

# STIX preview image archive and web imaging tools

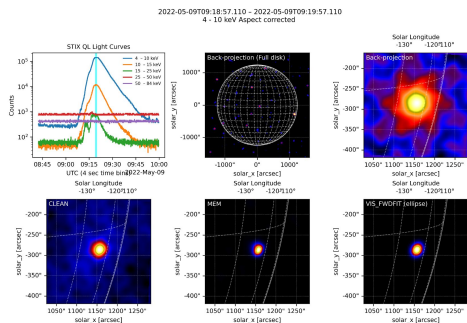
Hualin Xiao on behalf of STIX team  
July 14, 2022

# Flare image processing pipeline

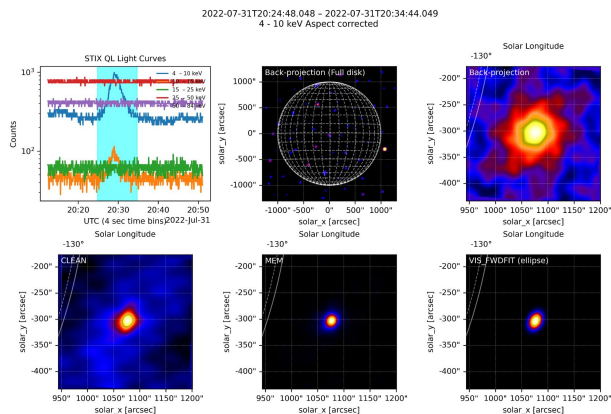
- The pipeline uses STIX IDL imaging software in SSWIDL
- BP, BP CLEAN, EM and forward-fit algorithms included
- FITS files created by the pipeline can be plotted with sunpy.map
- Web tools for interactive image reconstruction developed

IDL code: [https://datacenter.stix.i4ds.net/pub/misc/stix\\_imaging/](https://datacenter.stix.i4ds.net/pub/misc/stix_imaging/)

# Imaging and spectroscopy pipeline on the platform



A big flare

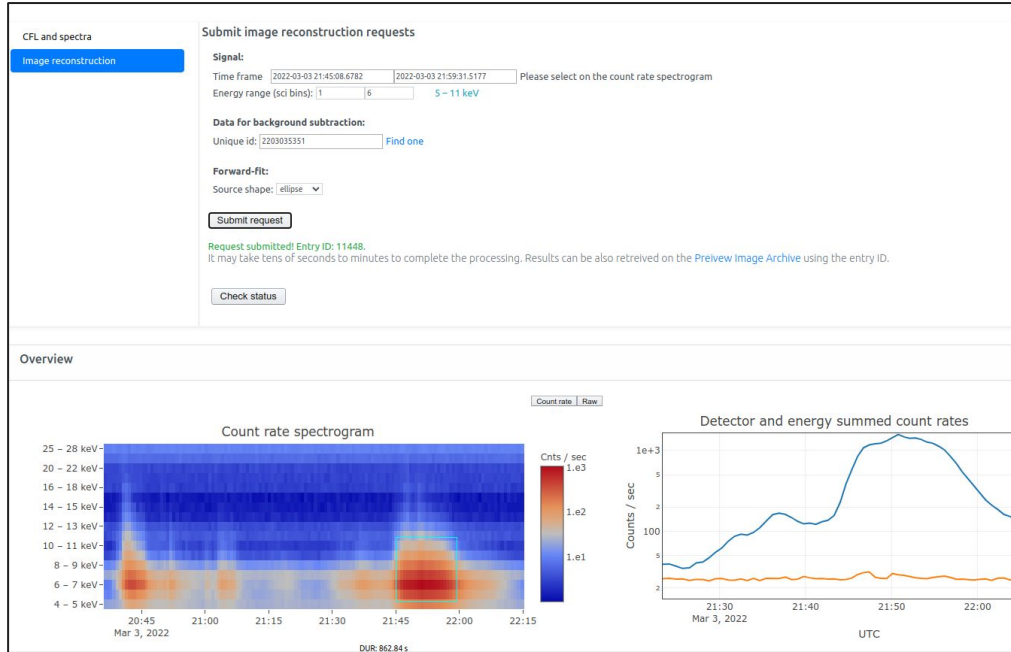


A micro-flare

- One image at the peak created for each detected flares
- Integration time 60 seconds for big flares
- Full flaring time for small flares
- Two energy ranges
  - 4 - 10 keV
  - 16 - 28 keV
- Minimal counts to create an image 10, 000 (BKG not subtracted)
- The closet in time background data selected for background subtraction
- thick2 model included automatically when spectral fitting

7320 automatic created runs in the database

# Imaging using the web tool on STIX data center



On science data browser

1. Select a science data file
2. Click the button “**interactive analysis**” then click the tab “**image reconstruction**”
3. Select time and energy ranges
4. Select data for BKG subtraction
5. Click “Submit”
6. After about 30 sec, clicking the button “check status”
7. Images will be displayed at the bottom of the page if success

<https://datacenter.stix.i4ds.net/view/list/bsd/id/9925>

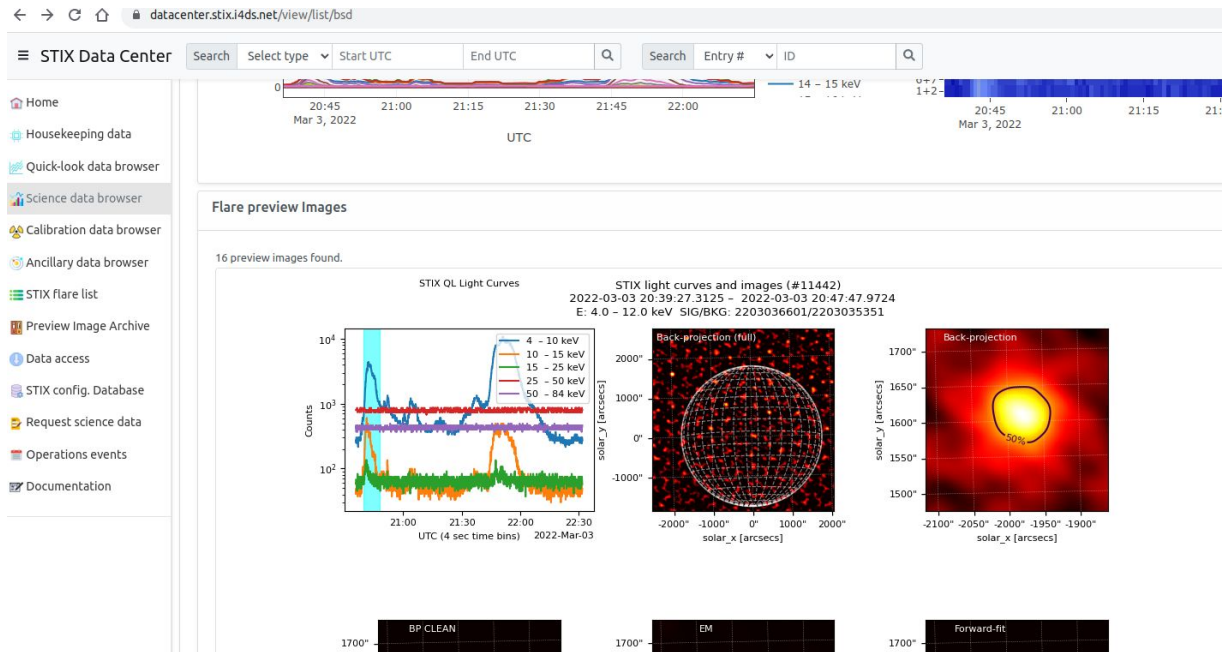
Only register users are allowed to submit processing requests!

# Where to find preview images

Preview images are displayed on three web pages

- Bulk science data page
- Preview image manager
- Quick-look data browser
  - Click the icon “IMG” in the top toolbar

# Browsing preview images on the science data browser

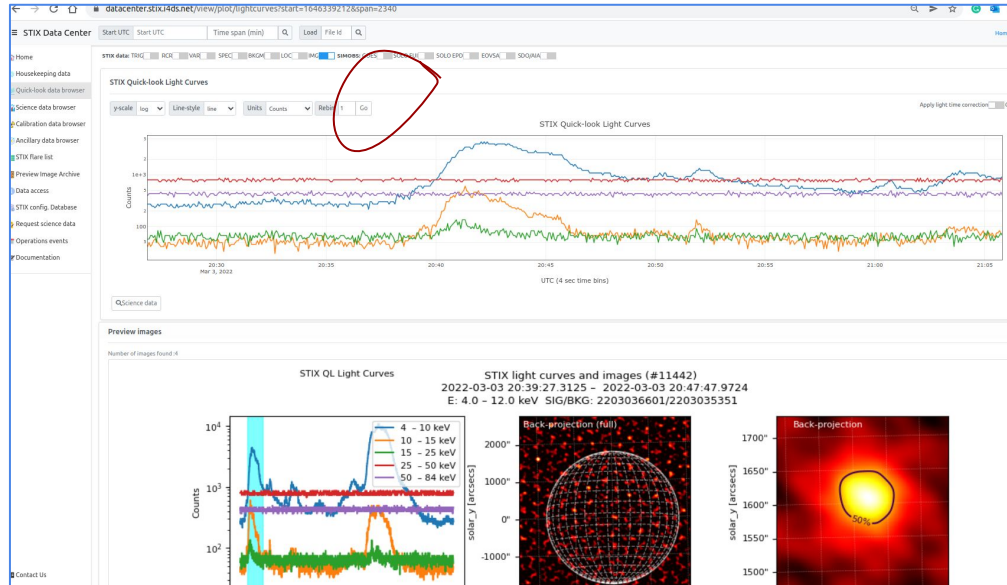


Available preview images for the current loaded science data are displayed at the bottom of the “preview” tab on the science data browser

Demo: <https://datacenter.stix.i4ds.net/view/list/bsd/id/9831>

# Browsing preview images on QL light curve page

Preview images for the current time frame are loaded after clicking the button **“IMG”** on the top



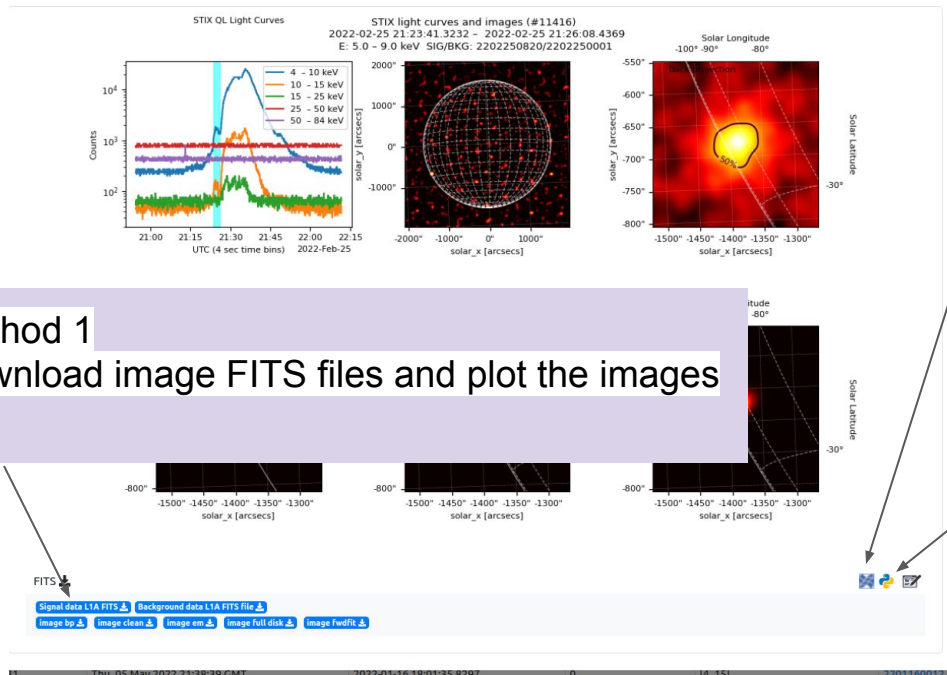
Demo:

<https://datacenter.stix.i4ds.net/view/plot/lightcurves?start=1648163410&span=2340>

Open the page at the link above then click the icon “IMG”

# How to reproduce preview images on your computer

STIX quick preview images



**Method 1**  
Download image FITS files and plot the images

**Method 2**

Clicking the "IDL" icon to download the IDL script then recreating the images in IDL

**Method 3**

Clicking the "Python" icon to download the IDL script then recreating the images in IDL



# IDL code template created by the web tool

```
1 Created at 2022-05-19T17:30:12.940411 by STIX data center online image reconstruction tool
2 ; To run this script, sswidl and stix IDL software must be installed on your computer.
3 ; Download FITS files from STIX data center
4 wget("https://datacenter.stix.j4ds.net/download/fits/filename/solo_L1A_stix-sci-xray_l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits", filename="solo_L1A_stix-sci-xray_l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits"); background file,
5 wget("https://datacenter.stix.j4ds.net/download/fits/filename/solo_L1A_stix-sci-xray_l1-2203241574_20220324T231823-20220324T233037_055791_V01.fits", filename="solo_L1A_stix-sci-xray_l1-2203241574_20220324T231823-20220324T233037_055791_V01.fits"); signal file,
6 ; Uncomment the following lines if you don't have stix image reconstruction.pro and stixmap2fits.pro on your local disk,
7 ; wget("https://datacenter.stix.j4ds.net/pub/misc/stix_imaging/stix_image_reconstruction.pro", filename="stix_image_reconstruction.pro"),
8 ; wget("https://datacenter.stix.j4ds.net/pub/misc/stix_imaging/stix_map2fits.pro", filename="stix_map2fits.pro"),
9 ; run stix image reconstruction.pro
10 ; run stix_map2fits.pro
11
12 sig filename="solo_L1A_stix-sci-xray_l1-2203241574_20220324T231823-20220324T233037_055791_V01.fits"
13 bkg filename="solo_L1A_stix-sci-xray_l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits"
14
15
16 path sci file="/*+sig filename
17 path bkg file="/*+bkg filename
18 start_utc="2022-03-24T23:23:59.719"
19 end_utc="2022-03-24T23:24:59.719"
20
21 bpelow=6 ; back-projection energy range lower limit
22 bpeligh=10
23 ; energy range in units of keV, used to make a back-project full image
24 ; the result will be used to locate the source(s)
25
26 elow=4
27 ehigh=10
28 ;energy range for EM, BP and forward-fit
29
30
31 ; s/c enphemeris data, computed using SPICE kernel toolkits.
32 bp=1.1384376751263139
33 lq=63.994372215521075
34 rsun=2957.616313971497
35 ; apparent radius of the sun in units of arcsec
36 dsun=48514944360.77641
37 ; distance between the sun and s/c in units of meters
38 roll_angle=1.18105822084851
39 ; spacecraft roll angle in units of degrees.
40 sun_center_x=-0.4041528737468275
41 sun_center_y=-0.3867359627245103
42 x_offset_arcsec=-sun_center_x
43 y_offset_arcsec=-sun_center_y
44 ;Note that the off-pointing should be further corrected using the stix aspect solution
45
46
47 vis_fwhm source type='circle'
48 ;Change the source shape if necessary. The source shape can be also "ellipse" or "multi" (multi-circle).
49
50
51 bp_fname="bp_map.fits"
52 full_disk_bp_fname="full disk_bp_map.fits"
53 vis_fwhm_fname="vis_fwhm_map.fits"
54 em_fname="em_map.fits"
```

To select different collimators for imaging, please modify `stix_image_reconstruction.pro`

You may need to include the aspect solution here

- Run the template with `sswidl` you may see the preview images

# Animate/overlay images using web tools

Animate

Overlay selected images

STIX Preview Image Archive

Preview images are automatically created by the imaging pipeline. Please don't use them in publications! Absolute location accuracy of preview images ~ 1 arcmin. X

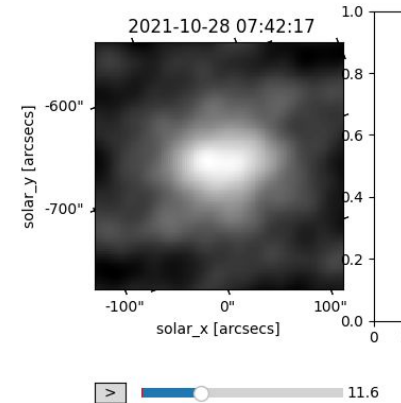
Number of entries: 55

Entry #	Submitter	Creation time	Obs. Start Time	Duration (s)	Energy range (keV)	Science data UID	Browse
6357	heath	Fri, 08 Jul 2022 19:27:48 GMT	2022-04-13T06:29:02.564200	108	[14, 25]	2204134581	Browse
6358	heath	Fri, 08 Jul 2022 19:27:24 GMT	2022-04-13T06:29:02.564200	108	[14, 25]	2204134581	Browse
6356	heath	Thu, 07 Jul 2022 18:31:31 GMT	2021-10-09T06:27:39.794800	74	[5, 20]	2110090088	Browse
6355	asa.kapornas	Thu, 07 Jul 2022 12:00:43 GMT	2021-10-09T06:27:50	30	[4, 14]	2110090088	Browse
6354	bruster	Thu, 07 Jul 2022 07:39:07 GMT	2022-05-03T01:25:49.552900	12	[15, 70]	2205037308	Browse
6353	stuartgjin	Wed, 06 Jul 2022 12:43:06 GMT	2021-10-04T09:34:08.993700	18	[12, 50]	2110040020	Browse
6352	bruster	Wed, 06 Jul 2022 12:27:36 GMT	2022-03-22T01:24:22.241800	13	[5, 7]	2203227606	Browse
6351	bruster	Wed, 06 Jul 2022 12:25:43 GMT	2022-05-22T01:24:22.241800	13	[11, 50]	2205227606	Browse
6350	bruster	Wed, 06 Jul 2022 12:23:29 GMT	2022-03-22T01:23:18.883300	170	[12, 25]	2203227606	Browse
6349	bruster	Wed, 06 Jul 2022 12:21:34 GMT	2022-03-22T01:24:18.293300	15	[13, 100000000]	2203227606	Browse
6348	bruster	Wed, 06 Jul 2022 12:15:46 GMT	2022-03-30T23:57:49.950800	16	[13, 100000000]	2203307117	Browse
6347	bruster	Wed, 06 Jul 2022 12:15:19 GMT	2022-03-30T23:57:49.950800	16	[0, 100000000]	2203307117	Browse
6346	bruster	Wed, 06 Jul 2022 12:14:51 GMT	2022-03-30T23:57:49.950800	16	[0, 100000000]	2203307117	Browse
6345	heath	Wed, 06 Jul 2022 09:21:32 GMT	2022-05-02T03:03:09.656400	45	[16, 63]	2205022163	Browse
6344	bruster	Mon, 04 Jul 2022 15:07:32 GMT	2022-05-02T03:03:13.887000	24	[13, 63]	2205022163	Browse

\*The images created by you are only visible to you.

On flare image archive page

- Select images in the table
- Click the button “ animation ...”
- Save the python template to you local disk
- Run the script



The tools can be found on the web page at the link:

<https://datacenter.stix.i4ds.net/view/image-archive>