

HOP 130:
Multi-temperature Full Disk Slot Scans
Pointings and Times

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1. Introduction

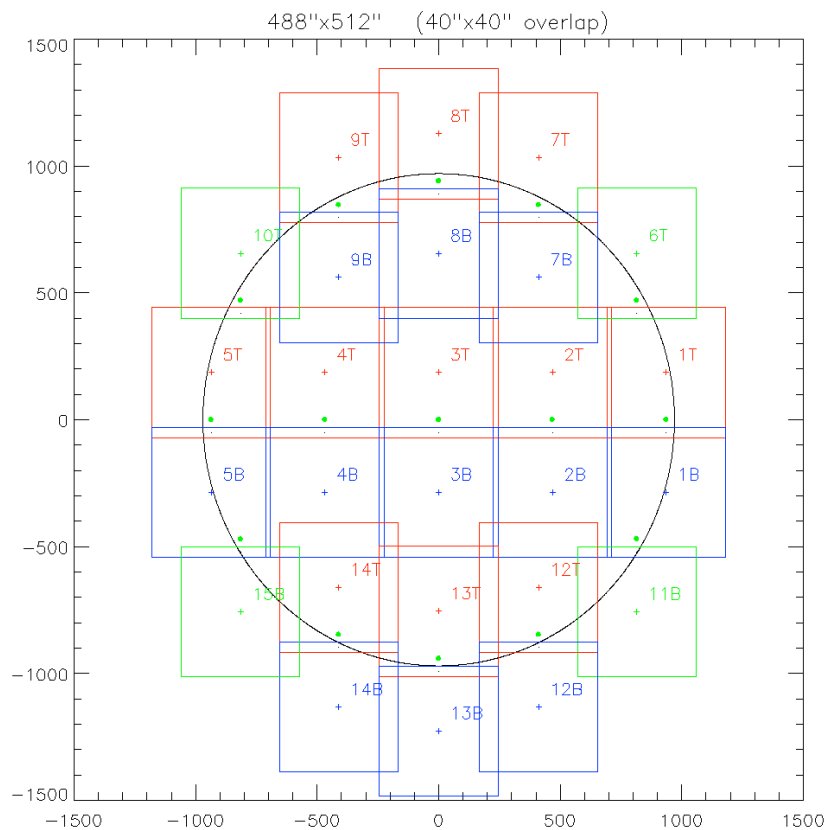
This is a document with all relevant information to HOP 130. The description of the HOP can be found at the end of this document and at: http://www.isas.jaxa.jp/home/solar/hinode_op/hop.php?hop=0130

Having read that, the only relevant missing part is how to get pointings and time for a particular date. This document explains how to do it.

Since April 2013, the EIS study to be used is: **full_sun_slot_scan_2** (Study ID 499).

2. Pointings and Times

Pointings are independent of date and time. 15 spacecraft pointings always at the same locations. No solar tracking. These locations:



Green dots: Hinode pointings (15)

Red crosses: EIS top of CCD pointings (1T, 2T, ..., 14T).

Blue crosses: EIS bottom of CCD pointings (1B, 2B, ..., 15B).

Boxes: EIS FOV.

Thin black dots: EIS CCD center (50" south of SOT).

Hinode & EIS pointings

EIS takes two (sometimes one) pointings per spacecraft pointing. Top (T) and bottom (B) of CCD, with an overlap. In arcseconds the actual pointings are:

| HINODE | X | Y | EIS | X | Y |
|--------|------|------|-----|------|-------|
| 1 | 936 | 0 | 01T | 936 | 186 |
| | | | 01B | 936 | -286 |
| 2 | 468 | 0 | 02T | 468 | 186 |
| | | | 02B | 468 | -286 |
| 3 | 0 | 0 | 03T | 0 | 186 |
| | | | 03B | 0 | -286 |
| 4 | -468 | 0 | 04T | -468 | 186 |
| | | | 04B | -468 | -286 |
| 5 | -936 | 0 | 05T | -936 | 186 |
| | | | 05B | -936 | -286 |
| 6 | 815 | 470 | 06T | 815 | 656 |
| 7 | 411 | 847 | 07T | 411 | 1033 |
| | | | 07B | 411 | 561 |
| 8 | 0 | 941 | 08T | 0 | 1127 |
| | | | 08B | 0 | 655 |
| 9 | -411 | 847 | 09T | -411 | 1033 |
| | | | 09B | -411 | 561 |
| 10 | -815 | 470 | 10T | -815 | 656 |
| 11 | 815 | -470 | 11B | 815 | -756 |
| 12 | 411 | -847 | 12T | 411 | -661 |
| | | | 12B | 411 | -1133 |
| 13 | 0 | -941 | 13T | 0 | -755 |
| | | | 13B | 0 | -1227 |
| 14 | -411 | -847 | 14T | -411 | -661 |
| | | | 14B | -411 | -1133 |
| 15 | -815 | -471 | 15B | -815 | -757 |

Timings

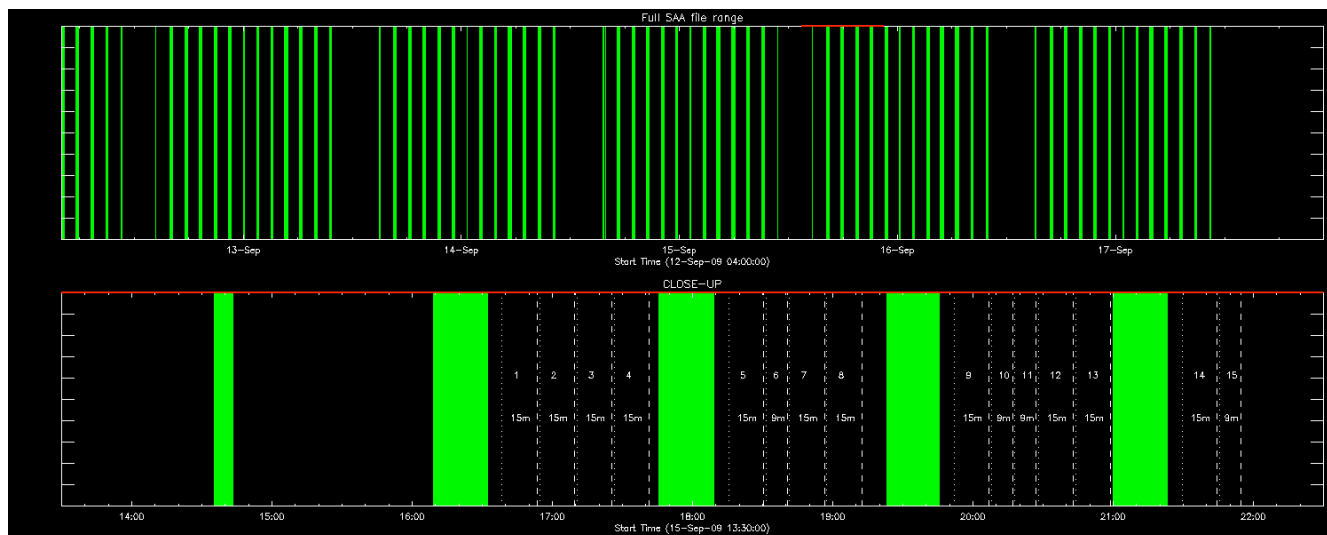
To calculate timings use routine: HOP130_TIMINGS.PRO
The routine is provided by the HOP130 contacts, as well as other required files (e.g. 'hinode_pointings.txt').

Syntax:

```
IDL> hop130_timings, 'obev_200909120100.evt', '15-Sept-2009 16:30'
```

where 'obev_200909120100.evt' is the SAA events file to be found in the CP directory (e.g. cp/cmdpln/tomorrow). Since May 2016 the 'hinode_pointings.txt' file is not needed as input and read by default from SSW.

Provided the SAA information and desired starting time for the HOP (e.g. '15-Sept-2009 16:30'), the routine returns TIMES for each one of the pointings, avoiding SAAs.



Larger version of the plot at the end.
Dotted lines: repointing and start of sequence.
Dashed lines: end of sequence.
Green areas: SAA.

The output text file looks like this:

```
-- SAA_ENTRY   : 2009/09/15.14:35:30 ;
-- SAA_EXIT    : 2009/09/15.14:43:30 ;
-- SAA_ENTRY   : 2009/09/15.16:09:00 ;
-- SAA_EXIT    : 2009/09/15.16:32:30 ;
++ POINTING 01 2009/09/15 16:38:30.000   X: 936   Y: 0
   END SEQ.   2009/09/15 16:53:30.000
++ POINTING 02 2009/09/15 16:54:30.000   X: 468   Y: 0
   END SEQ.   2009/09/15 17:09:30.000
++ POINTING 03 2009/09/15 17:10:30.000   X: 0     Y: 0
   END SEQ.   2009/09/15 17:25:30.000
++ POINTING 04 2009/09/15 17:26:30.000   X: -468  Y: 0
   END SEQ.   2009/09/15 17:41:30.000
-- SAA_ENTRY   : 2009/09/15.17:45:30 ;
-- SAA_EXIT    : 2009/09/15.18:09:30 ;
++ POINTING 05 2009/09/15 18:15:30.000   X: -936  Y: 0
   END SEQ.   2009/09/15 18:30:30.000
++ POINTING 06 2009/09/15 18:31:30.000   X: 815   Y: 470
   END SEQ.   2009/09/15 18:40:30.000
++ POINTING 07 2009/09/15 18:41:30.000   X: 411   Y: 847
   END SEQ.   2009/09/15 18:56:30.000
++ POINTING 08 2009/09/15 18:57:30.000   X: 0     Y: 941
   END SEQ.   2009/09/15 19:12:30.000
-- SAA_ENTRY   : 2009/09/15.19:23:00 ;
-- SAA_EXIT    : 2009/09/15.19:46:00 ;
```

```

++ POINTING 09 2009/09/15 19:52:00.000    X: -411    Y: 847
  END SEQ.    2009/09/15 20:07:00.000
++ POINTING 10 2009/09/15 20:08:00.000    X: -815    Y: 470
  END SEQ.    2009/09/15 20:17:00.000
++ POINTING 11 2009/09/15 20:18:00.000    X: 815     Y: -470
  END SEQ.    2009/09/15 20:27:00.000
++ POINTING 12 2009/09/15 20:28:00.000    X: 411     Y: -847
  END SEQ.    2009/09/15 20:43:00.000
++ POINTING 13 2009/09/15 20:44:00.000    X: 0       Y: -941
  END SEQ.    2009/09/15 20:59:00.000
-- SAA_ENTRY   : 2009/09/15.21:00:00 ;
-- SAA_EXIT    : 2009/09/15.21:23:30 ;
++ POINTING 14 2009/09/15 21:29:30.000    X: -411    Y: -847
  END SEQ.    2009/09/15 21:44:30.000
++ POINTING 15 2009/09/15 21:45:30.000    X: -815    Y: -471
  END SEQ.    2009/09/15 21:54:30.000

```

where -- indicates SAAs and ++ indicates Hinode's re-pointing coordinates and times. This information should be used on the daily meeting to input spacecraft pointings. The EIS pointings showed before (1T, 1B, 2T, 2B,...) will be the input to eis_mk_plan.pro. Two EIS pointings (sometimes one) per spacecraft pointing.

Recommendations:

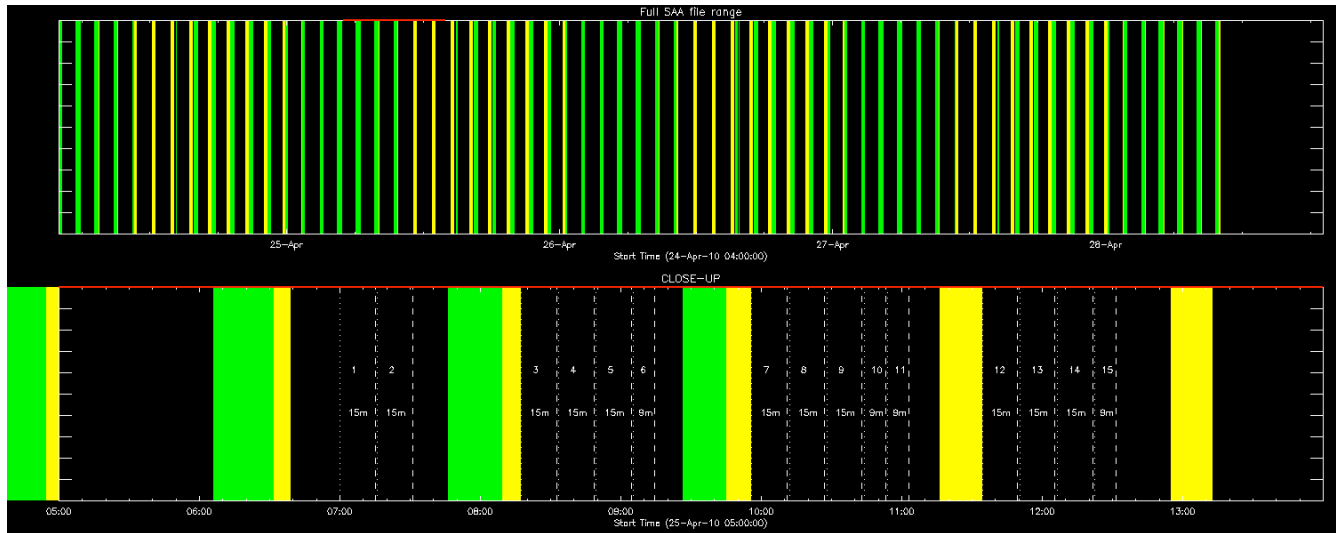
- Please, leave a 2 minute margin for pointing stabilization after each spacecraft pointing change.
- To minimize the number of time-tagged studies (OG), **use only one time-tagged study per spacecraft pointing** (button: Insert at cursors time (time-tagged)) **and append the second study to it** (button: Append to highlighted entry).

This routine will allow the planner the sufficient flexibility to program the HOP at any desired time.

Any problems or questions report to HOP130 contacts.

Addendum:

During the Eclipse season, we should also avoid the X-ray twilights. These events are labeled as XTW in the obev file. Since 2010/04/25, the routine hopl30_timings.pro avoids those entries too. The XTW are shown in yellow in the plots (when present). See below.



```

-- XTW_EXIT      : 2010/04/25.05:00:30 ;
-- SAA_ENTRY     : 2010/04/25.06:06:00 ;
-- XTW_ENTRY     : 2010/04/25.06:21:00 ;
-- SAA_EXIT      : 2010/04/25.06:32:00 ;
-- XTW_EXIT      : 2010/04/25.06:39:00 ;
++ POINTING 01 2010/04/25 07:00:00.000   X: 936   Y: 0
   END SEQ.   2010/04/25 07:15:00.000
++ POINTING 02 2010/04/25 07:16:00.000   X: 468   Y: 0
   END SEQ.   2010/04/25 07:31:00.000
-- SAA_ENTRY     : 2010/04/25.07:46:30 ;
-- XTW_ENTRY     : 2010/04/25.07:59:30 ;
-- SAA_EXIT      : 2010/04/25.08:09:30 ;
-- XTW_EXIT      : 2010/04/25.08:17:30 ;
++ POINTING 03 2010/04/25 08:17:30.000   X: 0     Y: 0
   END SEQ.   2010/04/25 08:32:30.000
++ POINTING 04 2010/04/25 08:33:30.000   X: -468  Y: 0
   END SEQ.   2010/04/25 08:48:30.000
++ POINTING 05 2010/04/25 08:49:30.000   X: -936  Y: 0
   END SEQ.   2010/04/25 09:04:30.000
++ POINTING 06 2010/04/25 09:05:30.000   X: 815   Y: 470
   END SEQ.   2010/04/25 09:14:30.000
-- SAA_ENTRY     : 2010/04/25.09:26:30 ;
-- XTW_ENTRY     : 2010/04/25.09:38:00 ;
-- SAA_EXIT      : 2010/04/25.09:45:00 ;
-- XTW_EXIT      : 2010/04/25.09:56:00 ;
++ POINTING 07 2010/04/25 09:56:00.000   X: 411   Y: 847
   END SEQ.   2010/04/25 10:11:00.000
++ POINTING 08 2010/04/25 10:12:00.000   X: 0     Y: 941

```

```
END SEQ.      2010/04/25 10:27:00.000
++ POINTING 09 2010/04/25 10:28:00.000    X: -411    Y: 847
END SEQ.      2010/04/25 10:43:00.000
++ POINTING 10 2010/04/25 10:44:00.000    X: -815    Y: 470
END SEQ.      2010/04/25 10:53:00.000
++ POINTING 11 2010/04/25 10:54:00.000    X: 815     Y: -470
END SEQ.      2010/04/25 11:03:00.000
-- XTW_ENTRY  : 2010/04/25.11:16:30 ;
-- XTW_EXIT   : 2010/04/25.11:34:30 ;
++ POINTING 12 2010/04/25 11:34:30.000    X: 411     Y: -847
END SEQ.      2010/04/25 11:49:30.000
++ POINTING 13 2010/04/25 11:50:30.000    X: 0       Y: -941
END SEQ.      2010/04/25 12:05:30.000
++ POINTING 14 2010/04/25 12:06:30.000    X: -411    Y: -847
END SEQ.      2010/04/25 12:21:30.000
++ POINTING 15 2010/04/25 12:22:30.000    X: -815    Y: -471
END SEQ.      2010/04/25 12:31:30.000
-- XTW_ENTRY  : 2010/04/25.12:55:00 ;
-- XTW_EXIT   : 2010/04/25.13:13:00 ;
```

3.HOP description

| HOP No. | HOP title |
|----------|--|
| HOP 0130 | CORE: Multi-temperature Full Disk Slot Scans |

4.

plan term

2009/09/15-2009/09/15
 2009/10/27-2009/10/27
 2009/11/17-2009/11/17
 2009/12/08-2009/12/08
 2009/12/29-2009/12/29
 2010/01/19-2010/01/19

proposer name Ugarte-Urra, Brooks & Warren e- iugarte[at]ssd5.nrl
 : mail : .navy.mil

proposer name Ugarte-Urra, Brooks & Warren e- iugarte[at]ssd5.nrl
 : mail : .navy.mil

5.

contact person

in name Ugarte-Urra, Brooks & Warren e- iugarte[at]ssd5.nrl
HINODE : mail : .navy.mil
team

abstract of observational proposal

Scientific background

By executing scans at a number of positions on the Sun, EIS is able to build up images of the entire solar disk. An initial dataset was taken June 27, 2009. This was a proof of concept. Clean monochromatic images of the full disk were taken in nine spectral lines, spanning a range of temperatures from 0.05 to 2.5 MK. These full disk mosaics were developed in anticipation of NASA's Solar Dynamic Observatory (SDO) mission, which is scheduled for launch in November of 2009. SDO will focus on the origins of space weather by monitoring the solar EUV irradiance, taking full-disk images of the Sun, and measuring the evolution of the Sun's magnetic fields. A prototype of the SDO irradiance instrument has already been flown on a rocket and comparisons between the rocket data and the EIS mosaics suggest that the sensitivity of EIS is close to the pre-launch calibration. Once SDO is launched this observing mode will provide a direct method for monitoring the EIS calibration. The study of EIS spectra also provides insights into the lower resolution irradiance spectra. The imagers on

SDO will take high resolution, full disk images of the Sun in 8 different wavelength channels at a 10s cadence. The spectroscopic capabilities of EIS complement these images by providing very strong constraints on the thermal structure of the solar corona.

Objectives

- 1.- Monitoring the EIS calibration in direct comparison with EVE on SDO.
- 2.- Monitoring of solar cycle dependent EUV radiance at multiple temperatures.
- 3.- Public outreach images.

request to SOT

request to XRT

— Full Sun images at disk center pointing.

Al-mesh (short+long exposure without AEC): totally 2 exposures

Ti-poly (short+long exposure without AEC): totally 2 exposures

Al_thick (long exposure without AEC): 1 exposure (binned 2x2)

If there is available data rate, take the thin filter images at full resolution, otherwise bin them 2x2 as well.

request to EIS

EIS study acronym: FULL_SUN_SLOT_SCAN_2

TARGET: Full Sun (multiple pointings)

EXPOSURE TIME: 20s

RASTER: Scanning

SLIT: 40"

FOV: 488"x512"

DATA COMP: JPEG85

DURATION: ~4h (5.75 min/exposure + pointing stabilization+SAA avoidance, 26 exposures)

DATA VOLUME: 364MB (14Mbits/exposure, 26 exposures)

SPECTRAL WIND.: 13

LINEs: He II 256.3, Si VII 275.3, Fe VIII 185.2, Fe XI 180.4, Si X 258.42, S X 264.2, Fe XII 195.1, Fe XIII 202.0, Fe XIII 203.8, Fe XIV 211.36, Fe XIV 274.24, Fe XV 284.1, Fe XVI 262.9

Pointing

— 15 spacecraft pointings covering full disk. Two EIS pointings

per spacecraft pointing: top and bottom of CCD in order to maximize area and minimize spacecraft pointings.

– This is a complex observation so for full details please check PDF file (hop_130_vX.X.pdf) at SolarSoft directory:

\$SSW/hinode/eis/idl/atest/ugarte

Email Ignacio Ugarte Urrea at ignacio.ugarte-urra@nrl.navy.mil with any specific questions.

other participating instruments

remarks

Pointing

– 15 spacecraft pointings covering full disk. Two EIS pointings per spacecraft pointing: top and bottom of CCD in order to maximize area and minimize spacecraft pointings.

– Exact positions and times provided by points of contact: Ignacio Ugarte-Urrea (iugarte@ssd5.nrl.navy.mil) or David Brooks (dhbrooks@ssd5.nrl.navy.mil)

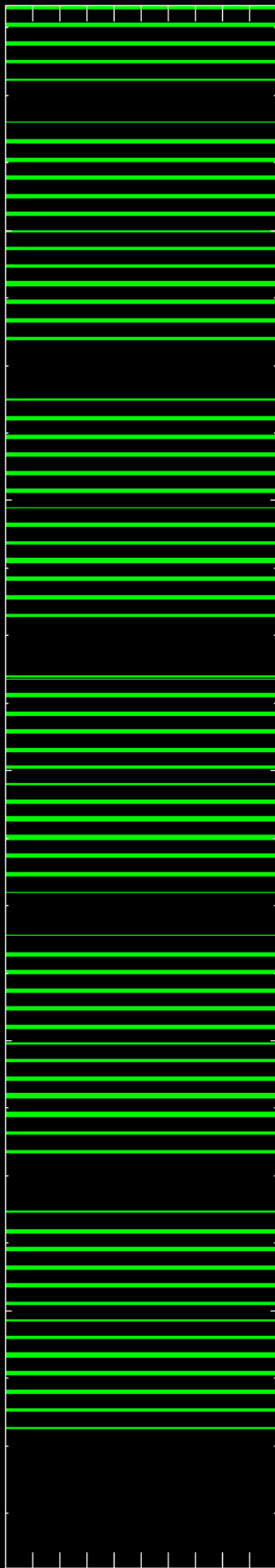
Duration:

– ~16min at each pointing.
– ~4h total with no gaps.

Frequency: approx. every 2-3 weeks to monitor activity.

SAA-free period preferred to minimize duration and facilitate planning. Other periods are OK.

Full SAA file range



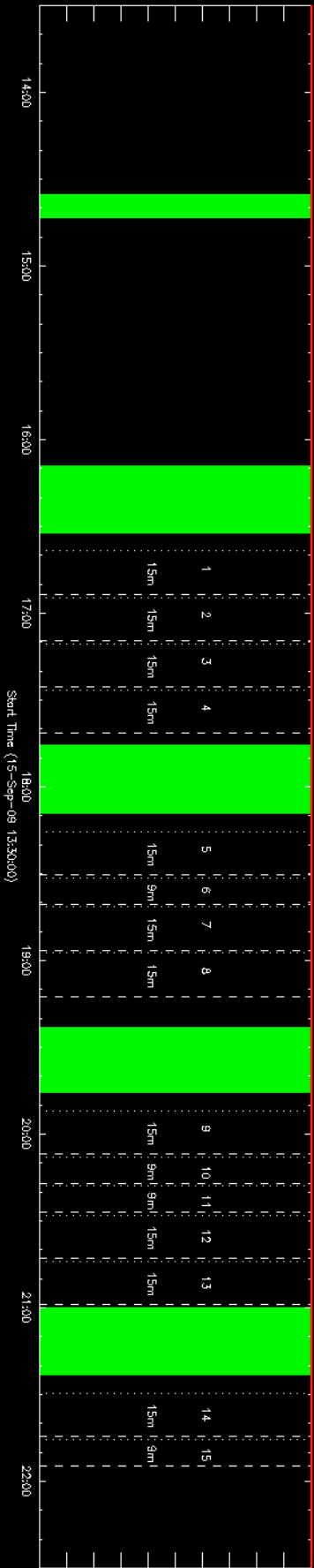
13-Sep

14-Sep

15-Sep
Start Time (12-Sep-09 04:00:00)
CLOSE-UP

16-Sep

17-Sep



14:50

15:00

16:00

17:00

Start Time (15-Sep-09 13:30:00)

18:00

19:00

20:00

21:00

22:00

1 15m
2 15m
3 15m
4 15m

5 15m
6 9m
7 15m
8 15m

9 15m
10 9m
11 9m
12 15m
13 15m

14 15m
15 9m