XRT Flare Mode Coordination with EIS and SOT

EIS Core Flare Study: Ryan Milligan and the EIS Team

This study will be the initial core flare study used by the EIS team during the hoped for rise of activity in solar cycle 24. Results should allow us to refine future flare studies and to develop strategies for the eventual use of the EIS internal flare trigger.

It includes a fast raster study designed to diagnose flaring plasma through measurement of line intensities, shifts, and widths over a range of high temperatures, as well as electron densities using the Fe XIV line ratio. The raster covers an 80"x120" FOV and uses the 2" slit with 5 second exposures. This gives a raster cadence of under 5 minutes. The study consists of 12 repeats of the raster which will take approximately 1 hour. A single raster has a data volume of 3012.55 kBits after compression, which equals 36.25 MBits per hour. Given the daily telemetry volume for EIS of ~600 MBits per day, this study should be run continuously on a target active region for at least 16 hours per day or longer if possible, adjusting for solar rotation. The flare trigger will not be used at least initially.

The raster comprises 4 spectral windows, each of which are in the LW detector to avoid pointing ambiguities:

 Window 1: 254.70 - 255.39. 32 pixels containing, primarily Fe XXIV (255.11) and Fe XVII (254.87), with enough room for large blueshifts in Fe XVII. There is a weak Fe X line at 255.39, and Fe VIII lines at 255.10 and 255.34.

 Window 2: 256.26 - 256.95. 32 pixels containing He II 256.32 and S XIII 256.68. We may also get the Ni XVI 256.56 and Fe XII 256.92 lines.

 Window 3: 264.60 - 264.94. 16 pixels centered on density sensitive Fe XIV 264.78.

 Window 4: 274.02 - 274.35. 16 pixels centered on density sensitive Fe XIV 274.20. Might also pick up the Si VII 274.17 TR line.

 SOT should run full FOV Ca II observations with a 2-3 minute cadence with a longitudinal magnetogram every 5 minutes. Ca II images are useful for identifying any enhanced chromospheric emission during flares.

 XRT can use the Al poly filter to get broadband images which will be used in conjunction with thermal images and spectra available from RHESSI for diagnosing temperature and density of the flaring plasma. A cadence of 2-3 minutes should suffice. Ideally the cadence should be as high as possible while maintaining joint observations with EIS for the 16 hours.

 The initial strategy would be to

     - Observe an established and flaring AR for three days or for ± 1.5 days of central meridian passage; this phase would focus on line-of-sight velocity
     measurement for plasma flows

     - Observe the same region for three days during its West limb passage; this phase would focus on non-thermal line broadening and the possible detection
     of reconnection flows

 Joint observations would be sought with SOHO/CDS and RHESSI and the target region shall be determined in coordination with the Max Millennium Chief Observer

- **Science Goal :** Monitor AR plasma before, during and after the flare

- Normal mode program (QT) should run for 18 hours

- XRT QT program: Al/poly(Med-Be) and Thin-Be(Med-Al), 384x384, no binning, long (AEC 2)/ short (AEC 3) pairs, 180 seconds cadence. Every 15 minutes, G-band to coalign with SOT. The program will also take the same images (single exposure, AEC 1,not pairs) in the preflare buffer. The preflare buffer should cover the ??? min before the flare flag is set with increasing cadence. Q92 for regular images, Q95 for preflare. The program uses ~ 30 Mbits/hour and can be run for 18 hours with 530Mbits. The preflare data needs 45 Mbits.

- XRT FL program: Thin-Be(Thin-Be+Thick-Be) (for continuity) and Med-Be(Med-Be+Thick-Al) with AEC 1, 20 second cadence for the first 5 minutes, than 60 second cadence. Q95. This takes 11Mbits for the first 5 minutes, then 52 Mbits/hour for max 2 hours (in the very rare case of a long duration flare, additional images are taken at 15 min cadence).

- Size of one HOP run Assuming 18 hours of observations with 3 30-min long flares: about 615 Mbits. Flare patrol images taken with 60 second cadence.

Name	Loop	Int	Duration	Size(Bits)	Center	Size	Comp	AEC	DMF	Buffer	L	Err
HOP 222			:13:19.3	10.9 M								
▼ Subr-1	4	:02.0	:13:00.0	10.0 M								
▼ HOP 222 – Main loop (2822)	1	:15.0	:15.0	2.50 M								
Al/poly (Med-Be) – 1x1 – 512 ms		:03.0	:03.0	626. K	1024x1024	384x384	35%	2	KSC, SSOC	Regular		
Al/poly (Med-Be) – 1x1 – 512 ms		:03.0	:03.0	626. K	1024x1024	384x384	35%	3	KSC, SSOC	Regular		
Thin Be (Med-Al) – 1x1 – 512 ms		:03.0	:03.0	626. K	1024x1024	384x384	35%	2	KSC, SSOC	Regular		
Thin Be (Med-Al) – 1x1 – 512 ms		:03.0	:03.0	626. K	1024x1024	384x384	35%	3	KSC, SSOC	Regular		
▼ HOP 222 – Preflare Buffer Images (2821)	4	:45.0	:03:00.0	00.0 M								
Al/poly (Med-Be) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-1		
Thin Be (Med-Al) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-1		
Al/poly (Med-Be) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-2		
Thin Be (Med-Al) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-2		
Al/poly (Med-Be) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-3		
Thin Be (Med-Al) – 1x1 – 512 ms		:06.0	:06.0	00.0 M	1024x1024	384x384	43%	1	KSC, SSOC	Preflare-3		
▼ Subr-2	1	:02.0	:11.8	921. K								
▼ HOP 101 – Gband coalignment (2816)	1	:04.0	:11.8	921. K								
G-Band – 1x1 – 64ms		:02.0	:11.8	921. K	1024x1024	384x384	52%	0	KSC, SSOC	Regular		

HOP 222: normal mode program XOB for XRT

Version: 15EC

Program Name: HOP 222

Author: GRIGIS, Paolo

Date: 2009/05/22 15:15:07

Loop Count: 0

Data rate: 13.6 Kbits/s

Name	Loop	Int	Duration	Size(Bits)	Center	Size	Comp	AEC	DMF	Buffer	L
HOP 101– Flare response (15E6)			:06:22:41.2	279. M							
▼ Subr–1	1	:02.0	:05:13.3	24.1 M							
▼ HOP 101 – Flare response (2817)	15	:20.0	:05:00.0	23.2 M							
Thin–Be (Thin–Be + Thick–Be) – 1x1 – 128ms		:02.0	:11.3	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
Med–Be (Med–Be + Thick–Al) – 1x1 – 362ms		:02.0	:04.0	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
▼ HOP 101 – Gband coalignment (2816)	1	:04.0	:13.3	921. K							
G–Band – 1x1 – 64ms		:02.0	:13.3	921. K	1024x...	384x384	52%	0	KSC, SSOC	Regular	
▼ Subr–2	8	:02.0	:02:01:46.7	193. M							
▼ HOP 101 – Flare response –short exposure (2818)	15	:01:00.0	:15:00.0	23.2 M							
Thin–Be (Thin–Be + Thick–Be) – 1x1 – 16ms		:02.0	:11.3	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
Med–Be (Med–Be + Thick–Al) – 1x1 – 64ms		:02.0	:03.7	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
▼ HOP 101 – Gband coalignment (2816)	1	:04.0	:04.0	921. K							
G–Band – 1x1 – 64ms		:02.0	:13.3	921. K	1024x...	384x384	52%	0	KSC, SSOC	Regular	
▼ Subr–3	25	:02.0	:04:15:33.6	61.7 M							
▼ HOP 101 – Flare response (2817)	1	:10:00.0	:10:00.0	1.54 M							
Thin–Be (Thin–Be + Thick–Be) – 1x1 – 128ms		:02.0	:11.3	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
Med–Be (Med–Be + Thick–Al) – 1x1 – 362ms		:02.0	:04.0	774. K	1024x...	384x384	43%	1	KSC, SSOC	Regular	
▼ HOP 101 – Gband coalignment (2816)	1	:04.0	:13.3	921. K							
G–Band – 1x1 – 64ms		:02.0	:13.3	921. K	1024x...	384x384	52%	0	KSC, SSOC	Regular	

HOP 222: Flare mode program XOB for XRT

Version: 15E6

Program Name: HOP 101– Flare response

Author: GRIGIS, Paolo

Date: 2008/11/06 21:06:10

Loop Count: 0

Data rate: 12.1 Kbits/s