

April 15, 2003

TO: G. Burke
FROM: A. Andujo
SUBJECT: Space Interferometry Mission (SIM) Loading Study

Loading Study Description

The Resource Allocation Planning and Scheduling Office (RAPSO) performed a loading study to determine the impact of the Space Interferometry Mission (SIM) tracking requirements on the Deep Space Network (DSN) and the ability of the DSN to support those requirements.

Analysis was accomplished using the FASTER (Forecasting and Scheduling Tool for Earth-based Resources) forecasting system, the Earth Trailing Orbit viewperiod, and the updated mission set database from the February 13, 2003 Resource Allocation Review Board (RARB). The draft RAPSO DSN User Future Mission Planning Set was not used. The Earth Trailing Orbit viewperiod is a generic viewperiod used by RAPSO to simulate the actual viewperiod of the mission.

Mission Summary

SIM will be an optical interferometer operating in an Earth-trailing solar orbit. In the reference launch scenario, the SIM spacecraft would be carried into orbit via the Space Shuttle, though other launch options are also being explored. Once deployed from the shuttle payload bay, initial checkout will take place. Next, SIM will gradually be boosted into an orbit about the Sun, via use of an Integral Propulsion Module (IPM). In its final orbit the spacecraft will slowly drift away from the Earth at a rate of approximately 0.1 AU per year, reaching a maximum communication distance of about 95 million kilometers (1 AU) after 5.5 years.

Mission Requirements

SIM mission requirements begin with Launch on December 31, 2009 and continue until the end of mission on June 30, 2020. The Project tracking requirements are divided into ten phases.

Mission Phases

Launch to Launch +30 days

The nominal launch day for the SIM is December 31, 2009. The Launch phase includes all support from launch through launch plus 30 days. Coverage requirements are for 21 eight-hour 34 meter subnet passes per week during this period (Week 53 2009 – Week 4 2010). Nominal antenna setup (precal) times of 30 minutes with a 15-minute tear-down (post cal) time were used. All Maneuvers during this phase (e.g., Trajectory Correction Maneuvers) are assumed to be covered within the stated tracking requirements for the phase. It was assumed that there is no requirement for use of the 26-meter subnet for acquisition aide.

Launch +30 days to Launch +6 months

Coverage requirements during this phase are for seven 8-hour 34 meter subnet passes per week during this period (Week 27 2010 – Week 5 2010).

Launch +6 months to Launch +3 years

Coverage requirements during this phase are for three 4-hour 34meter subnet passes per week during this period (Week 5 2010 – Week 52 2012).

Launch +3 years to Launch +4 years

Coverage requirements during this phase are for three 8-hour 34 meter subnet passes per week during this period (Week 52 2012 – Week 52 2013).

Launch +4 years to Launch +5 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and two 4-hour 70 meter subnet passes per week during this period (Week 52 2013 – Week 52 2014).

Launch +5 years to Launch +6 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and two 6.5-hour 70 meter subnet passes per week during this period (Week 52 2014 – Week 53 2015).

Launch +6 years to Launch +7 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and two 9-hour 70 meter subnet passes per week during this period (Week 53 2015 – Week 52 2016).

Launch +7 years to Launch +8 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and two 11-hour 70 meter subnet passes per week during this period (Week 52 2016 – Week 52 2017).

Launch +8 years to Launch +9 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and four 11-hour 70 meter subnet passes per week during this period (Week 52 2017 – Week 52 2018).

Launch +9 years to Launch +10.5 years

Coverage requirements during this phase are for two 4-hour 34 meter subnet passes per week and four 11-hour 70 meter subnet passes per week during this period (Week 52 2018 – Week 36 2020).

Tracking Support Assumptions

X-Band tracking is required from the 70 and 34-meter subnets. A minimum of 3 uplink passes per week are necessary in order to adequately maintain health and safety of the spacecraft.

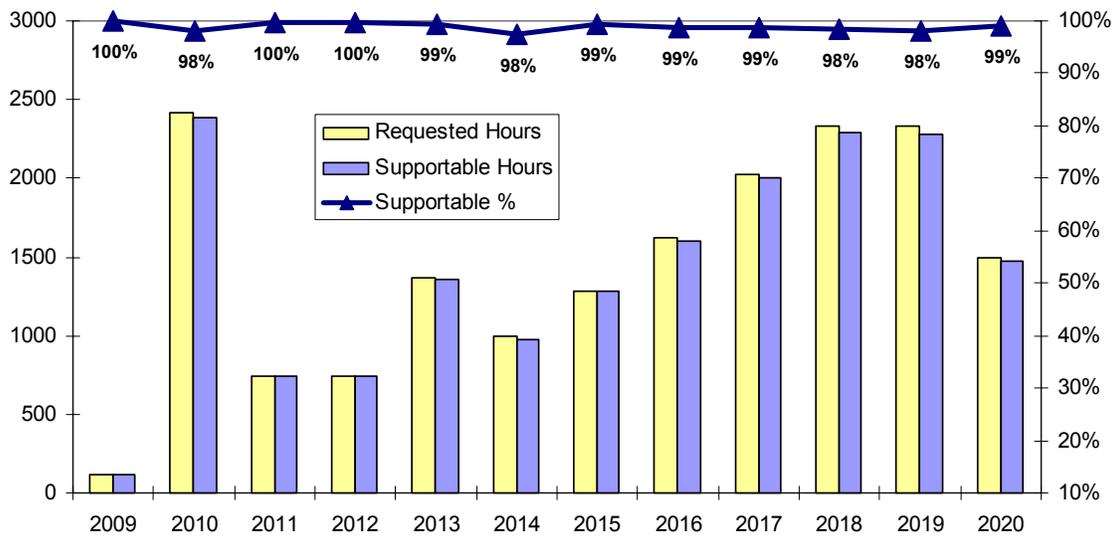
Assessment

This study addresses SIM’s tracking requirements for support on the 34 and 70-meter Subnets from Launch in 2009 until the end-of-mission in 2020.

Figure 2 illustrates the forecasted monthly supportable percentage of requested tracking time by year for the duration of the SIM mission and Total requested time contrasted with supportable time. SIM may expect to receive on average 98 to 100% of the time requested on the 34 and 70-meter Subnets at this time (April 2003).

Current analysis indicates that supportable tracking time is better than 98% of what SIM is currently requesting over the life of the mission (2009 – 2020). Tracking requirements of future missions that are not yet known may significantly reduce SIM’s expected tracking support as 2009 nears.

Figure 2: Space Interferometry Mission Forecast 2009 - 2020



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