epnoise

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Abstract

Algorithm to reject soft X-ray noise in the EPIC-pn camera

1 Instruments/Modes

Instrument	Mode
EPIC PN	IMAGING

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

3.1 General

epniose task removes soft X-ray noisy frames from EPIC-pn camera.

The task calculates the number of events per frame between 20 to 30 adu and removes those frames above a certain thershold defined by `noisecut` parameter. Once the noisy frames have been removed, the exposure time is updated accordingly.

To do this filtering, the **epnoise** task logic has been divided in two different steps.

During the first step, **epnoise** is run using as input the output files of **epframes** and **badpixfind** tasks. Then, **epnoise** identify the noisy frames, creates or updates the column NEVT_FRM, containing the number of events per frame and CCD with PHA values below a certain threshold, and write keywords containing sugestions for subsequent filtering. Where the keywords are:

- LAMBDA: lambda of poissonian fit
- NORM: normalization of poissonian fit
- NEVT_CUT:suggested cut value (”10
- NEVT_ALT: alternative cut value (1.0)

Pixels which are affected by bright celestial sources in this energy range are removed through a mask generation. To create this mask for removing bright sources, epnoise calculate the median of the full image and apply a cut using the `sigmacut` parameter. Then a mask for badpixel is created and added to the previous mask. The `savemasks` parameter writes to disk the masks of all CCDs.

After this first step of **epnoise**, the rest of the EPIC-pn processing chain is executed, propagating the new column (NEVT_FRM) and the new keywords (LAMBDA,NORM,NEVT_CUT,NEVT_ALT).

During the second step, **epnoise** filter the final event list using the NEVT_CUT threshold for each CCD. The **epnosie** filter the final event list cretaing the following expression per CCD (NEVT_FRM >= NEVT_CUT). Update the STDGTI extension adding the gaps corresponding to the frames that have been removed. Then, update the ONTIME and LIVETIME keywords.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
set	yes	filename		

Name of the epframes output file

eventSet	no	filename		

Name of the calibrated event file

identifynoisyframes	no	boolean	yes	yes—no

Identify Noisy Frames?

applyfilter	no	boolean	no	yes—no

Keep output of filtering process?

sigmacut	no	real	3.0	

Sigma cut for bright sources

noisecut	no	int	2	>0

Noise cut (maximum allowed number of soft events in frame)

savemasks	no	boolean	no	yes—no

Save CCDs mask to a file

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.

MissingParameter *(error)*
Missing input file name

TooManyFrames *(error)*
Too many frames while computingcounting the events per frames.

RawEventFileEmpty *(error)*
epframes output file is empty

NoisyEventsEmpty *(warning)*
None noisy events filtered.
corrective action: Check the NEVT_CUT value.

6 Input Files

1. The output file of **epframes** + **badpixfind** tasks (step 1).
2. The previous files (one for each CCD) + filtered event list (step 2).

7 Output Files

1. Event file with soft X-ray noisy filtered.

8 Algorithm

```
do i = 1,nfiles
  call identifynoisyframes [step1]
    open file
    call framecounter
    call ftpois
      call dpoiss
        call factrl
          call gammln
```

```
    call epnoisemask
      call createNoisyMask
    call framecounter
    call ftpois
      call dpoiss
        call factrl
          call gammln
    close file
    call writeInfo
  call removenoisyframes [step2]
enddo
call filterEventfile [step2]
```

9 Comments

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References