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

Spitzer Mission Operation System Status

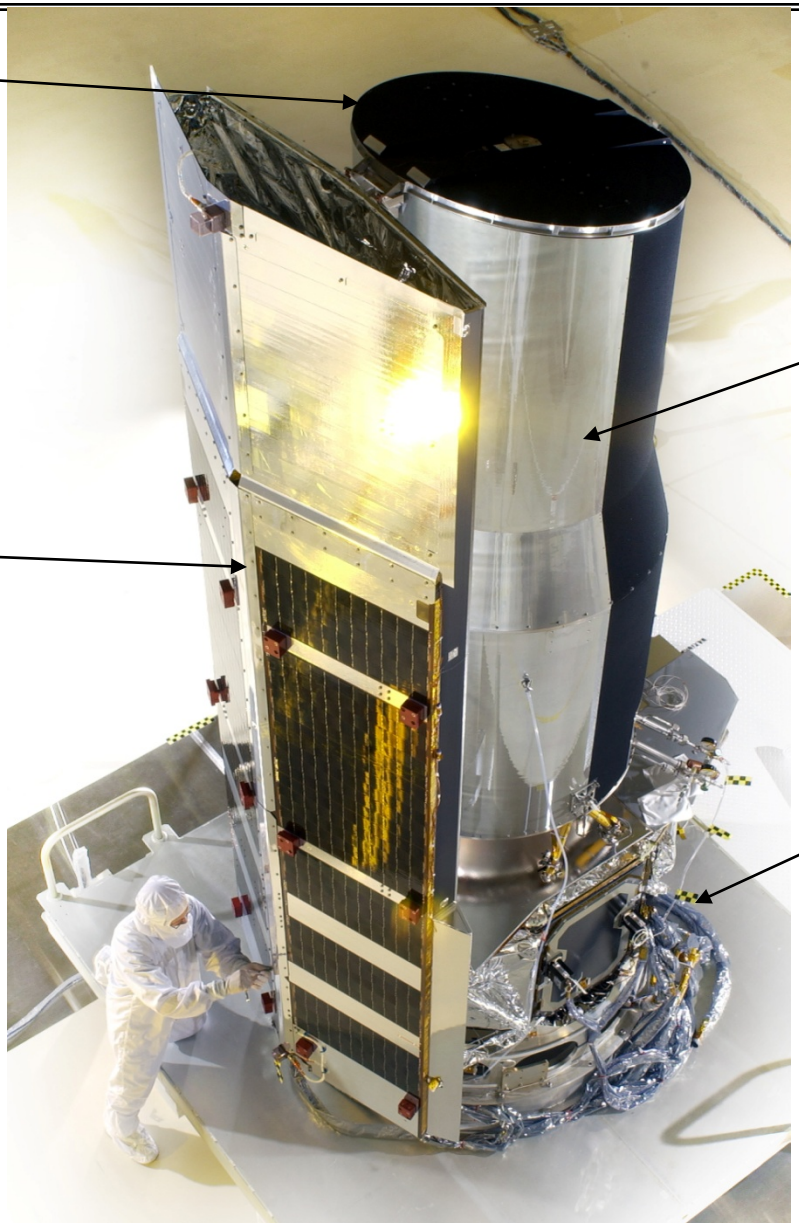
Joseph C. Hunt Jr.
Spitzer Deputy Mission Manger / Flight Director

Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109-8099 USA

Mission Overview

- The Spitzer Space telescope was launched on 25 August 2003 with a prime Cryogenic Mission Requirement of five years.
- The In Orbit Checkout (IOC) and Science Verification (SV) mission phases were conducted for a period of 90 days.
- The helium depleted on 15 May 2009, ending the prime mission and starting the Infrared Array Camera (IRAC) Warm Instrument Characterization (IWIC) followed by the extended mission.
- The Extended Warm Mission is approved for two years with a pending proposal for an additional two-year extension.

Spitzer Observatory



Spitzer Observatory Telescope

The primary mirror is 85 cm in diameter. It is made of beryllium and was cooled to between about 5.6 K and 12 K, depending on the instrument in use. The field-of-view angle of the telescope is 32′ (32 arcminutes). The focal length is 10.2 m. The total mass of the spacecraft at launch was 950 kg, including 50.4 kg of liquid helium cryogen.

Instruments

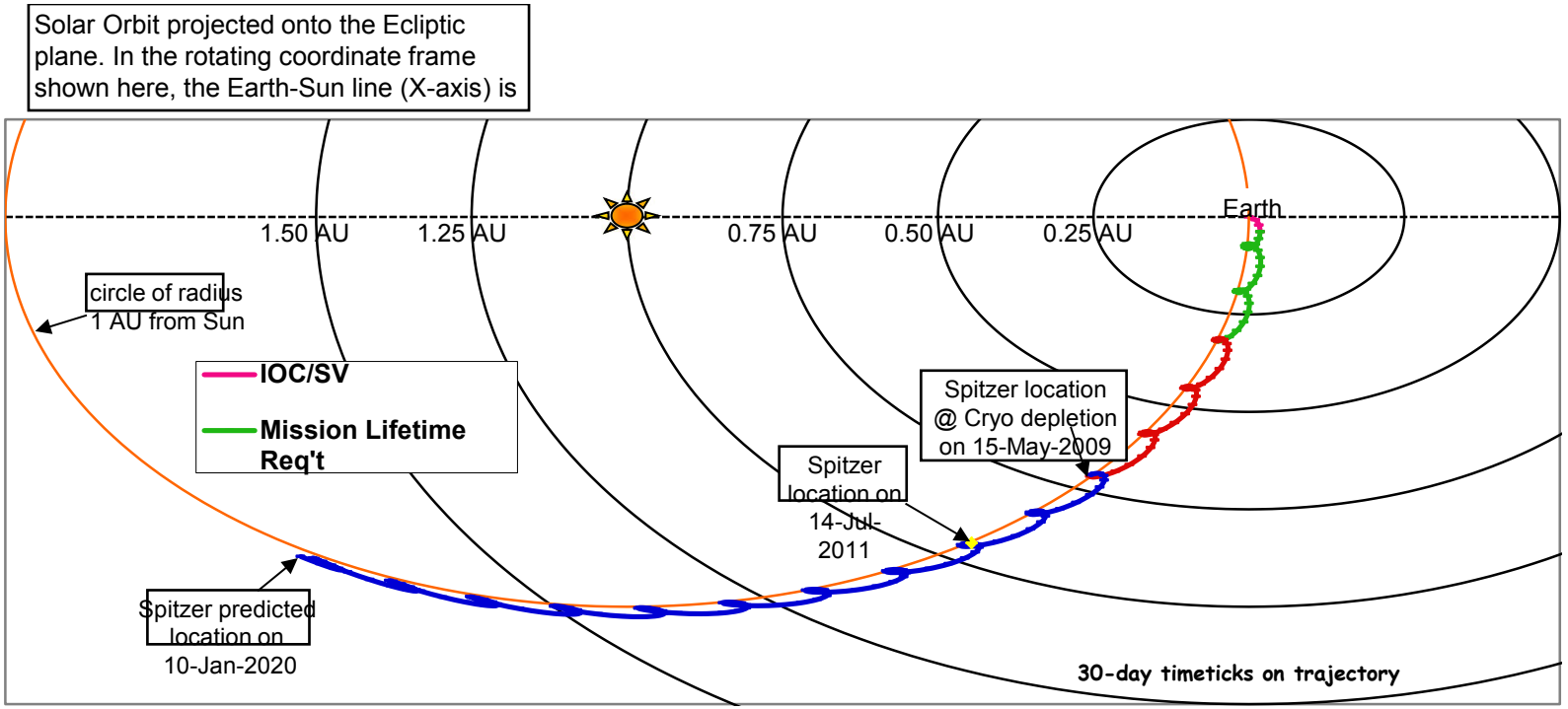
- Three science instruments
  - *IRAC – Infrared Array Camera*
    - Bands: 3.6 μm, 4.5 μm, 5.8 μm, and 8.0 μm
  - *MIPS – Multi-band Imaging Photometer*
    - Bands: 24 μm, 70 μm, and 160 μm
  - *IRS – Infrared Spectrometer*
    - Bands: 5.2 μm – 14.5 μm, 9.9 μm – 19.6 μm, 14.0 μm – 38.0 μm, and 18.7 μm – 37.2 μm
- In the Cryogenic Mission, only one instrument was on at a time for a sequence duration of one to three weeks.
  - *Primary mirror operates between 5.6 K and 12 K.*
- In the extended Warm Mission, only two bands of IRAC, 3.6 μm and 4.5 μm, will produce valid science data.
  - *Primary mirror operates at ~26 K*

(Current Orbit Information)

- Spitzer is in a heliocentric, Earth-trailing orbit. It follows the Earth around the Sun. Its orbit is slightly more elliptical than the Earth's, and most of the time it is farther away from the Sun than the Earth is, so it slowly recedes from Earth at about 0.1 AU/yr.

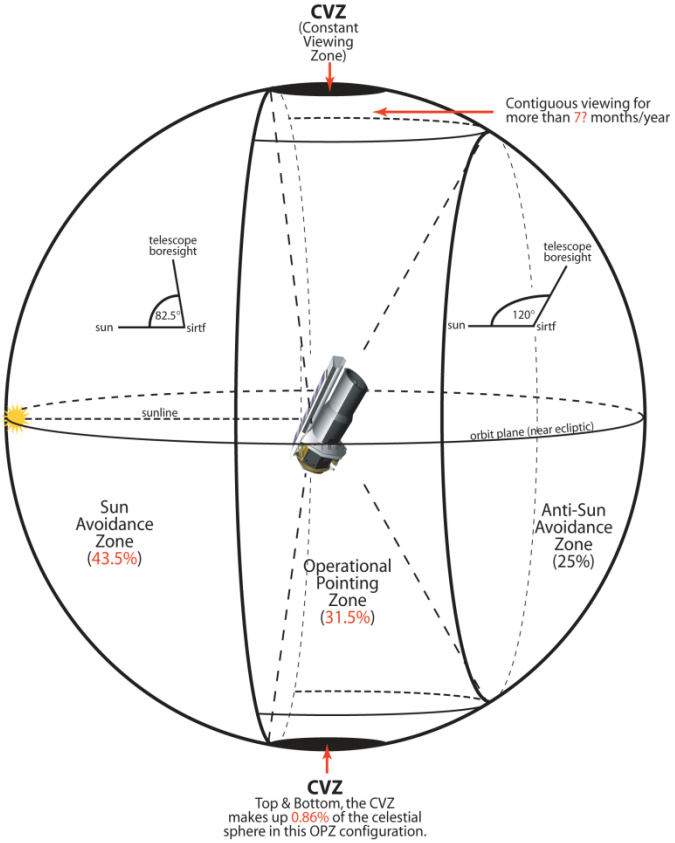
  – *Current Orbit Information (Geocentric)*
    - ***Distance = 142,894,314 km (~0.955 AU)***
    - ***One-way light time = 476.60 s (~7m:57s)***
    - ***Right Ascension (EME J2000) = 142.04 deg***
    - ***Declination (EME J2000) = 13.77 deg***

Current Orbit Information



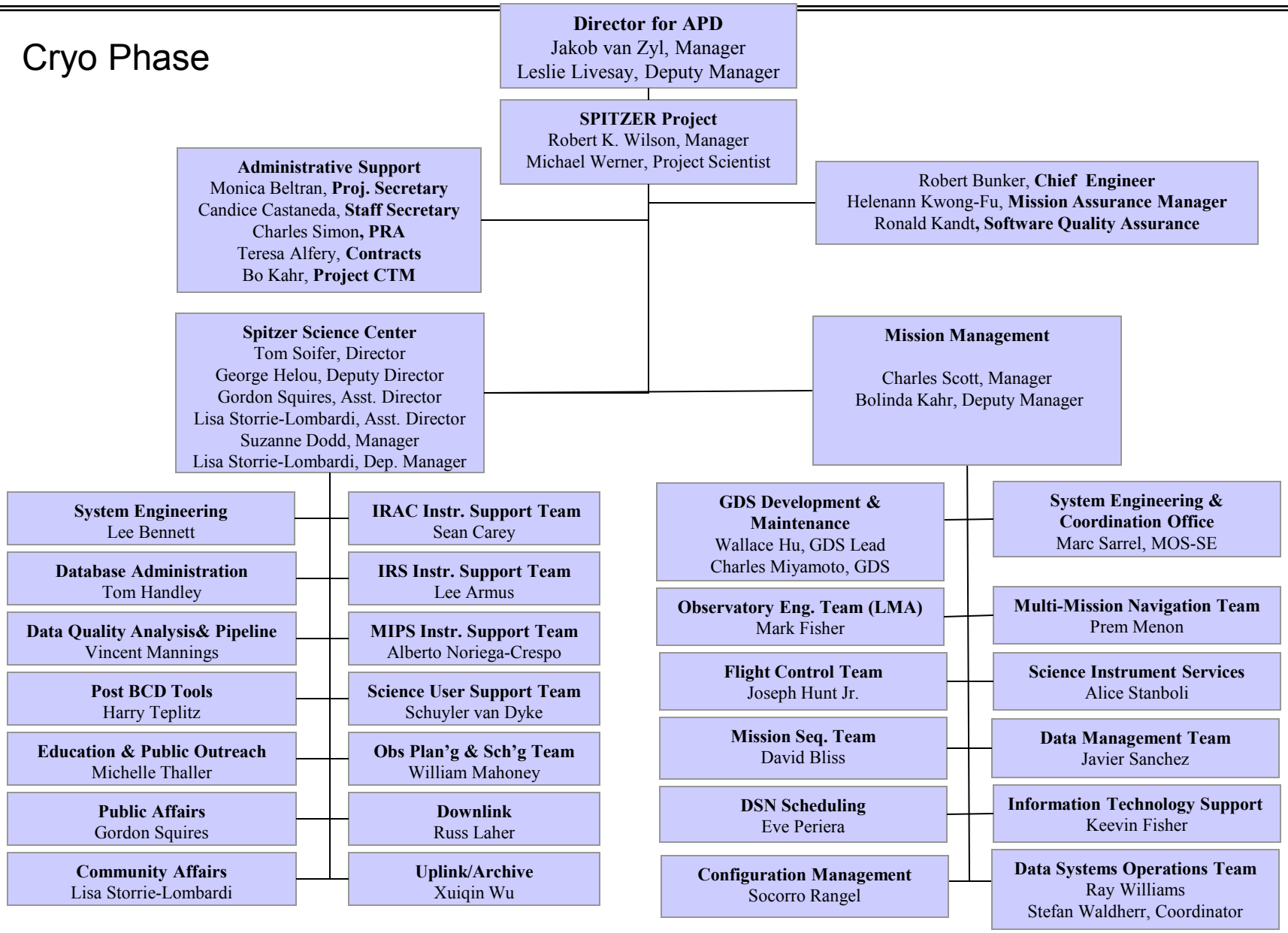
Operational Pointing Zone

- The spacecraft uses its on-board pointing control system to shade itself with its solar arrays for reasons of thermal control. As such, at any given time, it can see only about 31.5% of the full sky. This area is called the Operational Pointing Zone (OPZ). There are two zones of the sky around the ecliptic poles that are always in view. Objects in the ecliptic plane are in view for two periods of forty days each per year.



SPITZER Project Organization

Cryo Phase



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Spitzer Space Telescope

SPITZER Project Organization

Warm Mission

Director for APD
Jakob van Zyl, **Manager**
Dave Gallagher, **Deputy Manager**

SPITZER Project
Suzanne Dodd, **Manager**
Michael Werner, **Project Scientist**

Administrative Support
Monica Beltran, **Proj. Secretary**
Charles Simon, **PRA**
Teresa Alfery, **Contracts**
Bolinda Kahr, **Project CTM**

Robert Bunker, **Chief Engineer**
Jose Macias, **Mission Assurance Manager**

Spitzer Science Center
Tom Soifer, **Director**
George Helou, **Deputy Director**
Lisa Storrie-Lombardi, **Manager**
Gordon Squires, **Asst. Director for Public Affairs**
Lisa Storrie-Lombardi, **Asst. Director for Community Affairs**

Mission Management
Bolinda Kahr, **Manager**
Joseph Hunt, **Deputy Manager & Flight Director**

System Support
John Stauffer, System Scientist
Lisa Rebull, Archive Scientist

IRAC Inst. Support Team
Sean Carey, **Lead**
Jason Surace. **Deputy**

System Engineering, I & T Cryogen Mission Closeout
Lee Bennett, **Lead**

Observatory Scheduling Team Planning
William Mahoney, **Lead**
Lisa Garcia, **Deputy OPST**
Tom Handley, **Deputy DBA & PO**
Vince Mannings, **Deputy DQA**

EPO/Public Affairs
Gordon Squires, **Lead**

Science Support
Lisa Storrie-Lombardi, **Lead**
Schuyler Van Dyk, **Deputy User Support**
Vandana Desai, **Deputy POST BCD Tools**
Harry Teplitz, **Deputy Source List**

Information Technology Support
Keevin Fisher, **Lead**

DSN/Mission I/F Manager
Richard Benson
DSN NOPE
Al Hewitt

GDS Dev & Maintenance
Charles Miyamoto, **Lead**

Sys Engineering & Coordination
Joseph Hunt, **MOS-SE**
Socorro Rangel, **Configuration Mgmt**

Observatory Eng. Team (LMA),
Mark Fisher, **Lead**

Multi-Mission Navigation Team
Try Lam

Flight Control Team
Joseph Hunt, **Lead**

Science Instrument Services
Alice Stanboli

Mission Seq. Team
David Bliss, **Lead**

Data Management Team
Javier Sanchez

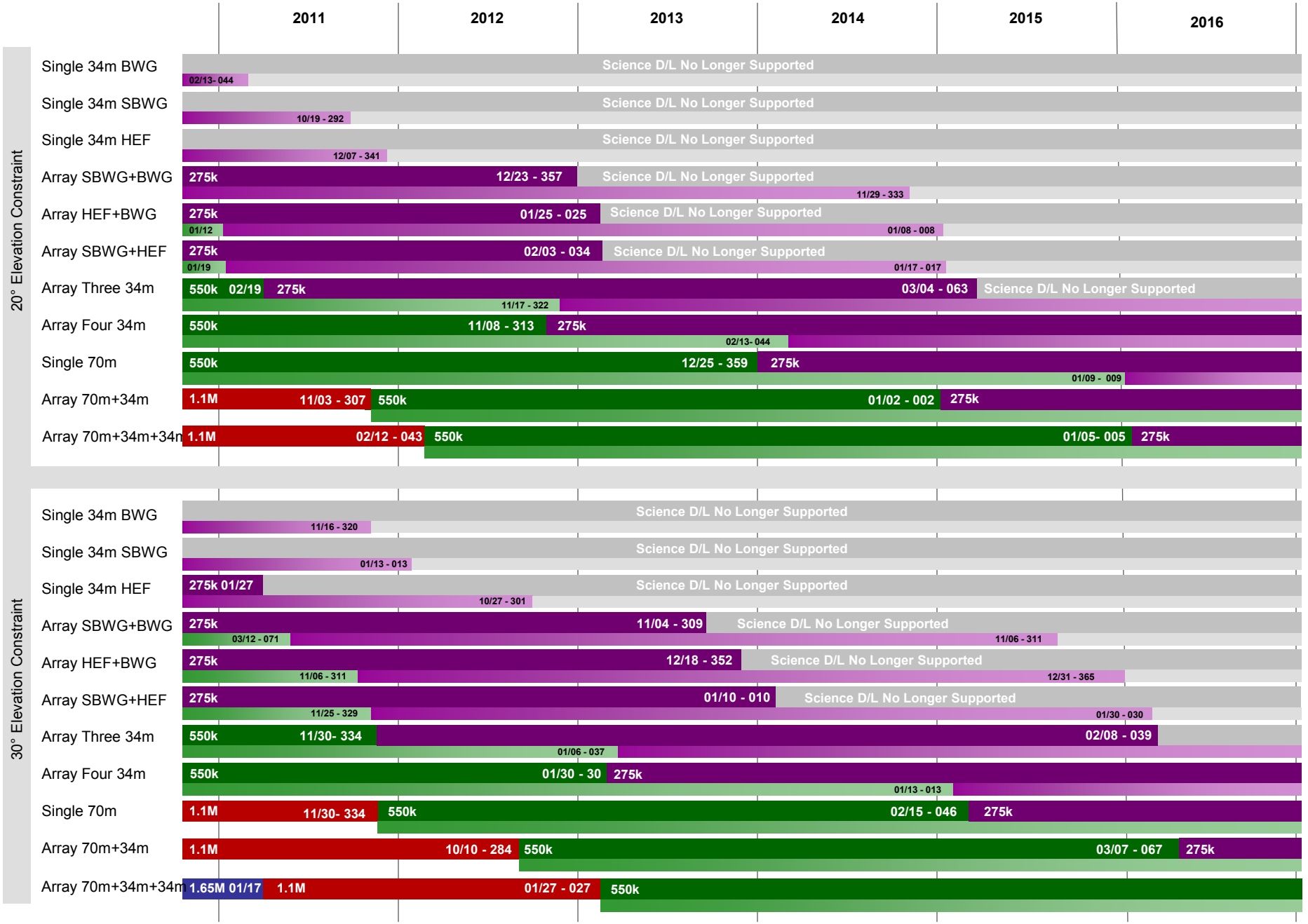
MRSS/DSN Scheduling
Jacqueline Jai

Data Systems Operations Team
Ray Williams (LMIT)

SPITZER DOWNLINK RATE CUTOFF DATES

Single SSPA Operations

NOTE: Thick bar predicts for 550 kbps and 275 kbps were based off of 7 1/2 Encoding, thin bar predicts were based off of 15 1/6 Encoding



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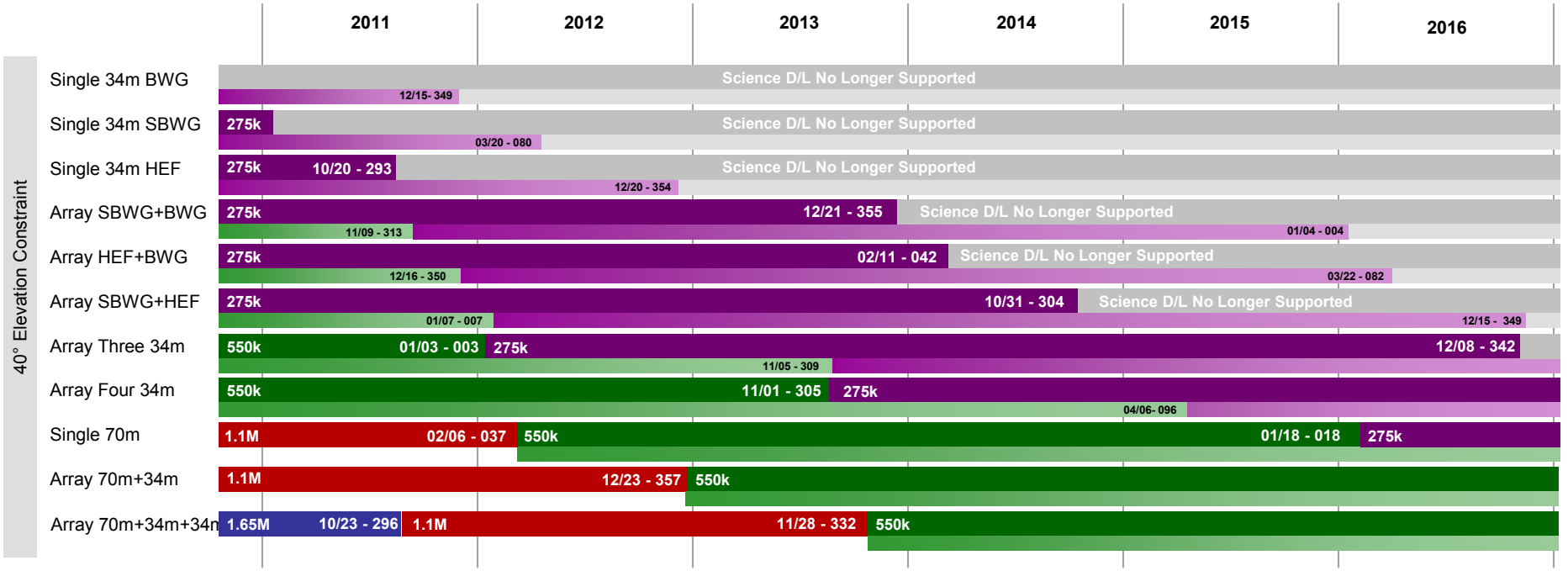

DSN Scheduling Rules

Nominal Tracking
(DOY 298/2010-DOY365/2010)

- DOY 298-365 2010 corresponds to 10/25/10-12/31/10
- Antenna requirement: Standalone 70m
  - *View period constraints: Entire track must be in 20 degree view*
- Track duration: 3 hrs (BOT-EOT)
- Gap requirement: BOT to BOT gaps to be within 20-28 hrs

DSN Scheduling Rules

Nominal Tracking
(DOY 365/2010-DOY 276/2011)

- DOY 365 2010-DOY 276 2011 corresponds to 12/31/10-10/03/11
- Antenna requirement: Either standalone 70m or 70/34m array
- View period constraints:
  - *Standalone 70m must be entirely in 30 degree view*
  - *70/34m array must be entirely in 20 degree view*
- Track duration: 3 hrs (BOT-EOT)
- Gap requirement: BOT to BOT gaps to be within 20-28 hrs

DSN Scheduling Rules

Prime Shift Requirement

- Prime shift tracks are required to perform routine spacecraft maintenance activities
- Prime shift is defined as 7:00am-5:00pm pacific local time
- A minimum of 1 day shift per week (Mon-Thurs) pending DSN constraints
  - *i.e. If our view period does not allow prime shift, we will track off-prime shift rather than skip a track*
- Prime shift track must not occur during weekly sequence transitions

Summary

- **Observatory Status**
  - *All Systems (Including Science) Are Functioning Exceptionally Well*
- **DSN / Spitzer Status**
  - *Actively working MMC mitigations for missed pass*
    - Use Express Packet Acknowledgement Process (PAP) to mitigate data volume on MMC during the pass (i.e. acknowledge data in near real-time)
    - Use dial tone to expand data playback by 7 minutes

DSN PERFORMANCE HAS BEEN OUTSTANDING – THANKS FOR ALL THE HARD WORK AND DEDICATION

Orion's Dreamy Stars

A colony of hot, young stars is stirring up the cosmic scene in this new picture from NASA's Spitzer Space Telescope. The image shows the Orion nebula, a happening place where stars are born. The young stars dip and peak in brightness due to a variety of reasons. Shifting cold and hot spots on the stars' surfaces cause brightness levels to change, in addition to surrounding disks of lumpy planet-forming material, which can obstruct starlight. Spitzer is keeping tabs on the young stars, providing data on their changing ways.

The hottest stars in the region, called the Trapezium cluster, are bright spots at center right. Radiation and winds from those stars has sculpted and blown away surrounding dust. The densest parts of the cloud appear dark at center left.

This image is a combination of data from Spitzer and the Two Micron All Sky Survey (2MASS). The Spitzer data was taken after Spitzer's liquid coolant ran dry in May 2009, marking the beginning of its "warm" mission. Light from Spitzer's remaining infrared channels has been color-coded: 3.6-micron light is green and 4.5-micron light is red. 2MASS 2.5 micron light is blue.

ACKNOWLEDGEMENTS

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Back-up Material

Mission Phases

Phase	Start and End Dates
Launch	2003-08-25
IOC and SV	2003-08-25 / 2003-12-01
Prime Cryogenic	2003-12-01 / 2009-05-15
Planned Standby	2009-05-15 / 2009-05-16
IWIC Overall	2009-05-16 / 2009-07-27
IWIC Post-Anomaly Only	2009-06-18 / 2009-07-27
Extended Warm Approved	2009-07-27 / 2011-12-31
Extended Warm Proposed	2012-01-01 / 2013-12-31

Back-up material

- In 1998, the science objectives for the Spitzer mission were defined as:
  - *Deep surveys of oldest galaxies*
  - *Evolution and structure of ultra-luminous galaxies and quasars*
  - *Search for Brown Dwarfs*
  - *Evolution of stellar disks and planetary systems*

- For the extended warm, IRAC-only mission, the new science objectives are:
  - *Study properties of extra-solar planets*
  - *Study galaxies during the first one billion years after the Big Bang*
  - *Complete census of the galaxy for young stars*
  - *Determine cosmic distance scale in the local universe*