JET PROPULSION LABORATORY INTEROFFICE MEMORANDUM

October 26, 2004

TO: Eugene Burke

FROM: J. Retana

SUBJECT: Solar-TErrestrial RElations Observatory Ahead and Behind (STEREO A & B) Loading Study

STEREO (Solar TErrestrial RElations Observatory) will employ two nearly identical space-based observatories known as STEREO Ahead (STA) and STEREO Behind (STB). STA and STB will be in a heliocentric orbit about the sun; one drifting ahead of the earth and one drifting behind the earth.

The purpose of this study is to evaluate STA's and STB's requirements based upon a new launch day of February 11, 2006 and re-plan of major events to be supported on the Deep Space Network (DSN). This study will also compare launch requirements for the old date of November 15th, 2005 to the February 11th, 2006 new launch date. Additionally, the study will illustrate STA's and STB's relative proximity to each other from launch to the 2nd lunar swing-by in week 20 of 2006.

Analysis was accomplished using the FASTER (forecasting and scheduling tool for earth-based resources) forecasting system and the updated mission set database from the August 2004 Resource Allocation Review Board (RARB).

Summary

The analysis of the DSN network loading and contention for the period of February 2006 through the End-Of-Prime Mission May 16, 2008. STA and STB are forecast to receive 89 to 95 percent of their requested support during the life of the mission.

The results of this study are preliminary as changes to requirements for missions are periodically updated. Detailed negotiations are handled with the Resource Allocation Planning Team where all projects are represented.

Assumptions for 2006 through 2008

STEREO Ahead and Behind scheduled to launch on February 11th, 2006.
DSS-63 is down for Antenna Controller Replacement in weeks 21 thru 35 of 2006.
DSS-24 is down for X/X-Ka Band installation in weeks 36 thru 42 of 2006.
DSS-45 is down for Antenna Controller Replacement in weeks 41 thru 49 of 2006.
DSS-54 is down for X/X-Ka Band installation in weeks 23 thru 30 of 2007.

Requirements

2005 Launch vs. 2006 Launch

The launch requirements for both STA and STB were reduced significantly in week 6 for the 2006 launch but the requirements increased from 210 hours to 343 hours in week 7, the week after launch for launch support, as compared to the 2005 Launch requirements. There are eleven less passes and thirty-seven less hours in the period from launch to the first earth swing-by which equates to the first 9 weeks from launch. (See Figure-1)

Figure – 1

Total Passes per Week Launch through 1st Swing-by

	WK46 WK6	WK47 WK7	WK48 WK8	WK49 WK9	WK50 WK10	WK51 WK11	WK52 WK12	WK1 WK13	WK2 WK14	Total
2005	39	24	18	18	20	28	18	17	15	197
2006	13	40	20	18	20	18	24	18	15	186
dif	-26	16	2	0	0	-10	6	1	0	-11

Total Hours per Week Launch through 1st Swing-by

	WK46 WK6	WK47 WK7	WK48 WK8	WK49 WK9	WK50 WK10	WK51 WK11	WK52 WK12	WK1 WK13	WK2 WK14	Total
2005	353	210	116	102	109	194	106	100	69	1359
2006	114	343	164	106	114	106	160	106	109	1322
dif	-239	133	48	4	5	-88	54	6	40	-37

Assessment on the DSN for 2006 through 2008

Overall, STA and STB are forecast to receive 89 to 95 percent supportability during the life of the mission. In weeks 7 of 2006, STA and STB are requesting 343 hours for launch support this is their greatest amount of requested hours during the mission. Due to their priority during this time frame STA and STB should not have a problem getting their requested time. (See Figure-2)

In 2007, STA and STB are requesting 33 to 44 hours per week each throughout the year. Due to STA and STB pass durations which average 4 hours per pass. STA and STB will lose 1 to 2 hours in weeks 23 and 24. Due to STA and STB flexibility to move to other stations this is insignificant and can be negotiated during the Mid-Range scheduling process. (See Figure-3)

In week 11 of 2008, Kepler will be performing a Quarterly Roll maneuver that will increase STB's unsupportable time by three hours. In week 13 thru week 20 of 2008 Phoenix will begin its Mars Approach Phase this will increase STB's unsupportable time from three to six hours. Due to STA and STB flexibility to move to other stations this is insignificant and can be negotiated during the Mid-Range scheduling process. (See Figure-4)

Figure-2

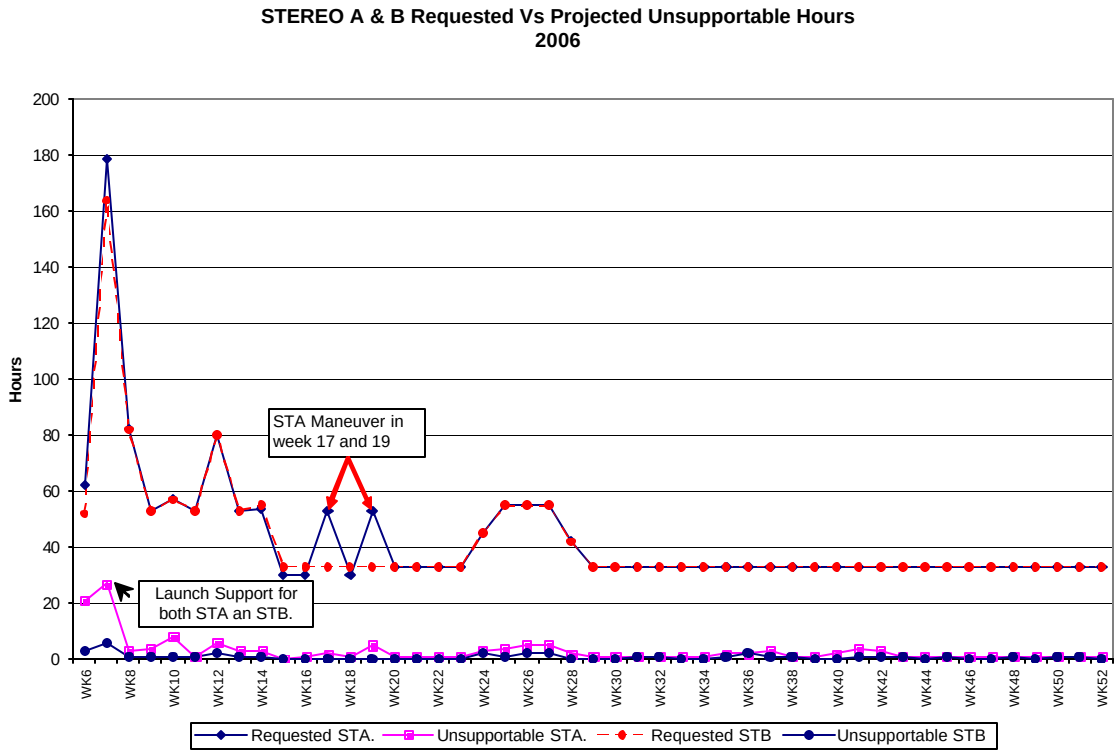


Figure-3

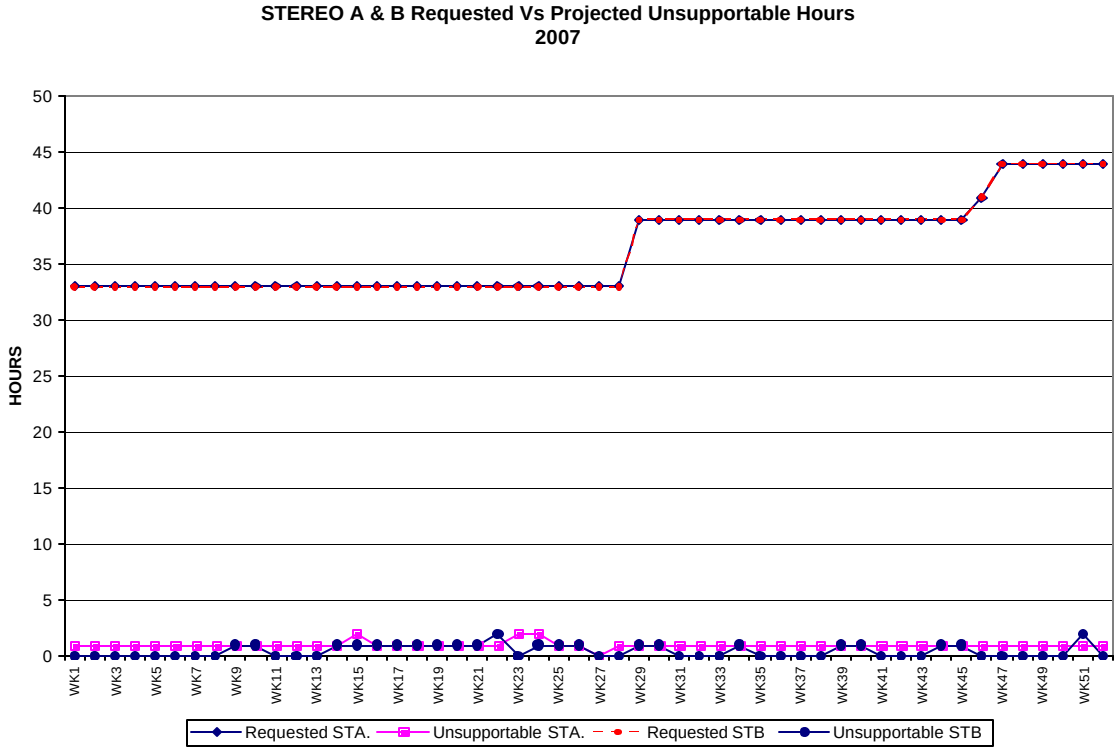
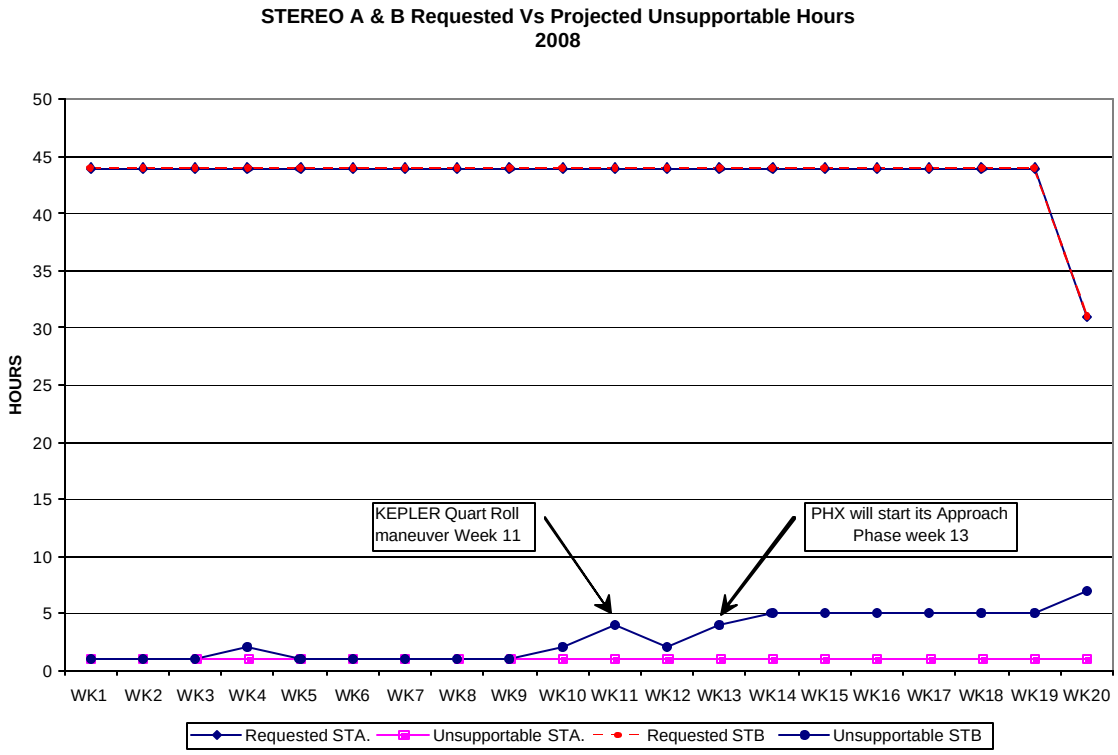


Figure-4


STEREO A & B Requested Vs Projected Unsupportable Hours
2008
HOURS
50
45
40
35
30
25
20
15
10
5
0
KEPLER Quart Roll maneuver Week 11
PHX will start its Approach Phase week 13
WK1 WK2 WK3 WK4 WK5 WK6 WK7 WK8 WK9 WK10 WK11 WK12 WK13 WK14 WK15 WK16 WK17 WK18 WK19 WK20
Requested STA.
Unsupportable STA.
Requested STB
Unsupportable STB

View Periods

The view periods for STA & STB will overlap nearly 100% (See Figure-6) from launch in week 6 thru week 17. In week 18 to the 2nd lunar swing-by in week 20 of 2006 the view periods will separate gradually and by week 21 of 2006 the view periods will only overlap on occasion for a few minutes to a few hours. (See Figure-7) The view periods from the 2005 Launch follow the same pattern as the 2006 launch. (See Figure-5)

This analysis shows view period overlap with Cassini, Spitzer, Ulysses and Wilkinson MAP from launch in week 6 to week 20 of 2006 for both STA and STB. In week 20 of 2006 STA will perform a lunar swing-by that will put STA in a different orbit, at which point STA view periods will overlap with the Mars projects, DSN Maintenance, New Horizons (Pluto Charon), MESSENGER, Phoenix from 50 to 100 percent through approximately October of 2007. STA and STB will gradually change their view period contention and by end of mission STB will overlap the Mars projects view periods from 50 to 100 percent. This is illustrated in figure-8.

Figure-5

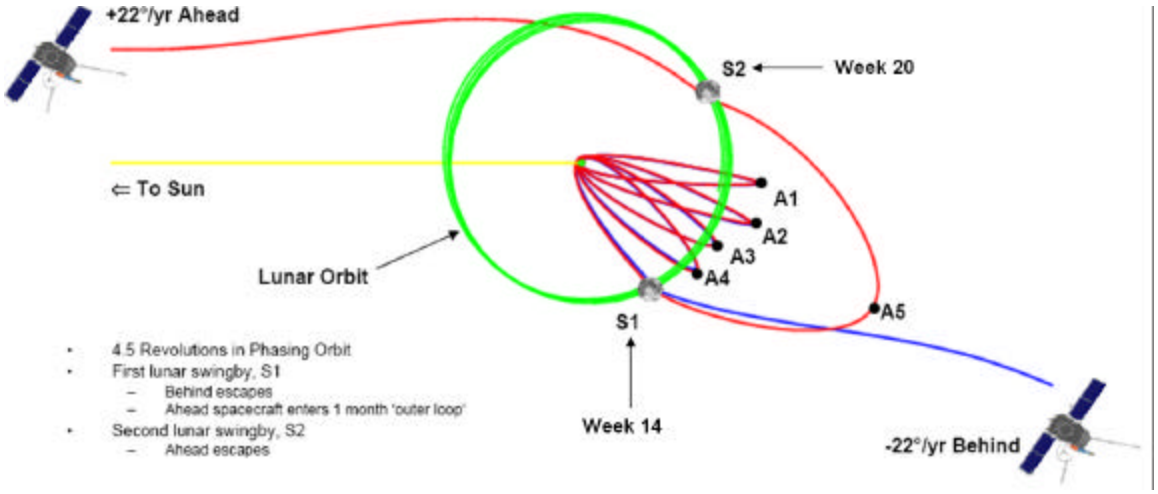


Figure -6

NOTE: STA is represented in YELLOW and STB is represented in BLUE.

Week 6

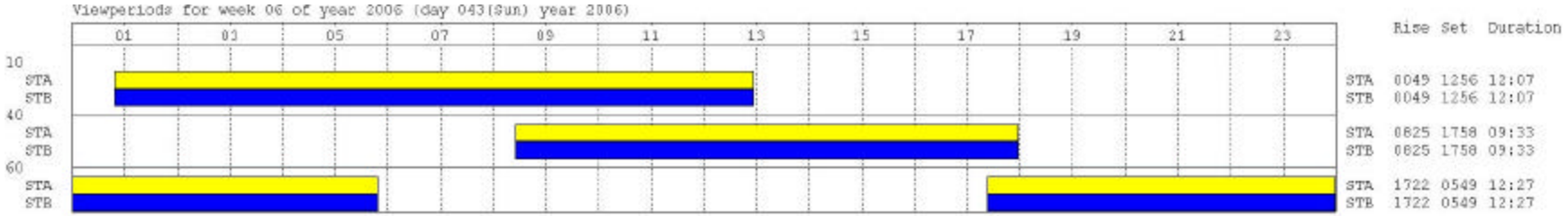
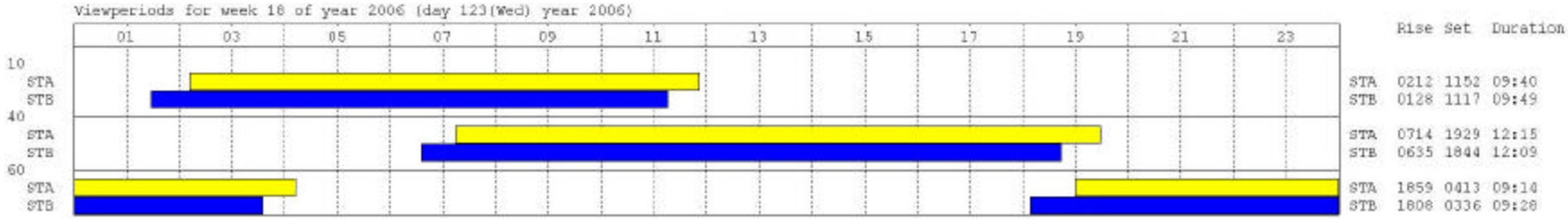
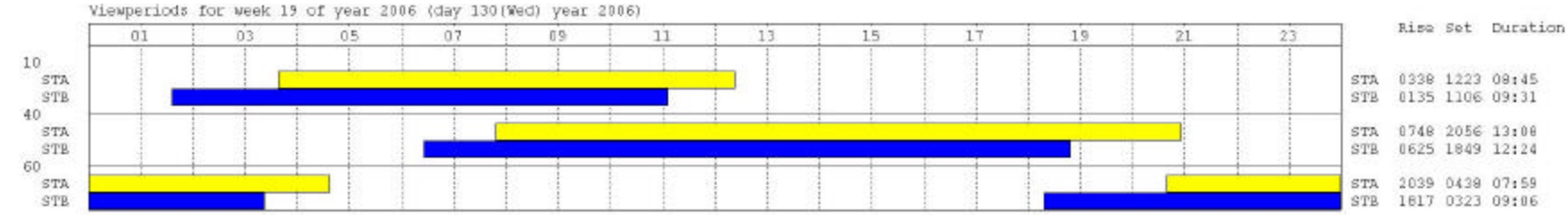


Figure -7

Week 18



Week 19



Week 20

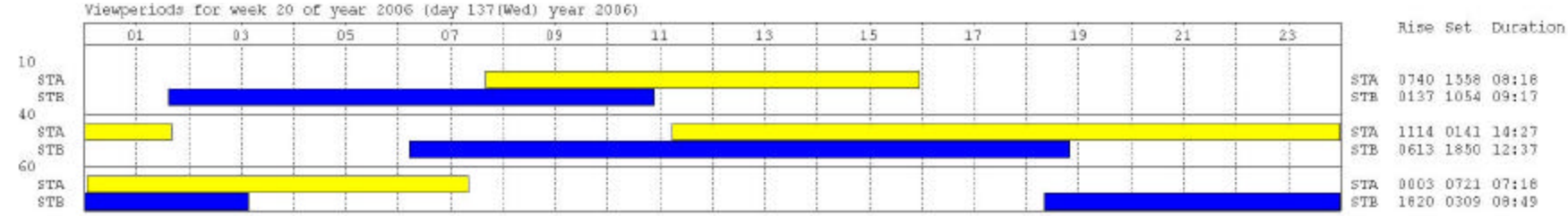


Figure-7 Continued

Week 21

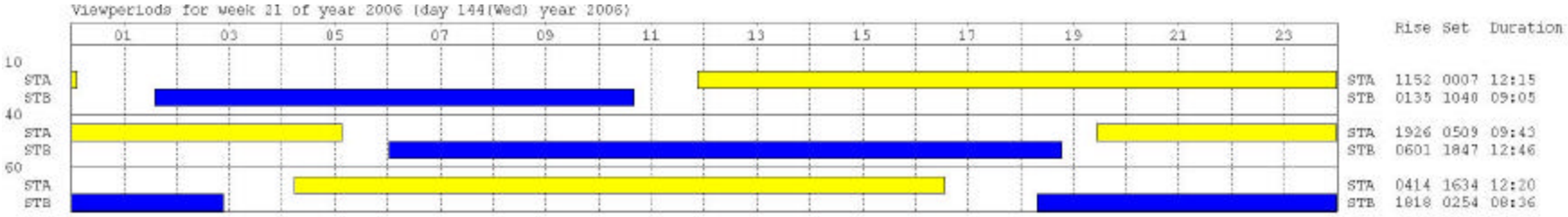


Figure-8

NOTE: STA is represented in YELLOW and STB is represented in BLUE. The projects in contention with STA and STB are represented in RED.

Week 6 of 2006

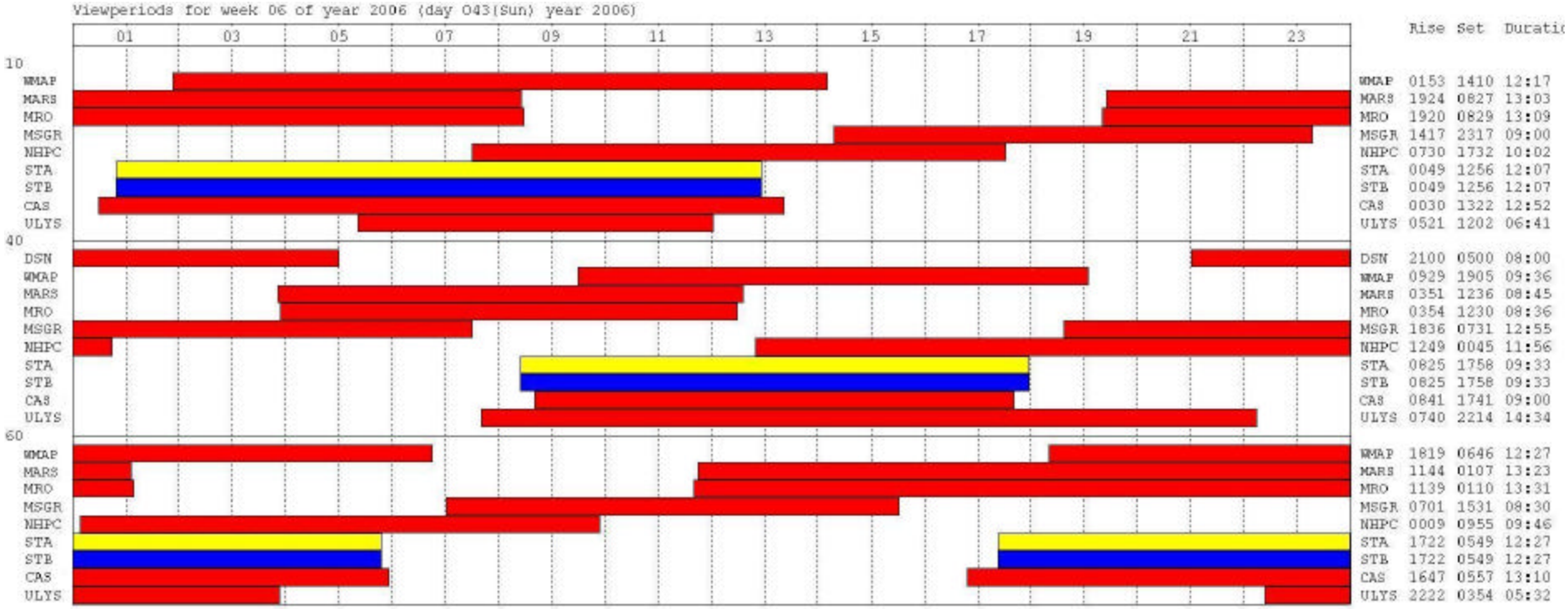


Figure-8 Continued

Week 42 of 2007

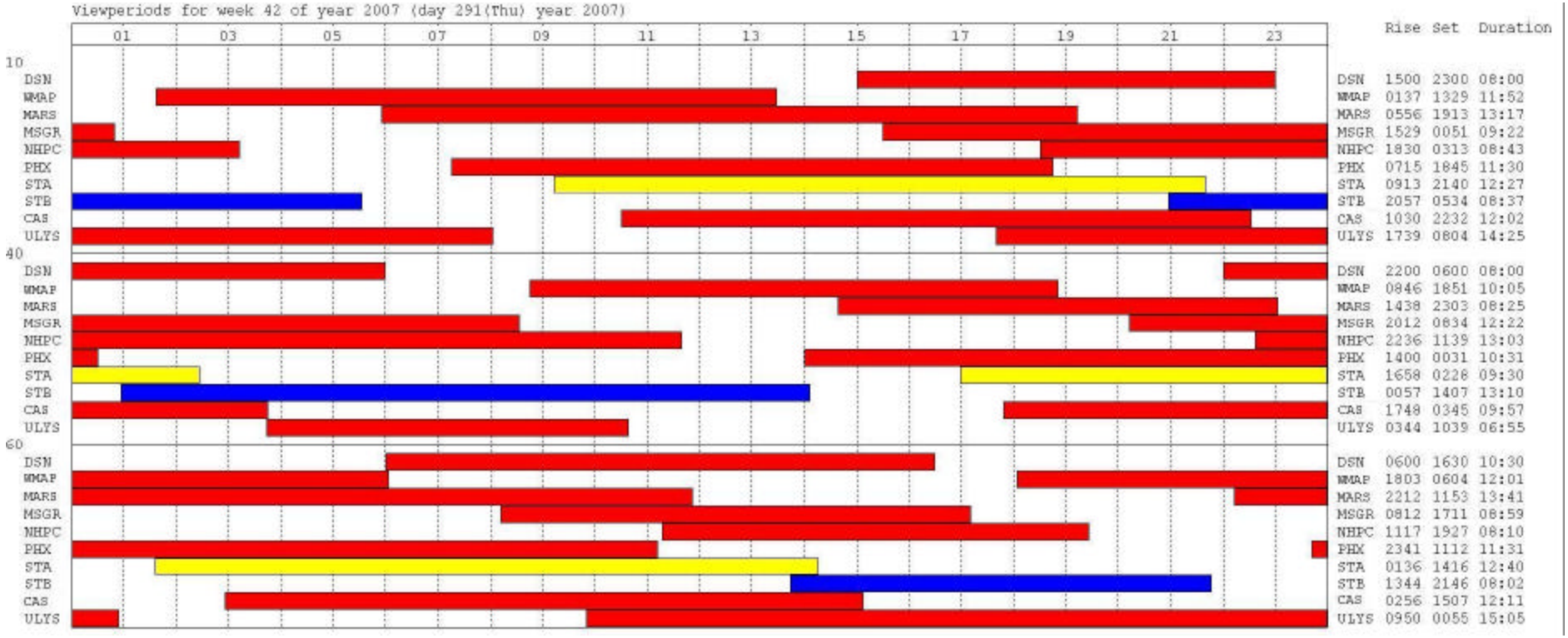
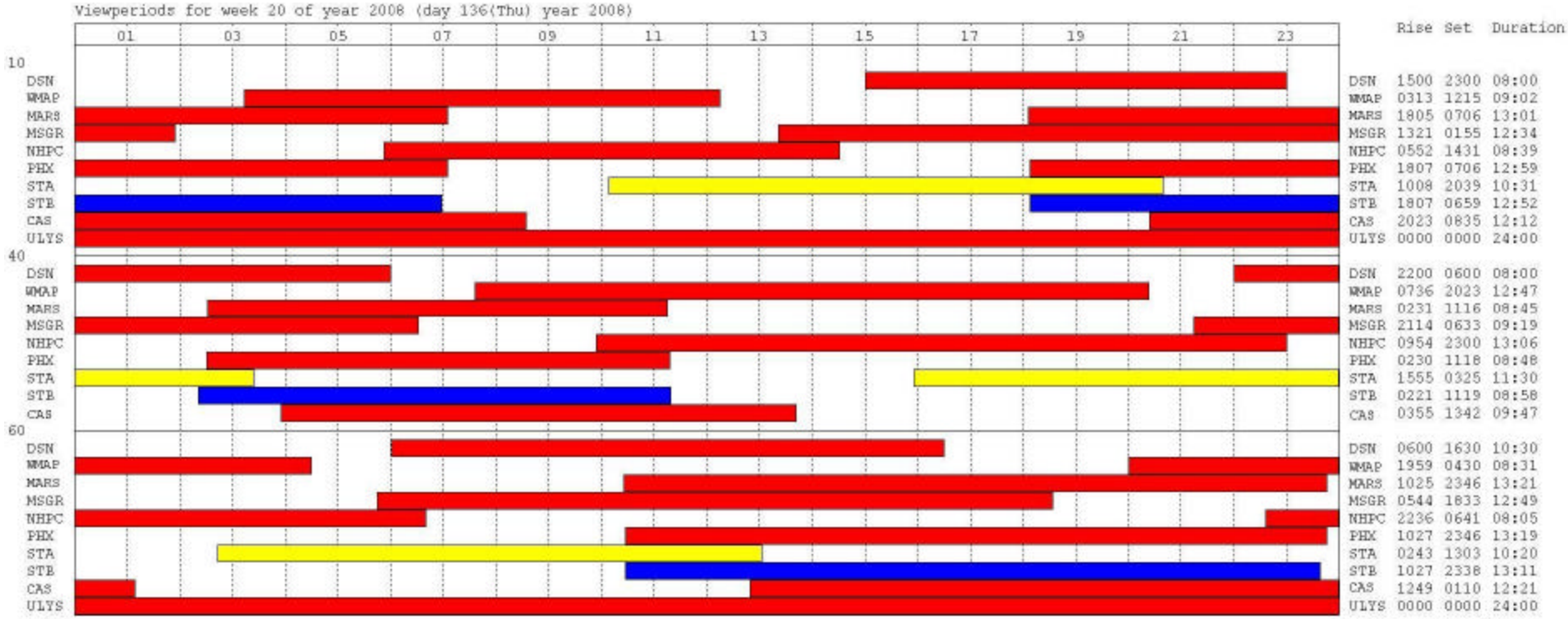


Figure-8 Continued

Week 20 of 2008



In conclusion, STEREO Ahead and Behind are forecast to receive 89 to 95 percent of their requested support from launch in week 6 of 2006 to end-of-mission in week 20 of 2008. Even though the launch slipped four months, the DSN supportability for STA and STB changed very little. The view periods will start with STA being in contention with the Mars projects from 50 to 100 percent and by the end-of-mission STB will be in contention with the Mars projects from 50 to 100 percent.

The results of this study are preliminary in that the network loading changes as requirements for planned missions are input and updated.

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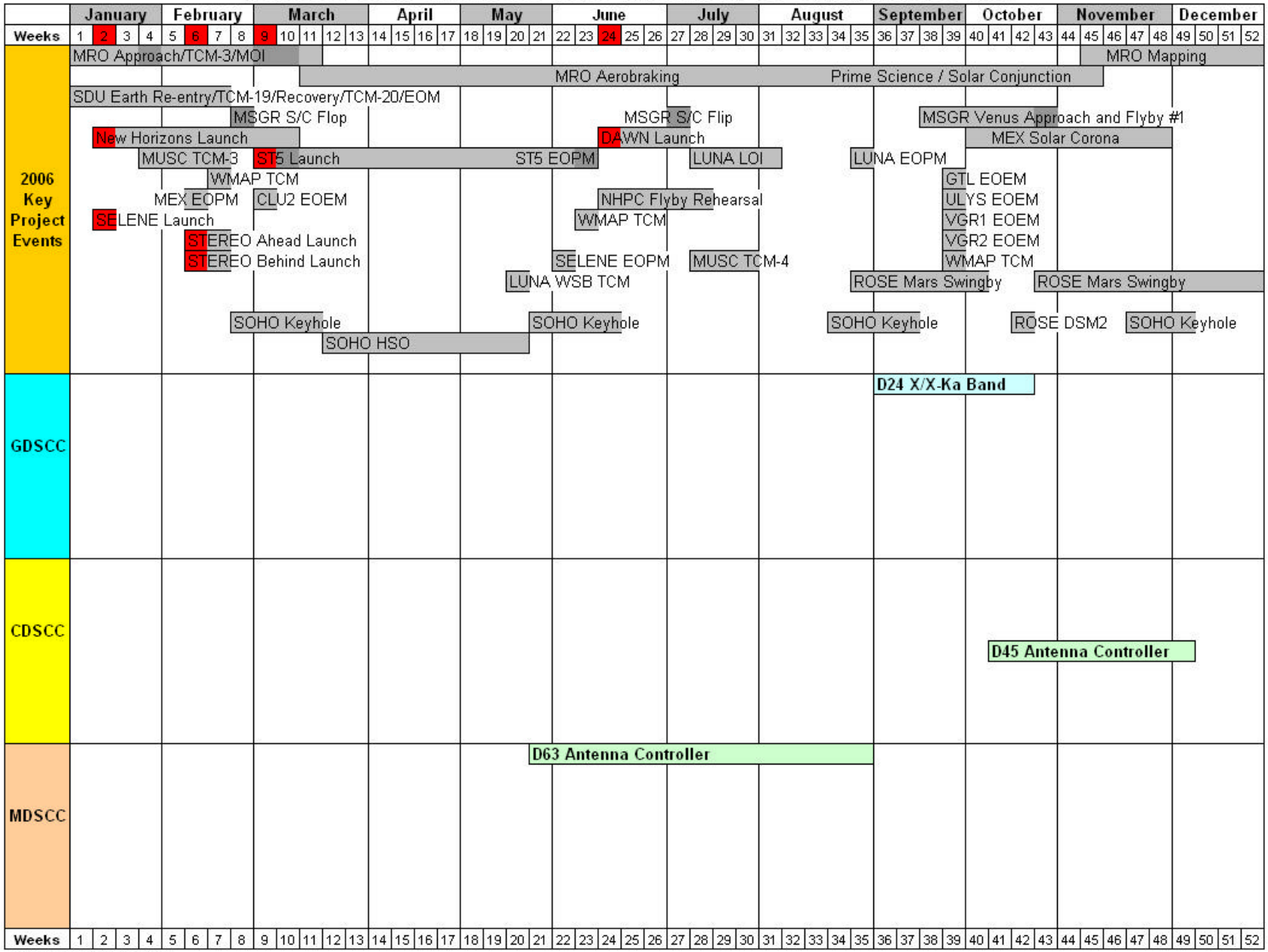
Attachments:

Major Events and Downtime Charts 2006 thru 2008

MAJOR DSN EVENTS AND ANTENNA DOWNTIMES 2006



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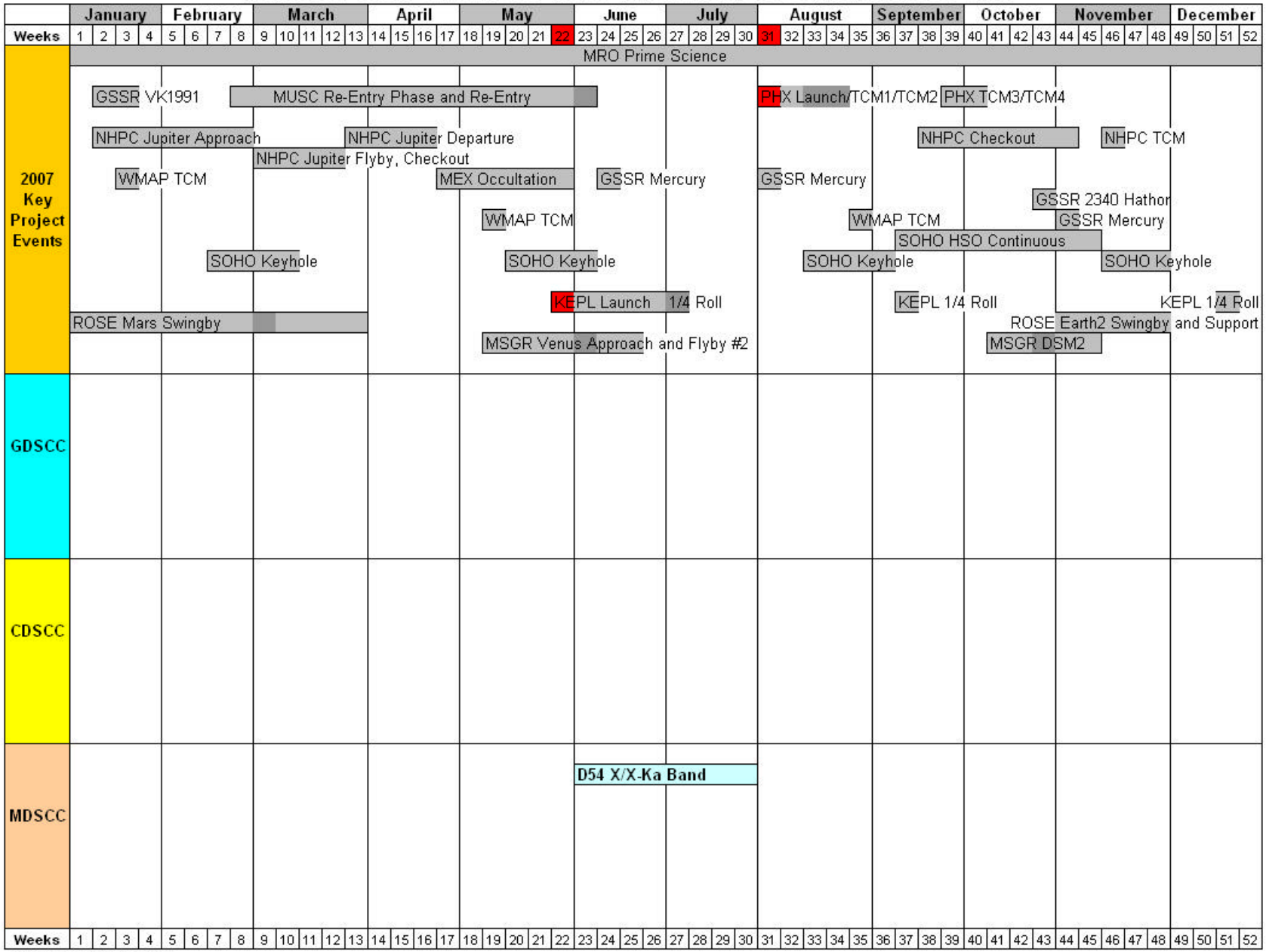
MAJOR DSN EVENTS AND ANTENNA DOWNTIMES 2007



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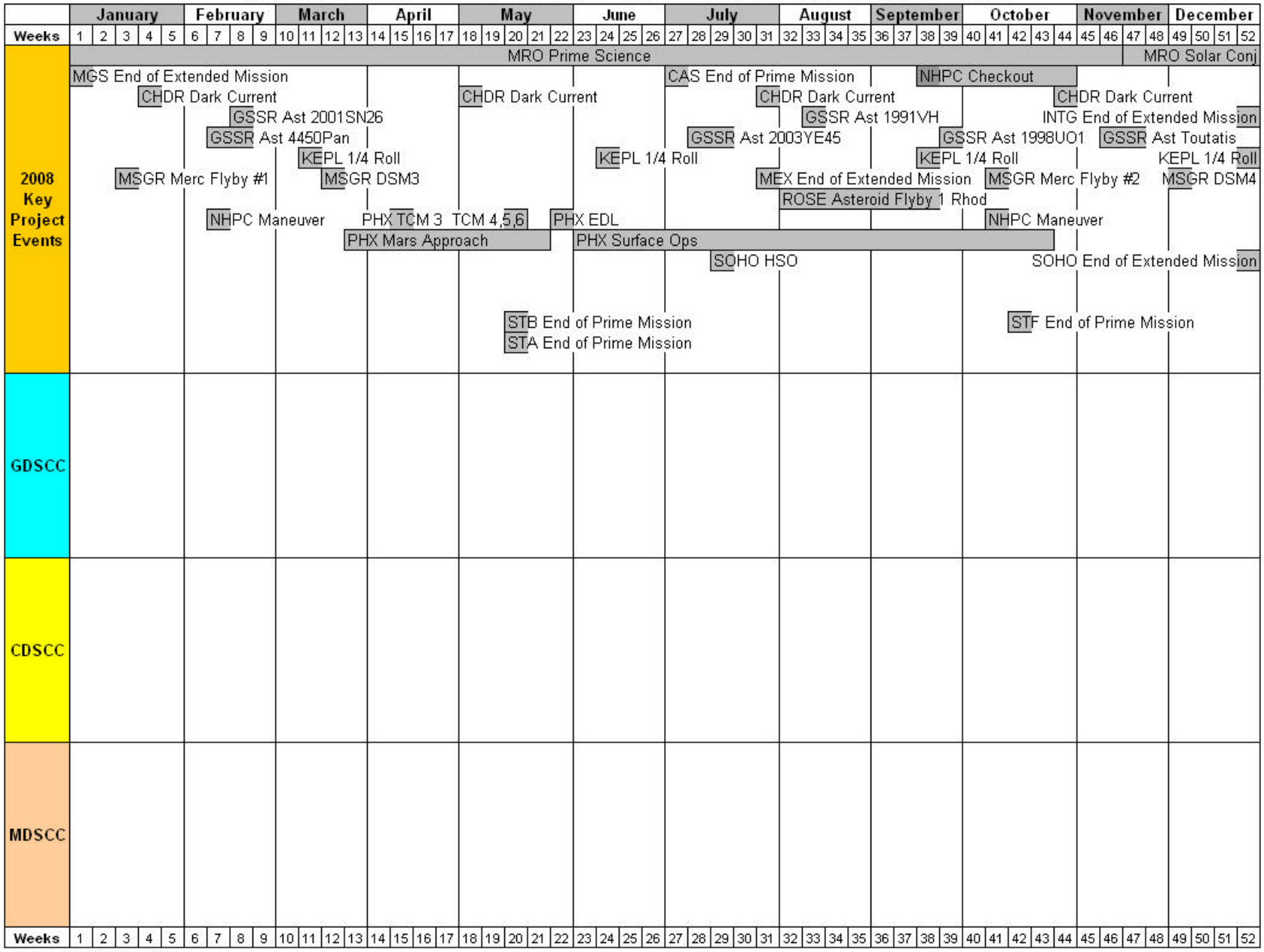
MAJOR DSN EVENTS AND ANTENNA DOWNTIMES 2008



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