SDO EVE Space Weather Workshop

EVE Operations

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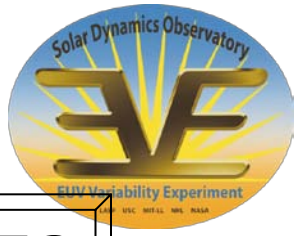
Outline

- Interface Overview
- EVE Operating Modes
- MEGS B Flare Campaign
- Spacecraft Maneuvers
- Science data interruptions

EVE-SOC Interface Overview

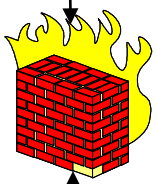


SDO in Geosynchronous Orbit

S-band

Ka-band

MOC at GSFC



DDS at WSC

RT HK (S-band)
Commands
Daily HK file
Planning data
Retransmissions

RT HK (S-band)

near-RT science data files (Ka-band)
Handshake files
Retransmitted science data files

EVE SOC at LASP

SPOC

ENG Data

IOC

RT HK

Science Data Products

WWW

USC

EVE Operating Modes

Channel	Nominal Science Mode	Modified MEGS B Operations	Daily Calibration	Weekly Calibration
ESP	•Primary filter •Cal reference off	Remain in nominal science	•140 seconds •Filters: Backup primary, Dark	•420 seconds •Filters: Backup primary, Scattered Light, Dark, Tertiary primary •Cal reference
MEGS A / SAM (shared CCD)	•Primary filter •LED off	Remain in nominal science	•600 seconds •MEGS A: Dark, 2nd order, Backup primary •SAM: Dark •Blue LED level 8	•1390 seconds •MEGS A: Tertiary primary, Dark, Backup primary •SAM: Dark, Backup primary •Blue LED levels 5 and 8
MEGS B / MEGS P (shared filter)	•Dark filter •LED off •MEGS P cal reference off	•Primary filter •LED off •MEGS P cal reference off	•600 seconds •Filters: Dark, 2nd order, Backup primary •Blue LED level 8 •Violet LED level 8	•1580 seconds •Filter: Dark •Blue LED levels 5 and 8 •Violet LED levels 5 and 8 •MEGS P cal reference
Cadence	Continuous – except when in daily or weekly cal	Daily •5 min/hour •3 hours/day (5:50 UTC)	Mon. – Sat. 2 hours later each day *Same note as Weekly Calibration	Sunday 12:56 UTC *Note: only 1 channel is out of nominal science at a time

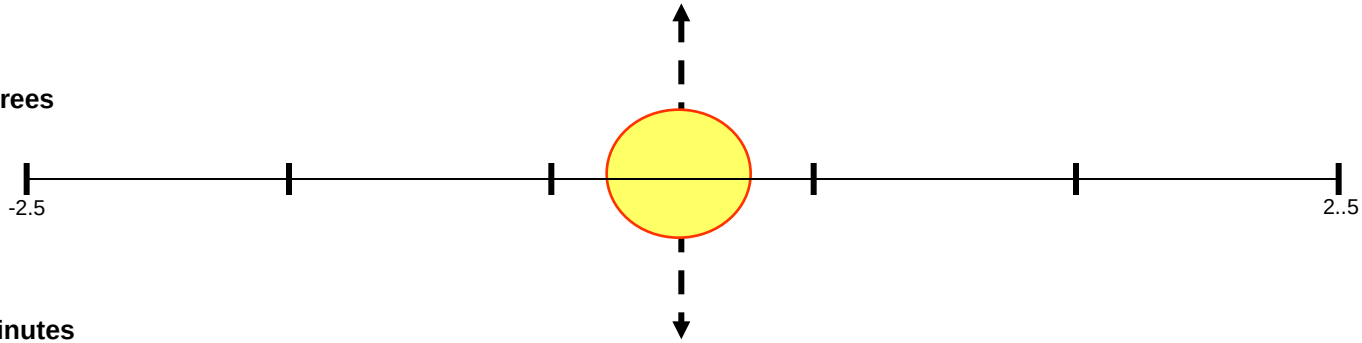
MEGS B Flare Campaign

- Campaign decision made by 14:45 UTC during work days (no weekends/holidays)
  - Performed if scientists determine that there is a high probability of a solar flare (M-class or above)
  - Commands sent during the EVE command window (15:00 – 17:00 UTC)
- MEGS B in primary filter for 24 hours (16:00 – 16:00 UTC)
- Daily calibration skipped during time frame (all components in nominal science)
- Limited to 1 campaign per month
  - Controls MEGS B degradation
- No MEGS B flare campaigns to date

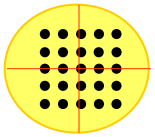
Instrument Calibration Maneuvers

Solar Disk (Reference)
(Radius 16 arcminutes)

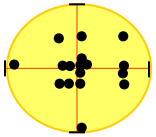
EVE Cruciform +/- 2.5 degrees
200 steps
8 hours, 49 minutes
Every 3 months
ACS: Inertial mode
Slew: SNR Delta



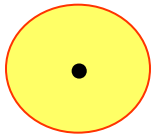
EVE FOV Map +/- 10 arcminutes
25 steps
1 hour 31 min. Every 3 months
ACS: Inertial mode
Slew: SNR Delta



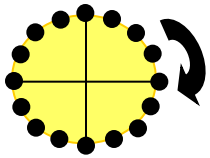
HMI/AIA Flat Field +/- 15 arcminutes
20 steps
2 hours 50 min. Every 6 months
ACS: Inertial mode
Slew: SNR Delta



GT Calibration +/- 30 arcseconds
20 steps
1 hour 45 min. Every month
ACS: Science mode
Slew: pitch/Yaw biases



HMI Roll 360 degrees
16 steps
6 hours 50 min. Every 6 months
ACS: Science mode
Slew: SNR Delta



Planned Interruptions to Science Data

- Eclipses
  - There are two eclipse seasons per year (around equinoxes)
    - Seasons last 22 days each
    - 1 eclipse per day (occur between 06:00 and 08:00 UTC)
      - Maximum eclipse period is 72 minutes
    - 1 hour recovery time following eclipse for EVE spectrum (thermal recovery)
- CCD bake out
  - Mitigate MEGS B degradation
  - Loss of data on both CCDs during the bake out
    - MEGS A / SAM (shared CCD)
    - MEGS B
  - Planned during eclipse season to minimize data loss
    - Frequency and duration are TBD based on results of Sept. 23 – 27 bake out
  - ESP remains in science mode
- Instrument calibration maneuvers
- Station keeping (thruster) maneuvers

Unplanned Interruptions to Science Data

- Science band downlink interruption
  - High winds at antenna
  - Rain or clouds above antenna (attenuates Ka-Band)
- Network or computer issues (impacts availability of near real-time space weather data)
  - Network problems between MOC and EVE SOC
    - Forwarding of real-time data to Science Data Processing impacted
  - Computer problems with EVE operations computer, science data processing computers or web servers

(Planned) Science Data Gaps Since May 1st

- EEPROM burn (EVE power cycled)
  - May 11th
- Station keeping maneuvers
  - May 19th
  - Aug. 25th
- CCD bake out (MEGS A, MEGS B, MEGS P, SAM)
  - June 16 – 18th
  - Sept. 23 – 27th
- Instrument calibration maneuvers
  - July 14th (EVE cruciform)
  - July 15th (HMI/AIA flat field / EVE FOV)
- MEGS B special test (power off for 36 hours)
  - July 28 – 30th
- Eclipse season
  - Sept. 15th – Oct. 7th

Web Tools

- Planning summary
  - Working on a web interface
  - View planned data outages

EVE Planning Summary

[show] EVE MegsBEvenHour
[show] EVE MegsBOddHour
[show] EVE Normal Science

Show All | Hide All

From 2010/277-00:00:00 to 2010/284-00:00:00

Success | Failure | Unknown/Indeterminate

337 activities/events were found. 22 activities/events are shown.

Instrument	Start Time	Stop Time	Activity	Parameters
EVE	2010/277-01:00:00.0	2010/277-01:31:10.0	Daily Calibration [info]	
EVE	2010/277-06:00:09.0	2010/277-06:53:49.0	Eclipse Calibration [info]	
Events	2010/277-06:00:09.0	2010/277-06:53:49.0	Eclipse [info]	
EVE	2010/278-03:00:00.0	2010/278-03:31:10.0	Daily Calibration [info]	
EVE	2010/278-06:01:45.0	2010/278-06:49:12.0	Eclipse Calibration [info]	
Events	2010/278-06:01:45.0	2010/278-06:49:12.0	Eclipse [info]	
EVE	2010/279-05:00:00.0	2010/279-05:31:10.0	Daily Calibration [info]	
EVE	2010/279-06:04:20.0	2010/279-06:43:40.0	Eclipse Calibration [info]	
Events	2010/279-06:04:20.0	2010/279-06:43:40.0	Eclipse [info]	
EVE	2010/280-05:00:00.0	2010/280-05:31:10.0	Daily Calibration [info]	
EVE	2010/280-06:08:43.0	2010/280-06:36:22.0	Eclipse Calibration [info]	
Events	2010/280-06:08:43.0	2010/280-06:36:22.0	Eclipse [info]	
EVE	2010/280-10:15:01.0	2010/280-13:55:00.0	MegsBScience [info]	
Events	2010/280-10:20:01.0	2010/280-13:44:33.0	FOV obstruction [info]	name = Moon
EVE	2010/280-11:16:36.0	2010/280-12:22:24.0	Eclipse Calibration [info]	
Events	2010/280-11:16:36.0	2010/280-12:22:24.0	Eclipse [info]	
EVE	2010/281-05:50:00.0	2010/281-08:55:00.0	MegsBScience [info]	
EVE	2010/281-09:00:00.0	2010/281-09:31:10.0	Daily Calibration [info]	
EVE	2010/282-05:50:00.0	2010/282-08:55:00.0	MegsBScience [info]	
EVE	2010/282-11:00:00.0	2010/282-11:31:10.0	Daily Calibration [info]	
EVE	2010/283-05:50:00.0	2010/283-08:55:00.0	MegsBScience [info]	
EVE	2010/283-12:56:00.0	2010/283-13:49:00.0	Long Integration Calibration [info]	

Summary

- Schedule operating modes to maximize nominal science data
- Reduced MEGS B science mode to mitigate degradation issue
- Working on web-based tools to account for planned data losses