coverage and can be supported at any antenna with S-Band (S/B) capabilities.

### **Background**

The Resource Allocation Planning Service (RAPS) has completed the analysis of the DSN loading in support of the annual SOHO HSO in 2009 and impact of the 60-day continuous HSO support on other projects and users of the DSN antenna resources. JPL Deep Space Mission Services (DSMS) are considering retiring the 26 Meter (26M) antenna subnet and adding S-band uplink (U/L) capability at DSS-45 and DSS-65. RAPS has been tasked to analyze the impact of the potential 26M closures the 34 Meter subnets, the 70M subnet and the 34M HSB antenna as well as to the users of the DSN. This study focuses on the projected network loading of the 34BWG1, 34HSB and DSS-45 and DSS-65. This study also discusses the impact to other DSN resources as a result of the projected 26M closure and DSS-45 and DSS-65 with S-band U/L capability.

### **Summary of Results**

Based on the projected major events and SOHO Keyhole periods, it is recommended that the 2009 SOHO HSO be conducted during the time period of March 2 through May 3, 2009 (Weeks 10 – 18). The actual dates may vary from a few days to 1 to 2 weeks; this is dependent on the selection of the SOHO Key Hole Periods for 2009. During the March 2 through May 3, 2009 time period, SOHO can expect to receive approximately 95 to 100 percent of their coverage for the 60 day HSO continuous time period. The projected 95 to 100 percent supportability is based upon the current DSN Mission Set for 2009. (See Figure 1) Other Projects/Missions are projected to receive 86 to 100 percent of their requested coverage during the SOHO HSO period.

## Assumptions

- SOHO HSO planned for March 2 through May 3, 2009
- During HSO, SOHO use full view (rise to set) view period at Goldstone
- SOHO Key Hole Periods for 2009 would occur approximately the same time period as 2008 (See below)
  - Weeks 06 through 09 of 2008
  - Weeks 19 through 21 of 2008
  - Weeks 31 through 35 of 2008
  - Weeks 45 through 47 of 2008
- No Launch support or Projects/Users level 1 or 2 major event scheduled during the planned SOHO HSO period
- Planned DSS-43 and DSS-63 Downtime for Proposed Life Extension (DSS-43 January – March; DSS-63 April – September)
- DSS-16 closed 2005
- Proposed closure for DSS-46 and DSS-66 as early as January 1, 2008
- DSS-27 upgraded with full NSP capability (TT&C, SLE)
- DSS-27 Setup and Teardown time is increase due to the change in equipment capability and use.
- DSS-45 and DSS-65 upgraded with S-Band Uplink capability
- All supports at the 26M subnets were reallocated at the 34HSB, 34BWG1, and DSS-45, DSS-65 and at DSS-15 when applicable

## Analysis

Analysis was accomplished using the Forecasting and Scheduling Tool for Earth-based Resources (FASTER) forecasting system and the updated mission set database from the August 2005 Resource Allocation Review Board (RARB) modified meeting.

All supports displaced as a result of the DSS-16 Closure and DSS-46 and DSS-66 antenna proposed decommissioning are S-Band missions belonging to the SSMO mission set. These missions were reallocated to other resources with S-Band U/L and D/L (downlink) capability such as the 34BWG1, 34HEF and 34HSB Subnets.

Based on forecast data gathered from the User Loading Profiles (ULP), taking all of the assumptions into consideration, and the view periods that overlap with SOHO, it is projected that SOHO HSO can expect to receive approximately 95 to 100 percent of their 60-day continuous support planned for the March through May time period. For all remaining active missions, the DSN can provide an average supportability of 86 – 100% of all Projects/Users currently requesting support during the recommended SOHO HSO period. Supportability for some Projects/Users specifically DSS-Maintenance and Voyager 2 drops to >66% in some weeks. The lost time for Voyager 2 is due to the planned downtime for DSS-43 ending in week 13, on March 29th. Most all supports allocated at DSS-43 were moved to either DSS-45 or DSS-34 when applicable causing an excess of unsupported time for Voyager 2 and DSS Maintenance. The high periods of contention for DSS Maintenance and Voyager 2 are further compounded by the view period overlap. See Figures 2 and 3. The view periods for DAWN, MRO and MSGR overlap with DSS Maintenance view period by 75 percent or more; Cassini, Kepler, and SETEO

Ahead and Behind view periods overlap with DSS Maintenance by approximately 45 to over 50 percent or more. Be advised also that the Resource Allocation Review Board process has not been applied to this period. It is expected that the weeks of low supportability can be negotiated to a workable level through the RARB process.

The upgrade of the DSS-27 antenna and the S-Band Uplink addition of the 34 HEF antennas help make it possible for SOHO HSO to maintain 95 to 100 percent of their 60-day continuous coverage. The 5 percent of projected unsupportable time can be recovered through the Mid-Range Conflict Negotiation Process.

**Conclusion**

SOHO can expect to receive between 95 – 100% supportability coverage for the 2009 HSO for early March through early May. The remaining 5 percent contention will be negotiated during the Mid-Range negotiation process.

Figure1: DSN Ongoing/Advanced User/Mission Planning Set

## DSN User / Mission Planning Set

**2009 - 2015**

As of: August 12, 2005

<b>ONGOING/PLANNED PROJECTS</b>				
Project	Acronym	Launch or Start	EOPM	EOEM
DSN Antenna Calibration	DSN	--	--	--
DSS Maintenance	DSS	--	--	--
DSN ZDD Calibration	DSN	11/01/04	--	--
European and Global VLBI Systems	EGS	--	--	--
Ground Based Radio Astronomy	GBRA	--	--	--
Reference Frame Calibration (Cat M&E and Clock Sync)	DSN	--	--	--
Space Geodesy	SGP	--	--	--
Voyager 2	VGR2	08/20/77	10/15/89	09/30/10
Voyager 1	VGR1	09/05/77	12/31/80	09/30/10
Goldstone Solar System Radar	GSSR	04/01/85	--	--
Advance Composition Explorer	ACE	08/25/97	02/01/01	09/30/10
Cassini	CAS	10/15/97	06/30/08	06/30/10
Stardust	SDU	02/07/99	02/15/06	---
Chandra X-ray Observatory	CHDR	07/23/99	07/24/09	07/24/14
Imager for Magnetopause-to-Aurora Global Exploration	IMAG	03/25/00	05/30/02	09/30/10
Cluster 2 - S/C #2 (Samba)	CLU2	07/16/00	02/15/03	12/31/09
Cluster 2 - S/C #3 (Rumba)	CLU3	07/16/00	02/15/03	12/31/09
Cluster 2 - S/C #1 (Salsa)	CLU1	08/09/00	02/15/03	12/31/09
Cluster 2 - S/C #4 (Tango)	CLU4	08/09/00	02/15/03	12/31/09
Wilkinson Microwave Anisotropy Probe	WMAP	06/30/01	10/01/03	09/30/09
Advanced Tracking and Observational Techniques (ATOT)	ATOT	02/01/02	12/31/08	---
Hayabusa (MUSES - C)	MUSC	05/09/03	06/10/07	---
Rosetta	ROSE	02/26/04	12/31/15	---
Messenger	MSGR	08/03/04	03/19/12	---
Deep Impact	DIF	01/12/05	08/05/05	---
Mars Reconnaissance Orbiter	MRO	08/12/05	12/31/10	12/31/15
Venus Express	VEX	10/26/05	04/09/06	TBD
New Horizons	NHPC	01/11/06	04/17/16	TBD
Stereo Ahead	STA	04/11/06	07/13/08	07/13/11
Stereo Behind	STB	04/11/06	07/13/08	07/13/11
Space Technology 5	ST5	02/28/06	06/11/06	TBD
Dawn	DAWN	06/17/06	01/12/16	TBD
Phoenix	PHX	08/03/07	10/26/08	TBD
Kepler Mission	KLM	06/01/08	06/30/12	---
Lunar - A	LUNA	08/01/09	03/10/10	---

<b>ADVANCED PLANNING PROJECTS</b>				
Project	Acronym	Launch or Start	EOPM	EOEM
SELENE	SELE	02/01/07	02/21/07	TBD
Lunar Reconnaissance Orbiter	LRO	11/15/08	TBD	TBD
Juno	JUNO	06/06/09	08/09/15	TBD
Mars Science Laboratory 2009	MSL	10/25/09	03/04/12	TBD
Space Interferometry Mission	SIM	02/14/10	08/30/20	TBD
James Webb Space Telescope	JWST	08/01/11	07/31/16	TBD
Mars Placeholder 2011	M11L	10/30/11	09/10/14	TBD
Mars Placeholder 2013	M13O	11/28/13	08/21/16	TBD

Figure2: Goldstone Viewperiod Overlap with SOHO

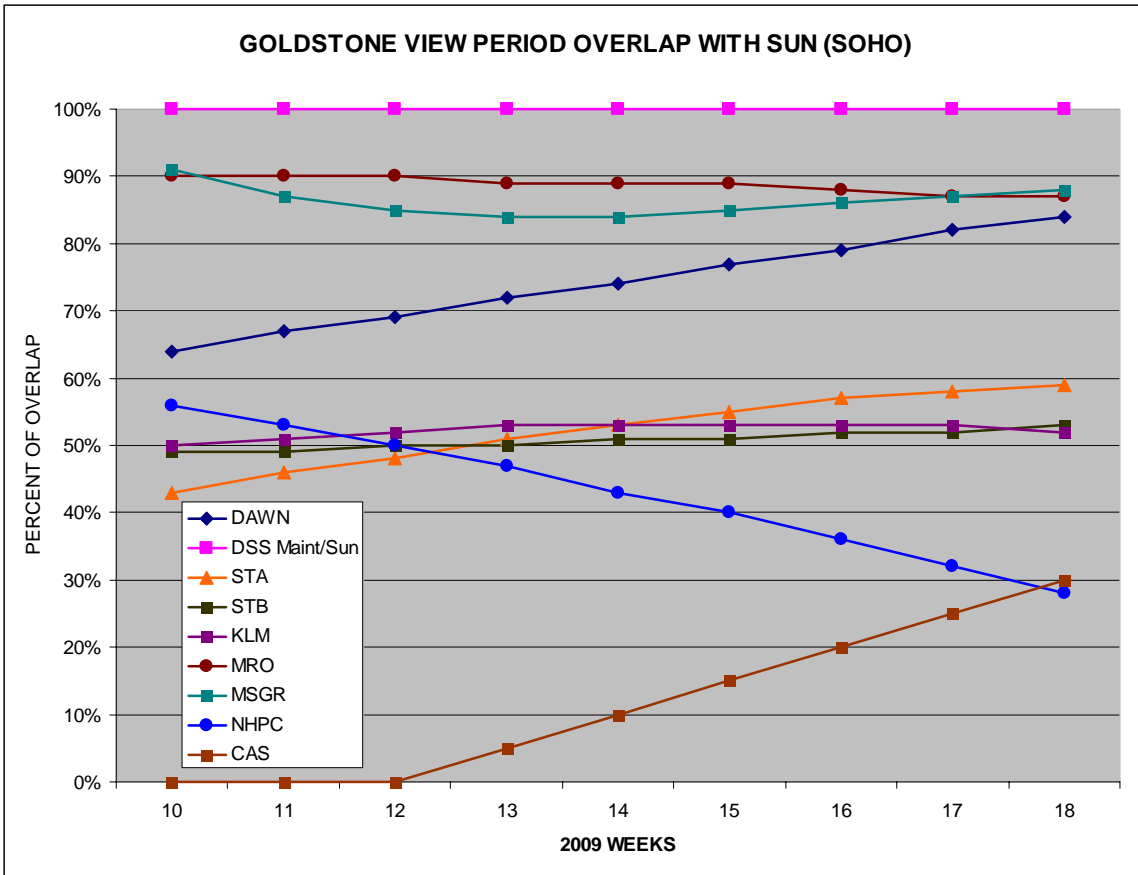


Figure3: Canberra Viewperiod Overlap with SOHO

