



emproc

January 27, 2025

Abstract

Process the EPIC MOS part of an Observation Data File.

1 Instruments/Modes

Instrument	Mode
EPIC MOS	IMAGING, TIMING, COMPRESSED IMAGING, COMPRESSED TIMING

2 Use

pipeline processing	no
interactive analysis	yes

3 Description

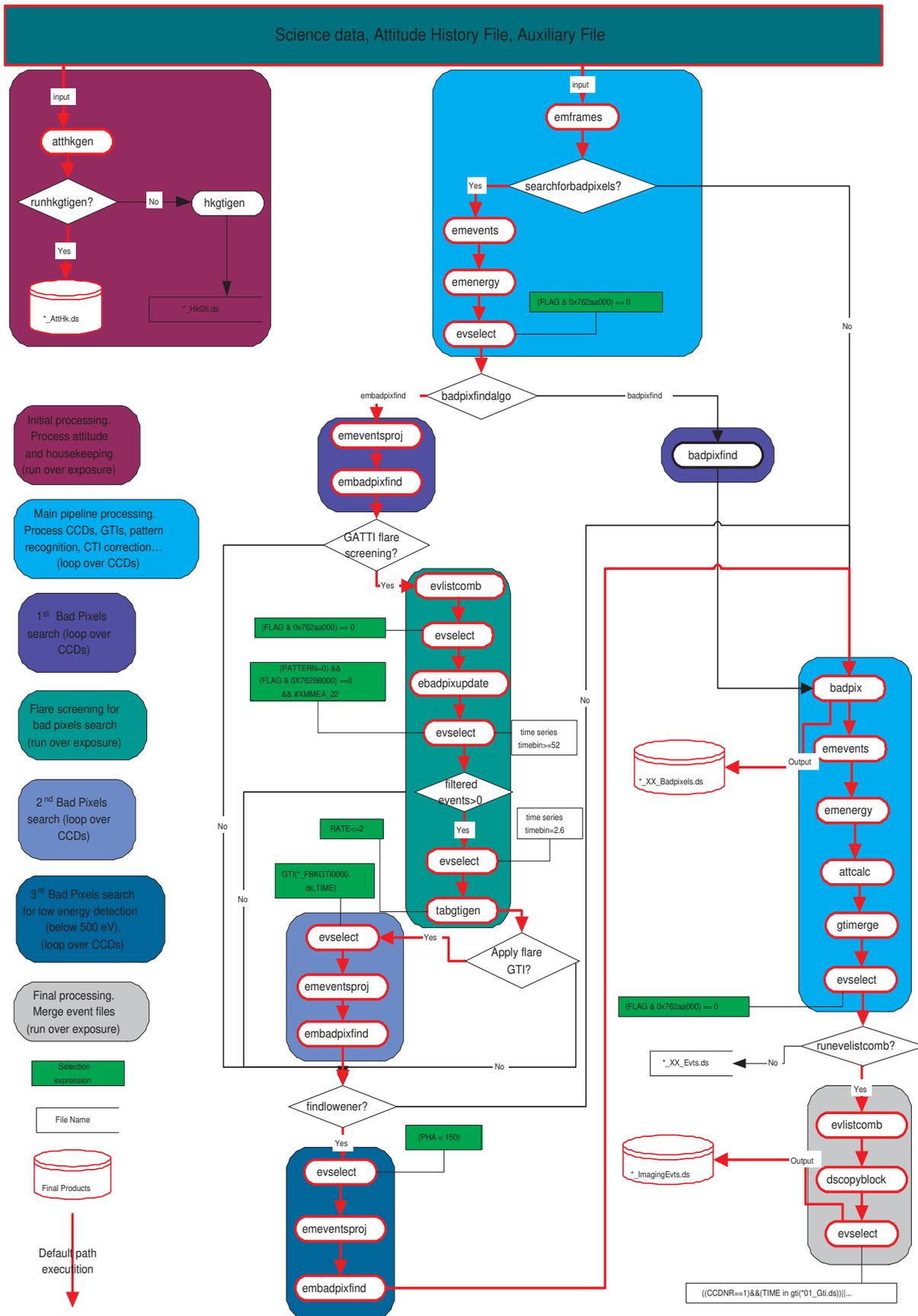
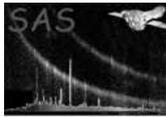
emproc is one of the two tasks in the SAS package **epicproc**. Please refer to the documentation in **epicproc** for information on most of the functionality available in **emproc**.

In the following we describe some of the MOS-specific task parameters. These can be found in the parameter dialog box labeled *Details*, but there are a few exceptions to this rule as noted below. The following subsections are titled as the panes in the parameter dialog.

The parameter dialog box is automatically displayed if the task is run from the SAS graphical user interface **sas**. On the command line one can achieve the same effect by typing **emproc -d**. (See also the documentation of package **taskmain**.)

3.1 Flow Chart

In the figure 3.1 there is a sketch of the pipeline with all the tasks that **emproc** execute. A default execution of **emproc** can be easily tracked, just simply following the red arrows.



emproc pipeline.



3.2 Bad Pixels

emproc has a more sensitive algorithm for bad pixels detection which is **embadpixfind** (refer to this task for further information). This task has been developed for finding bad pixels in an EPIC-MOS image in a completely automatic way.

If part of the exposure is affected by flares, this can seriously reduce the power of the bad pixels search (flares act as noise for the bad pixels and make detecting them more difficult). Therefore an intermediate flare screening is necessary (Fig ??). The bright pixels (which can perturb the flare screening) are flagged using **ebadpixupdate**. The resulting files are used to generate Good Time Intervals outside flares. Then the bad pixel search is run a second time on the data outside flares, in incremental mode.

Before applying this flare screening, we check the data quality inspecting the field of view value of each CCD (GATTI flare screening in Fig 3.1). If we obtain a value greater than 3 arcmin, we consider that the flare screening can be applied.

For **embadpixfind** the algorithm is called a third time (incrementally) on energies below 500 eV (and after flare screening), unless **findlowener=N**. This sometimes detects bad pixels more easily, because most appear at low energy.

Parts of the observation can be excluded from the search for bad pixels by giving **emproc** an additional GTI file via the parameters **withbadpixgti** and **badpixgti**.

For instance:

```
emproc withbadpixgti=yes badpixgti=mygti.ds
```

3.3 Details

In general there is no need to modify any of the parameters described in this section.

3.3.1 emframes

3.3.2 emevents

The following **emevents** parameters can be altered: **keepsifluor**, **randomizeposition**, **rejectrows**, **maxeventsperror**, and **randomizetime**.

3.3.3 emenergy

The following **emenergy** parameters can be altered: **useccfdarkframe**, **randomizeenergy**, **correctcti**, **correctgain** and **ontimepha**.

3.4 Examples

- `emproc selectinstruments=yes emos1=yes`



Process only the imaging exposures for EMOS1.

- `emproc timing=yes withsrccoords=yes srcra=xxx srcdec=xxx`

Process also the timing exposures. The source coordinates should be given. (See also the task `emframes`.)

4 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
-----------	------	------	---------	-------------

<code>selectinstruments</code>	no	b	false	yes no
--------------------------------	----	---	-------	----------

Select one of the cameras?

<code>emos1</code>	no	b	false	yes no
--------------------	----	---	-------	----------

Process EMOS1 data

<code>emos2</code>	no	b	false	yes no
--------------------	----	---	-------	----------

Process EMOS2 data

<code>removetemporaries</code>	no	b	true	yes no
--------------------------------	----	---	------	----------

Remove temporary data sets?

<code>removeintermediategtis</code>	no	b	true	yes no
-------------------------------------	----	---	------	----------

Remove intermediate GTI data sets?

<code>removeintermediateeventlists</code>		b	true	yes no
---	--	---	------	----------

Remove the intermediate CCD/node-based event lists?

<code>withinstexpids</code>	no	b	false	yes no
-----------------------------	----	---	-------	----------

Select exposures to process?

<code>instexpids</code>	no	S	'M1S001 M2S001'	
-------------------------	----	---	-----------------	--

List of exposures to process.

<code>selectccds</code>	no	b	false	yes no
-------------------------	----	---	-------	----------

Select the CCDs to process? false = process all CCDs.

<code>ccd1</code>	no	b	false	yes no
-------------------	----	---	-------	----------

Process data for CCD 1?

<code>ccd2</code>	no	b	false	yes no
-------------------	----	---	-------	----------

Process data for CCD 2?

<code>ccd3</code>	no	b	false	yes no
-------------------	----	---	-------	----------

Process data for CCD 3?

<code>ccd4</code>	no	b	false	yes no
-------------------	----	---	-------	----------

Process data for CCD 4?

<code>ccd5</code>	no	b	false	yes no
-------------------	----	---	-------	----------



Process data for CCD 5?

ccd6	no	b	false	yes	no
-------------	----	---	-------	-----	----

Process data for CCD 6?

ccd7	no	b	false	yes	no
-------------	----	---	-------	-----	----

Process data for CCD 7?

selectmodes	no	b	true	yes	no
--------------------	----	---	------	-----	----

Select the modes to process? false = process all modes.

imaging	no	b	true	yes	no
----------------	----	---	------	-----	----

Process imaging mode exposure?

rimaging	no	b	true	yes	no
-----------------	----	---	------	-----	----

Process reduced imaging mode exposure?

timing	no	b	true	yes	no
---------------	----	---	------	-----	----

Process timing mode exposures?

ctiming	no	b	false	yes	no
----------------	----	---	-------	-----	----

Process compressed timing mode exposures?

withgtiset	no	b	false	yes	no
-------------------	----	---	-------	-----	----

Use an external GTI dataset to be used when filtering the data?

gtiset	no	e	gti.ds		
---------------	----	---	--------	--	--

Name of the external GTI dataset to be used when filtering the data.

runhkgtigen	no	b	false	yes	no
--------------------	----	---	-------	-----	----

Generate a GTI dataset based on housekeeping?

runatthkgen	no	b	true	yes	no
--------------------	----	---	------	-----	----

Pre-process attitude data through atthkgen?

referencepointing	no	s	object	nominal	object	mean	median	user
--------------------------	----	---	--------	---------	--------	------	--------	------

Coordinates of the reference pointing used for the calculation of the sky coordinates

ra	no	u	0.0	$\geq 0.0 - \leq 360.0$		
-----------	----	---	-----	-------------------------	--	--

User-specified right ascension of s/c attitude (deg)

dec	no	u	0.0	$\geq -90.0 - \leq 90.0$		
------------	----	---	-----	--------------------------	--	--

User-specified declination of s/c attitude (deg)

posangle	no	u	0.0	$\geq -180.0 - \leq 180.0$		
-----------------	----	---	-----	----------------------------	--	--

User-specified astronomical position angle of s/c attitude (deg)

filterevents	no	b	true	yes	no
---------------------	----	---	------	-----	----

Filter the event lists?

flagfilteredevents	no	b	false	yes	no
---------------------------	----	---	-------	-----	----

Flag the events that match the filter expression instead of removing them?

rungtimerge	no	b	no	yes	no
--------------------	----	---	----	-----	----



Merge GTIs from each CCD

applygti	no	b	true	yes no
-----------------	----	---	------	----------

Apply GTI filter to the event lists?

runevlistcomb	no	b	true	yes no
----------------------	----	---	------	----------

Merge CCD-level event lists into exposure-level event lists (by mode)?

searchforbadpixels	no	b	yes	yes no
---------------------------	----	---	-----	----------

Search for bad pixels?

badpixfindalgo	no	s	embadpixfind	emabadpixfind—badpixfind
-----------------------	----	---	--------------	--------------------------

Algorithm for bad pixels

searchforbadcolumns	no	b	true	yes no
----------------------------	----	---	------	----------

Look for bad columns?

withbadpixgti	no	b	false	yes no
----------------------	----	---	-------	----------

Search for bad pixels only in the given good time intervals?

badpixgti	no	e	bapixgti.ds	
------------------	----	---	-------------	--

Good time intervals to use while searching for bad pixels.

thresholdlabel	no	s	rate	peak—rate—counts
-----------------------	----	---	------	------------------

Thresholds choice - as percentage of PEAK, as count RATE or pure COUNTS [!badpixfind]

lothresh	no	r	0.0	≥ 0.0
-----------------	----	---	-----	------------

Low threshold to search for dead pixels [badpixfind]

hithresh	no	r	0.005	≥ 0.0
-----------------	----	---	-------	------------

High threshold to search for hot pixels [!badpixfind]

columnsearchlabel	no	s	median	median—total
--------------------------	----	---	--------	--------------

Columnsearch thresholds choice - refer to TOTAL column value or MEDIAN column value [badpixfind]

locolthresh	no	r	0.0	≥ 0.0
--------------------	----	---	-----	------------

Low threshold to search for dead columns [badpixfind]

hicolthresh	no	r	0.002	≥ 0.0
--------------------	----	---	-------	------------

High threshold to search for hot columns [badpixfind]

flickertimesteps	no	i	1	≥ 1
-------------------------	----	---	---	----------

Number of timesteps to search for flickering pixels [badpixfind]

flickerksthresh	no	r	0.55	$\geq 0 - \leq 1$
------------------------	----	---	------	-------------------

K-S threshold for low count flickering pixels [badpixfind]

flickerchisqthresh	no	r	15.0	≥ 0
---------------------------	----	---	------	----------

Reduced Chi-sq threshold for high count flickering pixels [badpixfind]

backgroundrate	no	r	-1	none
-----------------------	----	---	----	------

Background rate (ct/s/pix) - if negative, mean over entire field assumed [!badpixfind]

narrowerthanpsf	no	r	3	≥ 0.0
------------------------	----	---	---	------------



PSF-pixel(s) comparison - 1:equal to PSF, i 1:more compact [!badpixfind]

threshabovebackground	no	b	no	yes	no
------------------------------	----	---	----	-----	----

High thresholds as values above background [badpixfind]

loenergythresh	no	r	0	$\geq 0 - \leq 30.0$
-----------------------	----	---	---	----------------------

Low energy threshold for searching (keV) [badpixfind]

hienergythresh	no	r	30.0	$\geq 0 - \leq 30.0$
-----------------------	----	---	------	----------------------

Hi energy threshold for searching (keV) [badpixfind]

useccfdarkframe	no	b	no	yes	no
------------------------	----	---	----	-----	----

Use dark frame in CCF [emenergy]

randomizeenergy	no	b	yes	yes	no
------------------------	----	---	-----	-----	----

Randomize PHA within one ADU bin [emenergy]

keepsifluor	no	b	no	yes	no
--------------------	----	---	----	-----	----

Keep as one event diagonals with Si fluorescence [emevents]

randomizeposition	no	b	yes	yes	no
--------------------------	----	---	-----	-----	----

Randomize DETX/DETY within one pixel [emevents]

rejectrows	no	b	yes	yes	no
-------------------	----	---	-----	-----	----

Throw away rows/frames with too many events [emevents]

maxeventsperrrow	no	i	4	≥ 1
-------------------------	----	---	---	----------

Maximum number of events per row/frame [emevents]

randomizetime	no	b	true	yes	no
----------------------	----	---	------	-----	----

Randomize TIME within one frame [!emevents]

withsrccoords	no	b	no	yes	no
----------------------	----	---	----	-----	----

Provide source coordinates (Timing only) [emframes]

srcra	no	u	0.	none
--------------	----	---	----	------

Source right ascension (J2000) [emframes]

srcdec	no	u	0.	none
---------------	----	---	----	------

Source declination (J2000) [emframes]

withparameters	no	b	false	yes	no
-----------------------	----	---	-------	-----	----

Specify explicit list of HK parameters? [hkgtigen]

parameters	no	S		
-------------------	----	---	--	--

List of HK parameters to consider [hkgtigen]

except	no	b	false	yes	no
---------------	----	---	-------	-----	----

Consider all parameters except those specified [hkgtigen]

withoverrideparameters	no	b	false	yes	no
-------------------------------	----	---	-------	-----	----

Specify list of additional parameters? [hkgtigen]

overrideparameters	no	S		
---------------------------	----	---	--	--



List of override/additional parameters [hkgtigen]

findlowener	no	b	yes	yes	no
--------------------	----	---	-----	-----	----

Additional run of embadpixfind below 500 eV.

analyzingSciSimdata	no	S		
----------------------------	----	---	--	--

Set up the configuration to analyze SciSim data with emproc

5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

SubTaskError (*warning*)

emproc has detected an error from one of the sub-tasks.

corrective action: The processing of the current data set is abandoned.

NoEventListsToMerge (*warning*)

There are no event lists to merge into an exposure-level data set. This can be caused by errors in some of the tasks. Examine the output of **emproc**. See also the warning **SubTaskError**.

corrective action: none

IntermediateEventListsNotRemoved (*warning*)

The user set **runevlistcomb** and **removeintermediateeventlists** to **true**, and the event list combination stage failed. As a consequence **emproc** does not remove the intermediate event lists.

corrective action: The intermediate event lists are not removed.

References