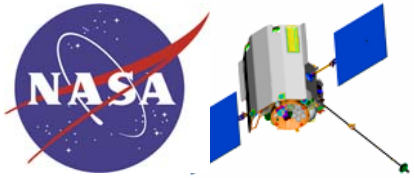
JOINT USERS RESOURCE ALLOCATION PLANNING COMMITTEE

Thursday, November 15, 2007, 1 PM

JPL - Building 126, Room 200

AGENDA

1. **Introductory Remarks ..... D. Morris**
2. **Conflict Resolution ..... D. Morris**
3. **Action Items..... D. Morris**
4. **SPECIAL REPORTS:**
   - **Messenger Deep Space Maneuver and Mercury Flyby 1 ..... L. Efron**
   - **SELENE Status ..... S. Waldherr**
5. **Resource Analysis Team ..... A. Andujo**
   - **Mid-Range Status**
   - **Proposed DSS Downtime Changes**
   - **Special Studies**



MESSENGER

Navigation Status

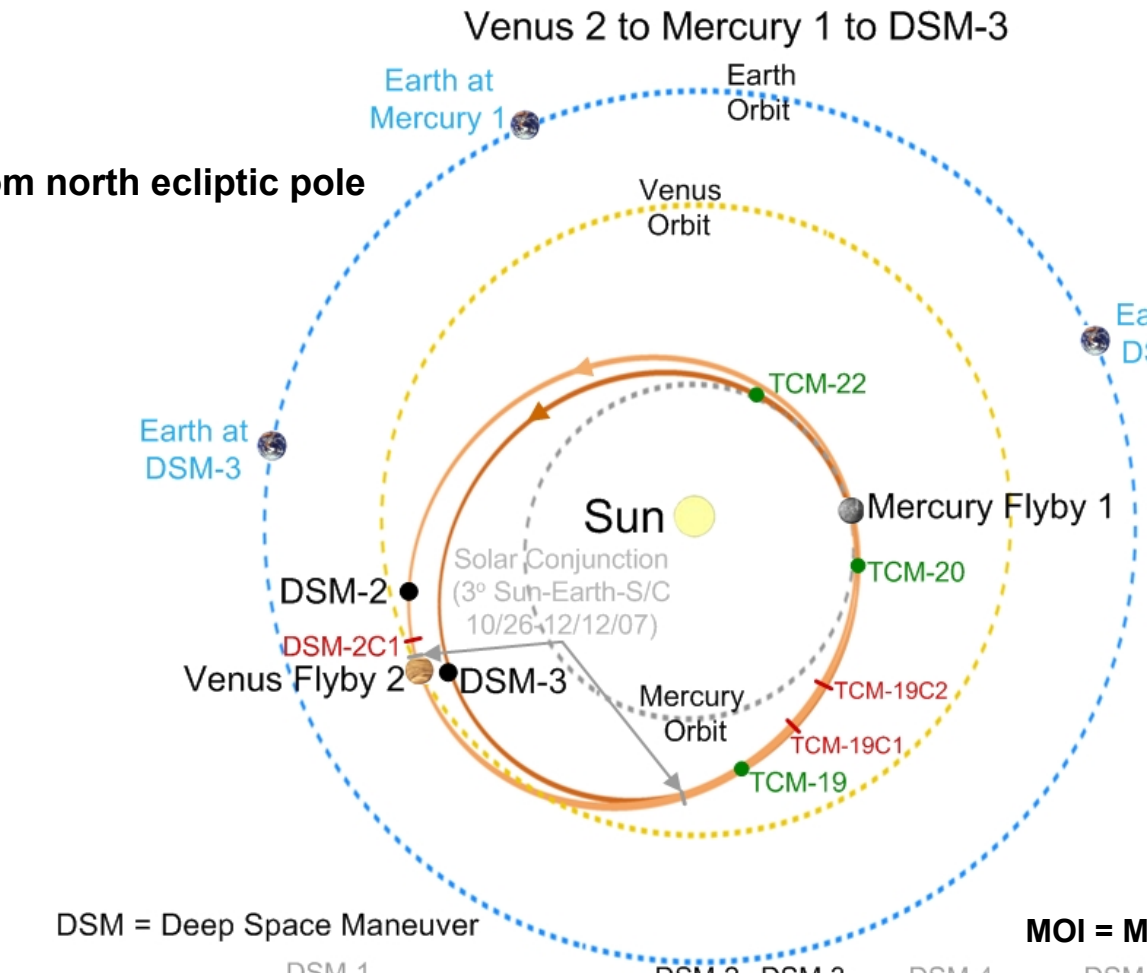
15 November 2007

DSM-2 and Mercury Flyby 1

Len Efron
KinetX, Inc. SNAFD
21 West Easy St. Suite 108
Simi Valley, CA 93065
805-527-4890

MESSENGER

Heliocentric Trajectory (Venus 2 to DSM-3)



Update List

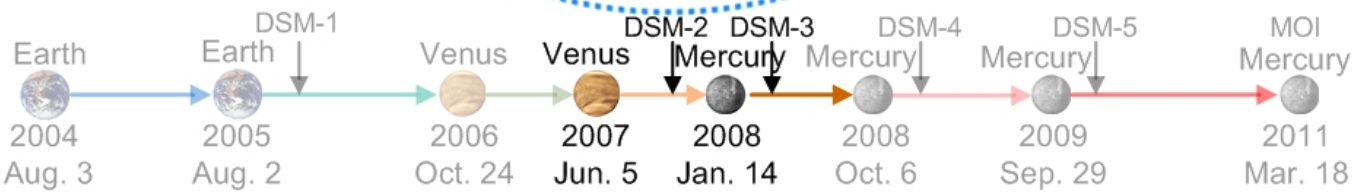
DSM-2 contingency now 6 days (vs. 7) after DSM-2 → DSN resource issue

7-day earlier TCM-19 option

4-day earlier DSM-3 at 1.2 m/s cost to enable DSM-3 contingency

DSM = Deep Space Maneuver

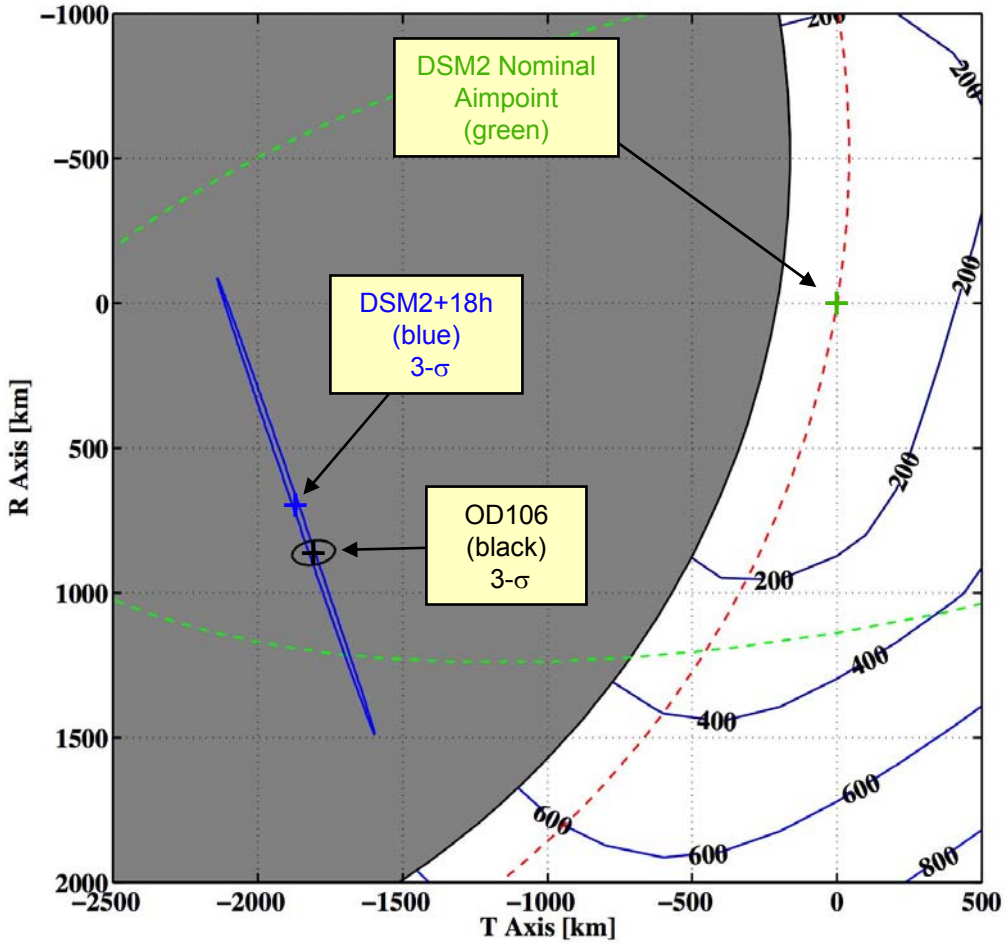
MOI = Mercury Orbit Insertion



MESSENGER

Mercury B-plane as of 29 October 2007

Mercury B-plane, Post-DSM2

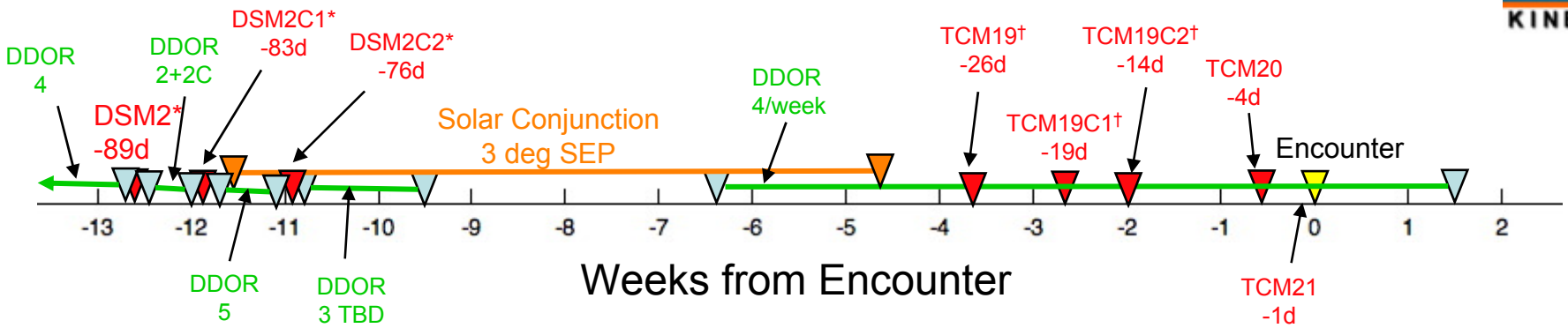


Positions, Times, and 3-Sigma Errors

- **DSM2 Nominal:**
  - B•T,B•R = 3185, 516 km (Aimpoint)
  - 18:18:06.9 ET ± 79 m
  - Ellipse: 3072 x 1161 km, -11 deg
  - Basis: OD104 + DSM2 design
- **DSM2 + 18h**
  - B•T,B•R = 1318, 1218 km
  - 19:01:19.7 ET ± 301s
  - Ellipse: 834 x 10km, 71 deg
  - Basis: G&C telemetry reconstruction + 18h tracking data.
  - Error ellipse includes no future dynamic uncertainties
- **OD106**
  - B•T,B•R = 1378,1378 km
  - 19:02:35.8 ET ± 25.5
  - Ellipse: 74.7 x 41.1 km, 170 deg
  - Basis: Data to 23 Oct 14:40 (DDOR to 21 Oct 23:00)
  - Error ellipse includes future dynamic uncertainties of 15 mm/s per axis per week, 3-sigma

MESSENGER
Delta-DOR Timeline

Proposed/Actual Delta-DOR Schedule for Mercury 1 Approach



Cannot get the 4/week required before conjunction because of DSN contentions (other projects,two stations down)

- Four baselines from 30 September until DSM2
- From DSM2 to DSM2C1: 2 baselines + 2 contingency baselines if DSM2C1 cancelled
- From DSM2C1 to DSM2C2: 5 baselines
- From DSM2C2 until 1.5 degree SEP (8 November): TBD (4/week requested, 3 total expected)
- From 1.5 degree SEP until 10d after encounter: 4 baselines/week (AI from August review)
  - 30 November to 24 January
- Alternate N-S and E-W baselines where geometry and contentions permit
  - No Madrid-Goldstone overlap above 10 degrees elevation after late November (7 degrees elevation is the limit, but difficult and with degraded accuracy)

* DSM2 options (DSM2 = Nominal; DSM2Cn = nth Contingency or Backup)
†TCM19 options (TCM19 = Early /Optimistic; TCM19C1 = Nominal /Expected; TCM19C2 = Backup)

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JAXA SELENE-"KAGUYA" Overview

SELenological and Engineering Explorer (SELENE) goal is to obtain scientific data of the lunar origin and evolution, and to develop the technology for future lunar exploration. SELENE consists of a main orbiting satellite at about 100km altitude circular orbit and two small satellites (Relay Satellite and VRAD Satellite). The instruments and the relay satellites are used to carry out global mapping of the lunar surface. The DSN does not support the Relay Satellite or the VRAD satellite. The DSN supports only the SELENE main orbiting satellite. DSN support is for launch plus 40 days. After the launch plus 40 days the DSN will support only emergency and contingency for 13 month SELENE mission.

Key Mission Events

Event	Date
Launch day	**14 September 2007**
Prime DSN support	**L to L +40 days**

DSN Tracking Summary
TLM, CMD, & TRK, RNG
Telemetry Rates Max 4kbps -2kbps
26/34 meter support S-Band U/L & D/L
8-16 hours per day for 40 days

Communications line: Interface between JAXA (NASDA/ISAS) and JPL for TLM/CMD using SLE protocol. The Communications lines were procured by JAXA.

Telecommunications Summary
S-Band
Uplink 2084 MHz
Downlink 2263MHz
TLM Rates: 2kbps and 4kbps
TLM Code MCD 2

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RSAT and VRAD SELENE Sub Satellites Overview

- **SELENE Main Orbiter Characteristics**
  - **Main Orbiter Mass 3 tons**
  - **Max Power3.5kW**
  - **Size2.1m x 2.1m x 4.8m**
  - **Attitude control is three-axis stabilized**
  - **Orbit is Circular orbit,**
    Altitude is 100km
    Inclination is 90 deg

- Relay sub Satellite
  - **Mass is 50kg**
  - **Attitude stabilization is Spin-stabilized**
  - **Orbit is Elliptical orbit (100km x 2400km)**
  - **Inclination : 90 degree**

- VRAD sub Satellite
  - **Mass50kg**
  - **Attitude stabilization is Spin-stabilized**
  - **Orbit is Elliptical orbit (100km x 800km)**
  - **Inclination : 90 degree**

SELENE Main Orbiter with the Relay Satellite
And the VRAD Satellite

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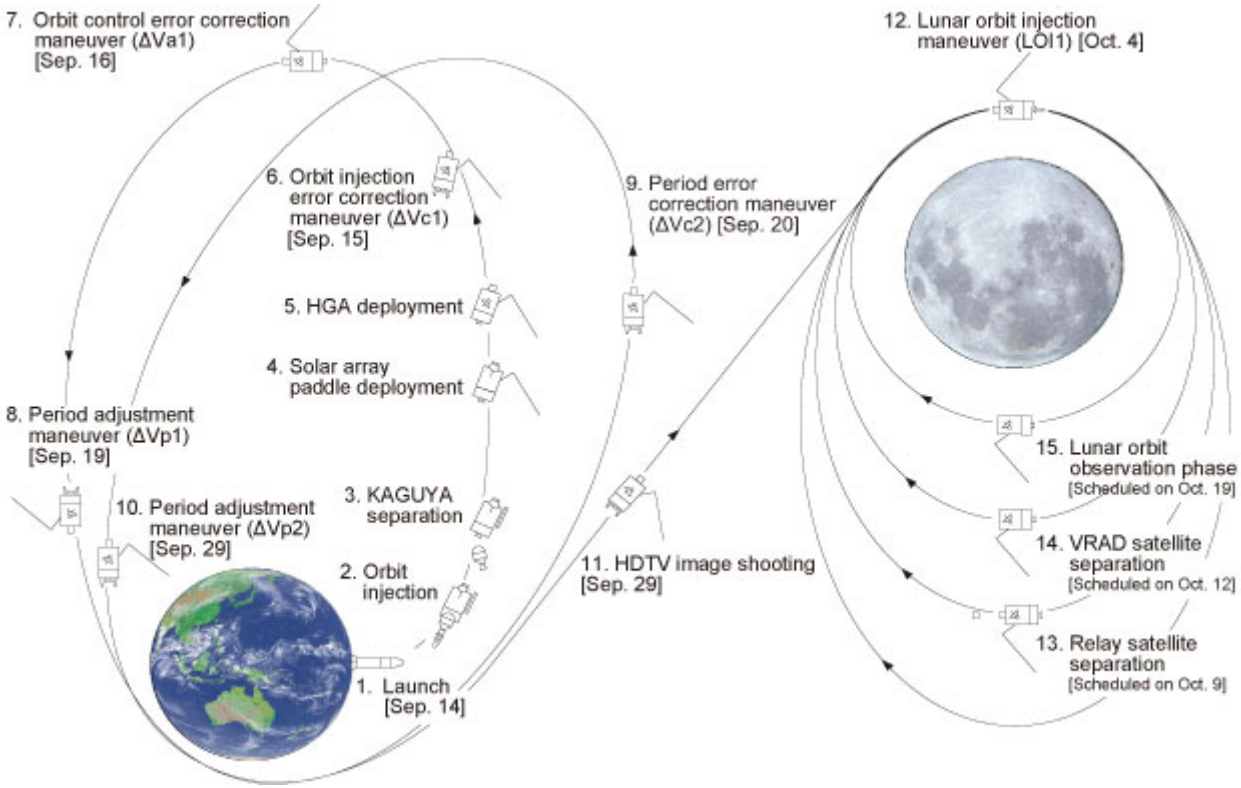
SELENE Mission Time Line



SELENE DSN Support Summary

- On DOY 257 September 14, 10:31am Japan Standard Time, JAXA successfully launched the SELENE spacecraft.
- The Madrid complex supported the successful initial acquisition.
- Subsequent to the initial acquisition, the DSN supported 40 days of tracking support.
- Over the 40 days of prime support, JAXA conduct a spacecraft maneuver almost every other day (about 20 maneuvers).

SELENE DSN Support Summary- cont

- The DSN is still committed to support emergency and contingency support for launch to launch plus 13 months (October 2008).
- JAXA also indicated possible spacecraft eclipse support during the period of February-August 2008.
  - JAXA is in the process to determine DSN eclipse support to augment the JAXA ground stations.
  - JAXA will be submitting the request as soon as possible.

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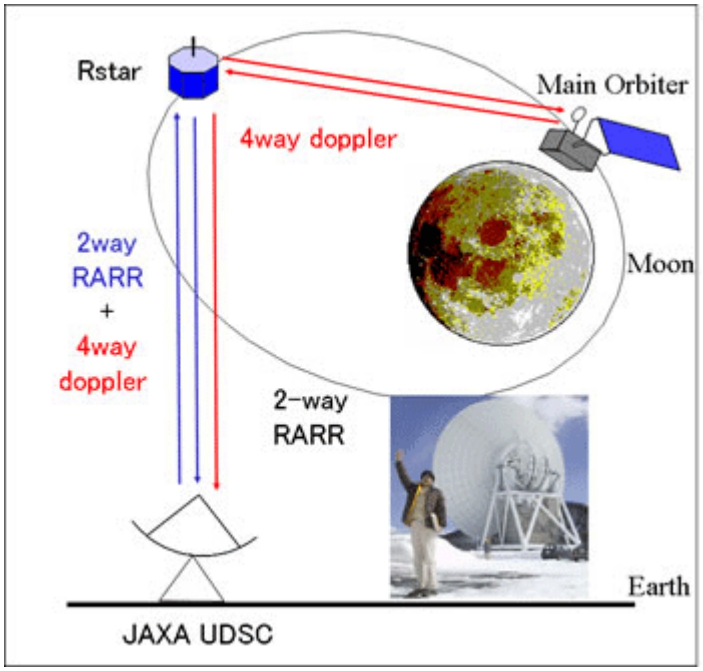
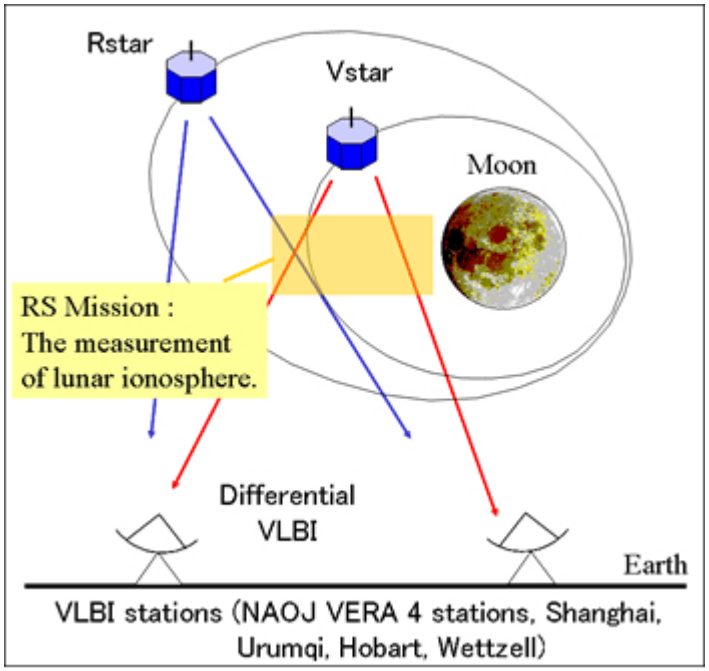
RSAT and VRAD SELENE Sub Satellite Science Overview

Relay SAT: 4way Doppler measurement by Relay satellite



Relay Satellite: The uplink radio wave from Usuda is relayed to the Main Orbiter via the relay satellite, which is returned to Usuda via relay satellite again. Then the Doppler frequency is measured at Usuda.

VRAD SAT: Differential VLBI observation of radio sources



VRAD Satellite: Radio waves from the two sub-satellites are received at VERA radio telescopes in NAOJ and others.

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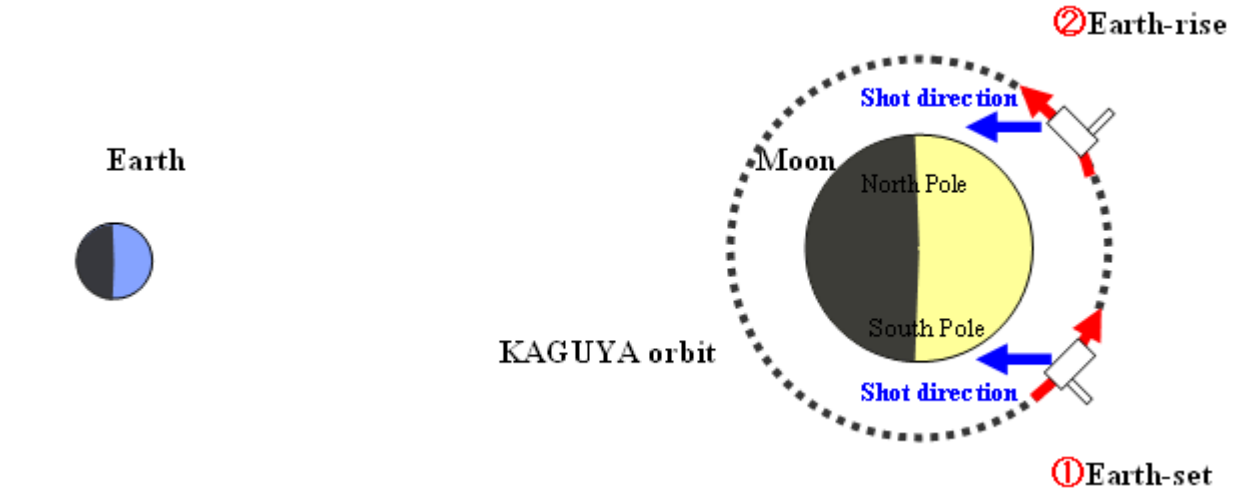
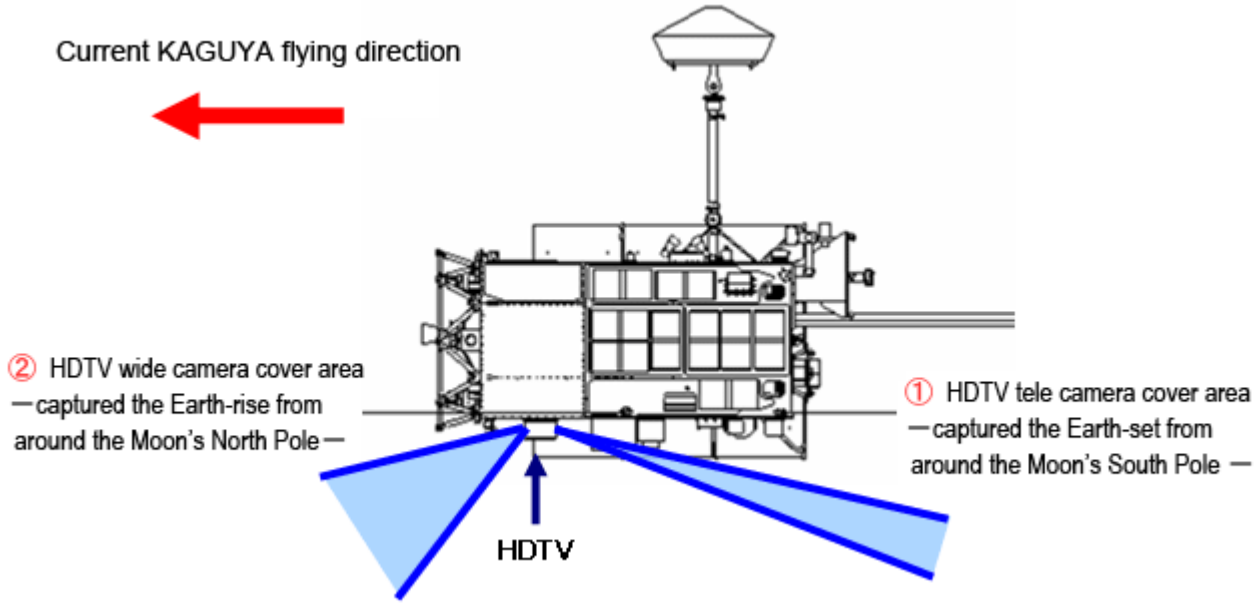
SELENE HDTV LUNAR Observation





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EARTH RISE as seen by SELENE

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

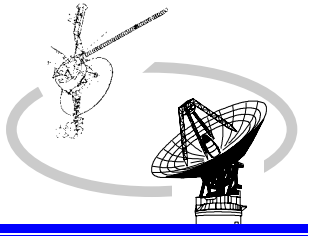
EARTH SET as seen by SELENE

JOINT USERS RESOURCE ALLOCATION PLANNING COMMITTEE

Resource Analysis Team

November 15, 2007

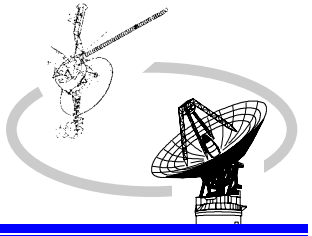
Art Andujo



MID-RANGE SCHEDULING STATUS

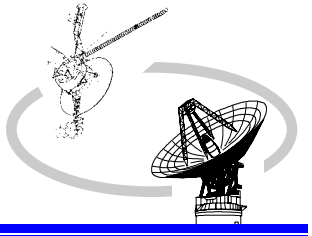
- **RESOURCE NEGOTIATION STATUS**
  - 2007 WEEKS 46 - 52 (THRU 12/23/2007) HAVE BEEN RELEASED TO DSN SCHEDULING AS OF 11/15/2007.
  - 2008 WEEKS 04 - 10 (THRU 03/09/2008) WERE RELEASED TO THE REMOTE USERS ON 11/09/2007.
  - 2007 WEEKS 01 – 10 of 2008 (THRU 03/09/2008) HAVE REMAINING FACILITY AND EQUIPMENT CONFLICTS.

- The Mid-Range Scheduling process has schedules 16 weeks ahead of real-time. Currently, there are 7 weeks of conflict-free schedules. Conflict Resolution is required for the following eight weeks: 12/31/2007 through 03/09/2008.



MID-RANGE SCHEDULING STATUS

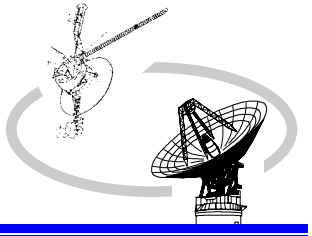
- **Accelerated Schedule Production and De-conflicting**
  - Mid-Range scheduling has fallen behind in the production and de-conflicting of schedules.
  - An accelerated plan has been in place to ensure the RAPT team can provide DSN scheduling with at least 8 weeks of conflict free schedules.
    - Increased initial schedule builds
      - Two to three Mars Integrated Schedules are now being delivered approximately every week. Thus producing two to three new preview schedules per week.
    - Increased RAPT Negotiation Meetings
      - From November 2007 through January of 2008 the RAPT team has planned to more than double the planned meetings. (26 meetings versus 12 nominal meetings.)
  - By the end of January 2008 it is expected that this accelerated plan will yield 26 weeks of mid-range schedules and 15 of those weeks will be conflict free.
  - This is an ambitious plan that is requiring and will continue to require a tremendous amount of support from all members of the RAPT team, as well as the support from all missions to allow us to concentrate our efforts to this undertaking.



Resource Allocation Review - February 2008

- **RAR Activities**
  - Minutes for the August 2007 review and status of Action Items will be published Friday, November 16, 2007.
  - Requirements input for the February Review will begin Friday, November 16th through Friday, November 30th.
  - RAR Timeline February 2008

Calendar Date	Work Days Remaining	Milestones
11/16/2007	54 Days	Post Mission Set, Major Events & User Loading Profiles on RAPWEB for Projects/Users Review and Verification on RAPWEB.
11/30/2007	52 Days	Deadline for Projects/Users Responses to Mission Set, Major Events, and User Loading Profiles. Last day for Trajectory or Viewperiod Updates and Submissions.
01/10/2008	21 Days	Post Preliminary Events, Contentions, Recommendations and Analyses on RAPWEB
02/04/2008	5 Days	Projects/Users Review of RAPWEB Major Events, Contentions, & Recommendations – Concluded
02/06/2008	3 Days	Post Final Major Events, Contentions, and Recommendations on RAPWEB
02/11/2008	**--**	**February RAR Negotiation Process – Concluded**



ON-GOING SPECIAL STUDIES/ACTIVITIES

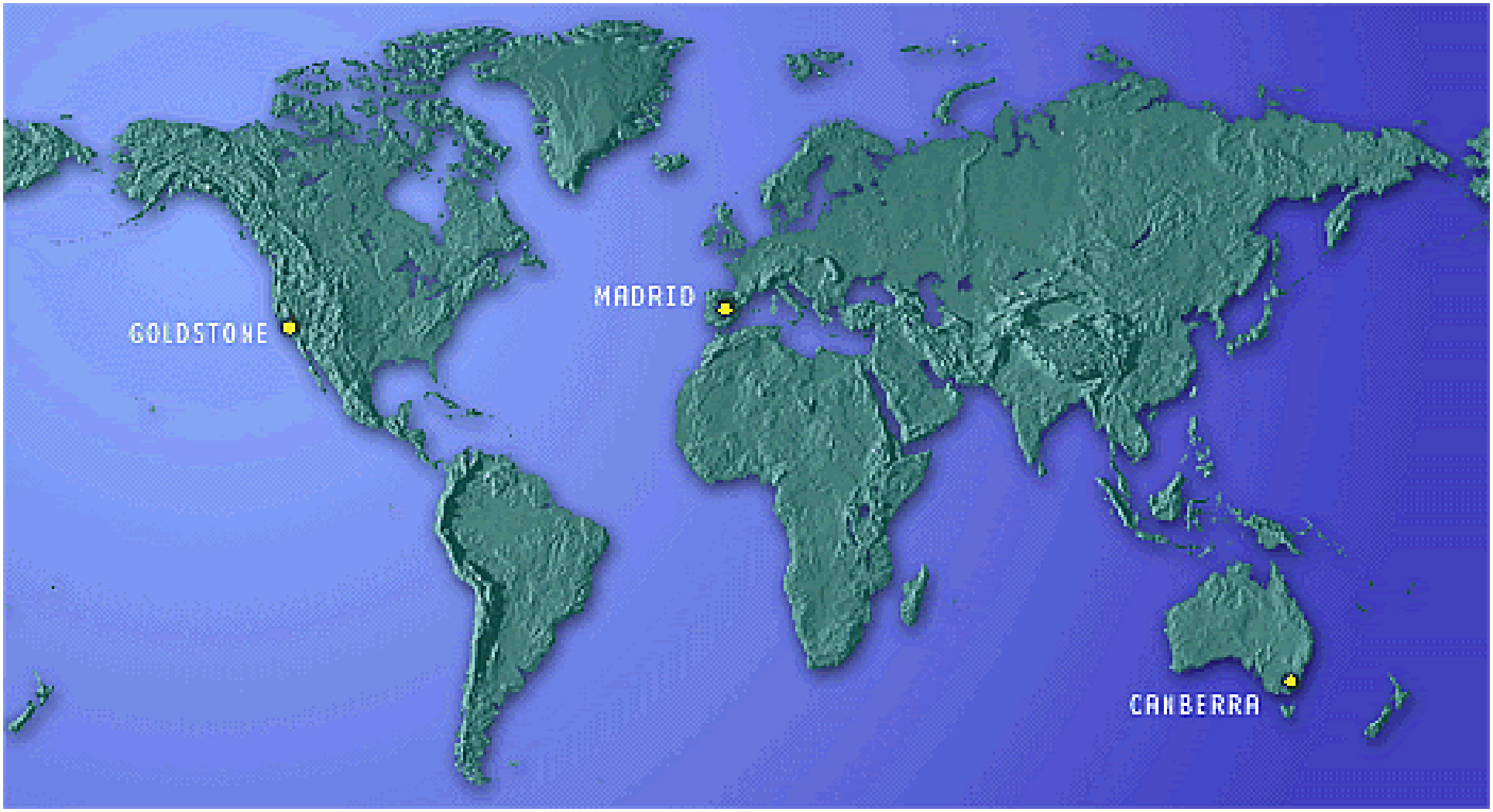
- Downtime Planning – ongoing
- MMS Study was completed
- DAWN & NHPC Supportability 2014 – 2015 Study was completed

DSN Mission Set

- The DSN Mission Set is available at the Resource Allocation Planning Service website:

http://rapweb.jpl.nasa.gov/raphome.html

DSN Antenna Downtime Status and Forecast



http://rapweb.jpl.nasa.gov/planning

Antenna Downtime Status and Forecast

The following downtimes were approved for 2008 - 2010

- SPC-60 downtime for Commercial power installation task. The Saturday-Sunday 36 hours in week 12.
  - The 12-hour blocks on Sunday of week 14 and Monday of week 15 are being proposed to merge to a 32.5 hour block.
  - The Sunday of week 13 and Monday of week 14 are being proposed to merge to a 36 hour block.
- DSS-55 downtime for Paint Repair beginning in June 2008 for weeks 23 - 28.
- DSS-34 downtime for DSS-34 Azimuth Track Replacement in June 0f 2008 for week 25 - 28
- DSS-65 downtime for Life Extension Elevation for October, November of 2009 for weeks 45 - 48.
- DSS-25 downtime for Ka U/L install for April 2010 for weeks 13 - 15.
- DSS-14 downtime for Life Extension beginning 09/28/2009. It was requested by the MESSENGER mission to delay the start of the downtime by up to ten days to support Mercury flyby and post flyby support. This was agreed to but the amount of days needed has not yet been determined but is ten days or less.
- Approved DSS-14 Grouting for week 25 has been requested to move due to other requirements in that week.
- MDSCC 26m antenna, DSS-66 will close at the end of FY08 as currently shown. CDSCC 26m antenna, DSS-46 will close as of August 1, 2009.

Antenna Downtime Status and Forecast

Downtime request for 2008

The following proposals for 14 hour complex downtimes are requested by GDSCC.

- Corrective maintenance “Apollo Tie-Line CB 22 Electrical Maintenance” in April.
- Corrective maintenance “G86/G81 Transfer Switch Electrical Maintenance” in May.
- Preventative maintenance “G91 2400V Switchgear Electrical Maintenance” in June.
- Preventative maintenance “Echo Tie-Line Electrical Maintenance” in September.
- Preventative maintenance “Apollo Tie-Line Electrical Maintenance” in October.
- Preventative maintenance “SPC-10 Electrical Maintenance” in November.

The following proposals for antenna downtimes are requested.

- CDSCC Annual Antenna Inspections including Annual Servo Testing at DSS-43, -45 and -34 in weeks 3 & 4 of 2008 not to be scheduled concurrently.
- GDSCC Annual Antenna Inspections including Annual Servo Testing at DSS-14, -15, -24, -25, and -26 in weeks 15 & 16 of 2008 not to be scheduled concurrently.
- MDSCC Annual Antenna Inspections including Annual Servo Testing at DSS-63, -65, -54 and -55 in weeks 23 & 24 of 2008 not to be scheduled concurrently.
- HEF Transmitter Manifold Installation at DSS-15, -45 and -65 between July, 2008 and June 2009 not to be scheduled concurrently with DSS-15 being scheduled first.

Antenna Downtime Status and Forecast

Changes to 2007 Downtime Schedule

- 13-hour complex-wide downtime for SPC-10 Electrical Maintenance is scheduled for DOY 341/2115 – 342/1015.

- 2-hour daytime complex-wide downtime per complex every month for Ground Network Maintenance are scheduled:
  - SPC-40 week 44 302/2315-303/0115
  - SPC-10 week 44 304/2015-2215
  - SPC-60 week 45 312/0700-0900

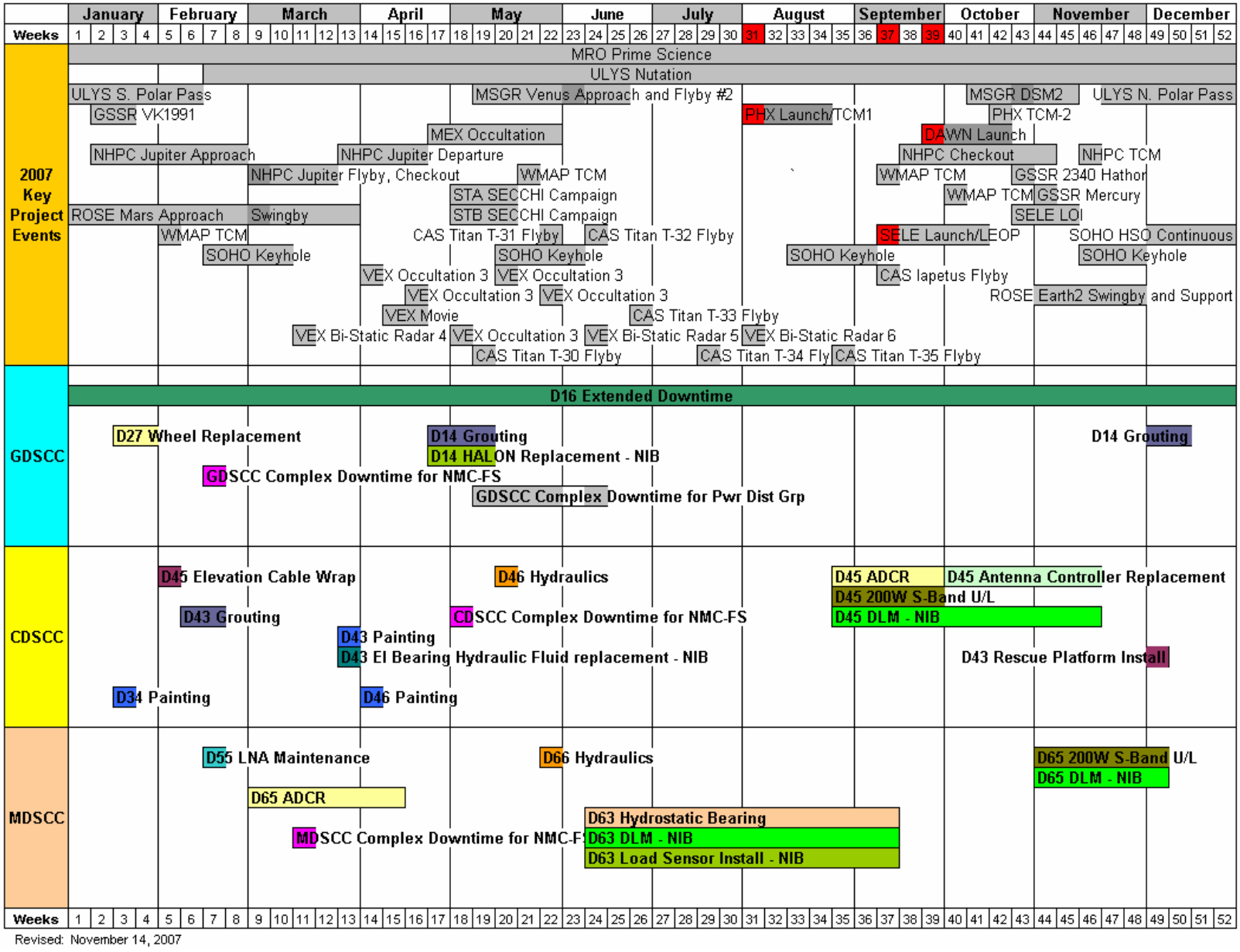
- 2-hour daytime complex-wide downtime per complex every month for Network Infrastructure are scheduled in week 46:
  - SPC-10 316/0000-0200
  - SPC-40 316/1210-1410
  - SPC-60 316/0730-0930

- Downtime for DSS-43 for Rescue Platform Install is scheduled for DOY 336/2100 – 339/2100.

- ACR S/W install is in the schedule for DOY 25/0000 – DOY 34/0000.

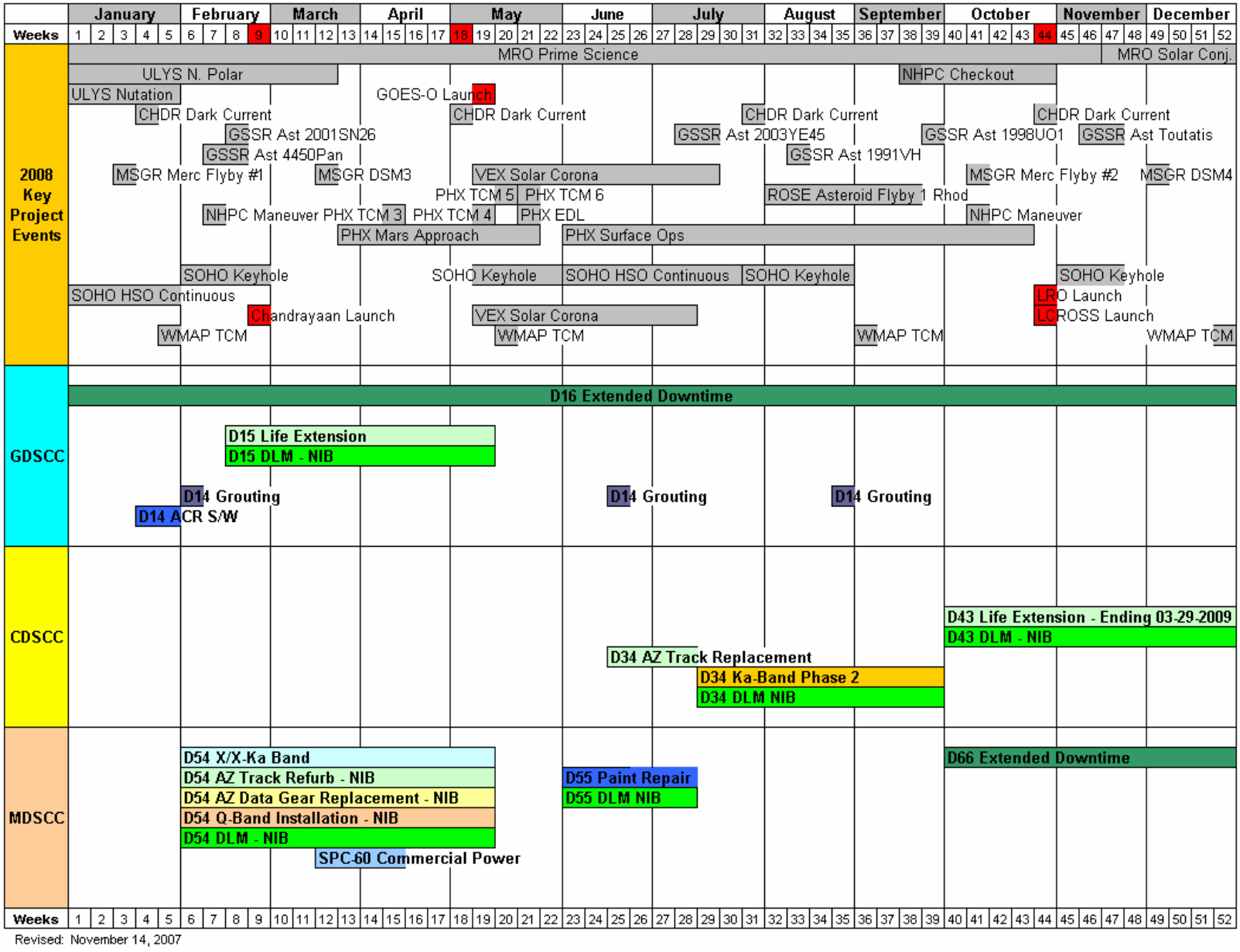
- Downtime for Grouting is scheduled for DOY 340/1600 – DOY 346/0000.

Antenna Downtime Status and Forecast 2007



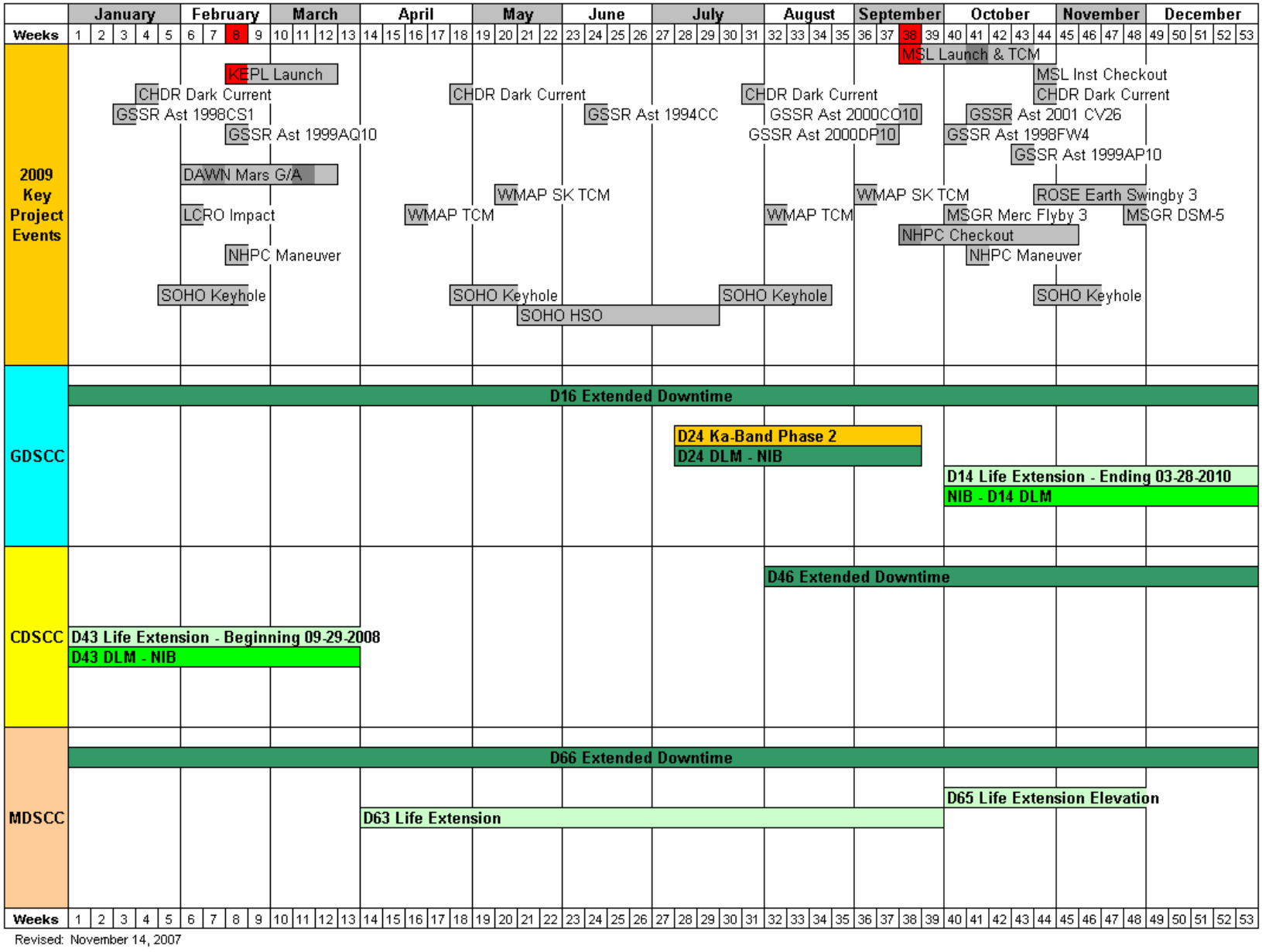
Revised: November 14, 2007

Antenna Downtime Status and Forecast 2008



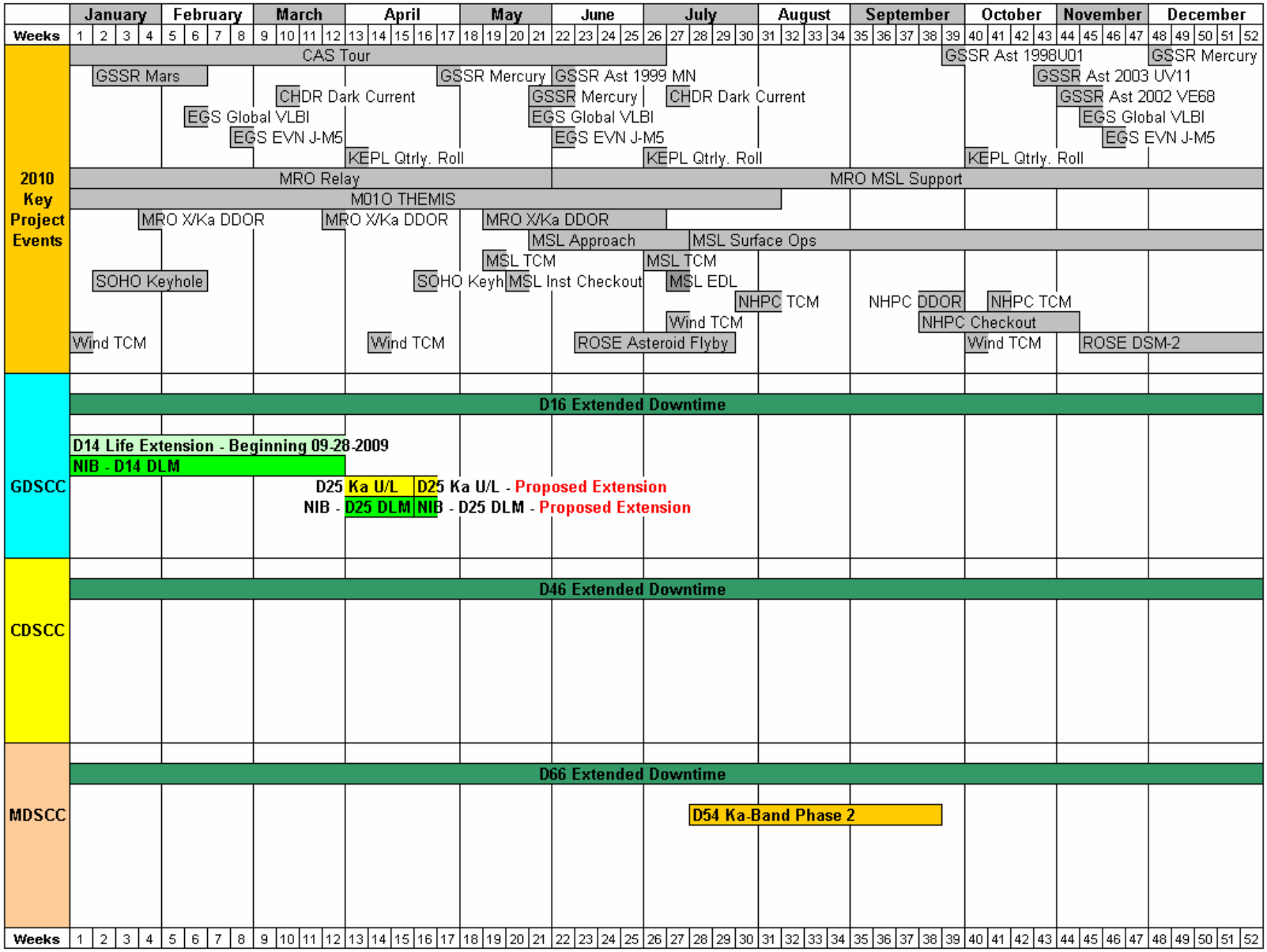
Revised: November 14, 2007

Antenna Downtime Status and Forecast 2009



Revised: November 14, 2007

Antenna Downtime Status and Forecast 2010



Revised: November 15, 2007

Antenna Downtime Status and Forecast

DSN Resource Implementation Planning Matrix By Subnet

Complex	Station	Subnet	S-Band		X-Band		Ka-Band		Ka Phase 2
			Down	Up	Down	Up	Down	Up	
10	DSS-16	26M	✔	✔	N/A	N/A	N/A	N/A	N/A
40	DSS-46	26M	✔	✔	N/A	N/A	N/A	N/A	N/A
60	DSS-66	26M	✔	✔	N/A	N/A	N/A	N/A	N/A
10	DSS-27	34HSB	✔	✔	N/A	N/A	N/A	N/A	N/A
10	DSS-24	34B1	✔	✔	✔	✔	N/A	N/A	09/21/09
40	DSS-34	34B1	✔	✔	✔	✔	✔	N/A	09/29/08
60	DSS-54	34B1	✔	✔	✔	✔	04/15/08	N/A	09/27/10
10	DSS-25	34B2	N/A	N/A	✔	✔	✔	08/01/10	N/A
10	DSS-26	34B2	N/A	N/A	✔	✔	✔	N/A	N/A
60	DSS-55	34B2	N/A	N/A	✔	✔	✔	N/A	N/A
10	DSS-15	34HEF	✔	N/A	✔	✔	N/A	N/A	N/A
40	DSS-45	34HEF	✔	11/18/07	✔	✔	N/A	N/A	N/A
60	DSS-65	34HEF	✔	12/10/07	✔	✔	N/A	N/A	N/A
10	DSS-14	70M	✔	✔	✔	✔	N/A	N/A	N/A
40	DSS-43	70M	✔	✔	✔	✔	N/A	N/A	N/A
60	DSS-63	70M	✔	✔	✔	✔	N/A	N/A	N/A

N/A = Capability Not Planned xx/xx/xx = Capability Date Recently Changed As of: 08/16/07

✔ ✔ ✔ = Capability Recently Exists ✔ = Capability Exists