

FXT Data Description

The FXT science data can be collected using three readout modes (Table 1), the full frame (FF) mode, partial window (PW) mode and timing (TM) mode. This guide includes the descriptions of the FXT science data files, the file naming convention and main columns included in an observation.

Table 1: FXT science mode

Mode	Image capability (x×y)	Read time per frame	Flux level (thin filter, pileup<2%)	Fraction of OoT
FF	384 × 384, 2D	50 ms	< 2 mCrab	0.23%
PW	128×61, 2D	2.2 ms	< 40 mCrab	<1%
TM	128×384, 1D	23.68 μ s (Read time per row)	< 100 mCrab (spectral analysis) < 1 Crab (timing analysis)	-

1 Level 1 Data Product

For scientific user, data analysis starts from Level 1 data product. The root directory of every product is named by the Observation ID and is organized as followed:

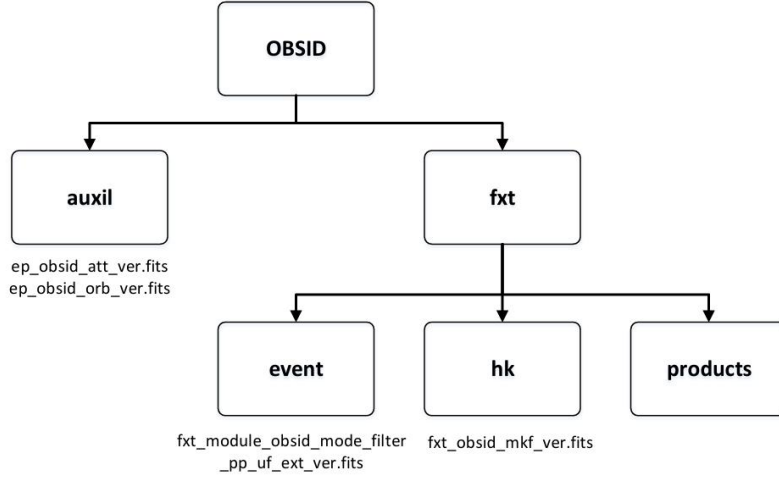


Figure 1: FXT observation ID and the data files. (Figure taken from Zhao et al. 2025)

The ‘auxil’ directory stores attitude and orbit data. While the ‘fxt’ directory includes the ‘event’ and ‘hk’ directory. ‘event’ contains the event files obtained by the three science modes and ‘hk’ stores the make filter file (MKF) of fxt data.

2 FXT file naming convention

The file name format for the FXT science files uses the following convention:
fxt_[module]_[obs_id]_[mode]_[lter]_[pp]_[uf]_[ext]_[lev].fits.

The filename contains several keywords:

- [fxt] is a prefix to indicate the mission name.
- [module] indicates the instrument (a/b) of FXT.
- [obs_id] contains an 11 digits number to identify the observation ID.
- [mode] indicates the scientific mode to obtain the data (ff/pw/tm).
- [filter] gives the thickness of the filter of FXT with values 01/02/03, indicating thin/medium/hole
- [pp] identifies if the event data were taken with the satellite in pointing mode (po) or during a slew (sl).
- [uf] indicates the file is an unfiltered file.
- [ext] indicates the file type and is typically set to 'evt'. However, it can sometimes be set to 'fsaevt', which means events originating from the frame-store area.
- [lev] gives the file version.

The file version definition rule is as follows: (1) represented by three characters; (2) the first character indicates data integrity (2, uncompleted; 3, completed; 6, merged); the second character indicates the data version (the number of times the data is produced under a certain software version); the third character represents the software version.

3 Main columns in FXT FITS events files

This section describes the important columns found in the event files.

The RAWX and RAWY columns give the discrete CCD pixel location of each event processed by the on-board electronics. The data processing using the ground calibrations, produces the DETX and DETY focal plane coordinates and X and Y sky coordinates. For the FF and PW modes, the RAWX and RAWY correspond to spatial information and RAWY is along the readout direction. In the TM mode, the RAWY is a counter incremented by one when a row is read out.

The TIME column contains the time assigned to each event and it is given in seconds after the reference time.

CCDFrame contains the frame number.

The Channel range is from 0 to 4095. And the PI (pulse invariant) column is derived by gain-correcting the Channel values.

The GRADE describes the grade of the event and these values are calculated by “fxtgrade” tool. Figure 2 shows the definition of the grades of FXT.

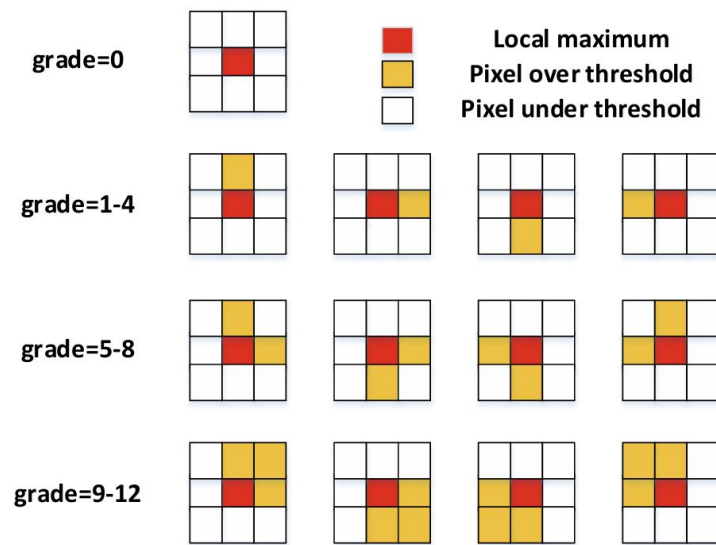


Figure 2: The definition of the FXT grades. (Figure taken from Zhao et al. 2025)

The STATUS column contains a bit mask flag describing the quality of the event. The column is populated during the data calibration in the “fxtgrade” step. The possible flags are:

- GOODSTATUS 0x00: good event
- GROUNDSTATUS 0x01: bad pixel from on-ground CALDB bad pixel file
- BOARDSTATUS 0x02: disabled pixel from on-board software
- USERSTATUS 0x04: bad pixel in the file provided by the user
- HOTSTATUS 0x08: pixel hot found in the current observation
- FLICKSTATUS 0x10: pixel flickering found in the current observation
- NEIGHBORSTATUS 0x20: neighbor close to a bad pixel 3*3 reconstructed
- NEIGHBORSTATUS 0x40: neighbor close to a bad pixel 5*5 reconstructed