mosback

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Abstract

This task creates model particle background spectra and images (if selected with a non-zero energy range) for the selected region from the intermediate files produced from *mosspectra*. The resultant image is in detector coordinates which is then transformed into sky coordinates by the SAS task *rotdet2sky*. *mosback* creates a QDP plot file which shows the source and model background spectra for the observation. Any enhancement of the data over the particle background model at higher energies probably indicates residual soft proton contamination, unless there are really hard and bright sources in the field. This task was originally a subtask of the SAS *esas* task named *mos_back* prior to SAS-21 and retains all of its functionality.

1   Instruments/Modes

Instrument	Mode
EPIC	Imaging

2   Use

pipeline processing	no
interactive analysis	yes

3   Description

This task creates model particle background spectra and images (if selected with a non-zero energy range) for the selected region from the intermediate files produced from *mosspectra*. The resultant image is in detector coordinates. The resultant image is in detector coordinates which is transformed into sky coordinates by the sas task *rotdet2sky*. *mosback* creates several QDP plot files which shows the source and model background spectra for the observation and other diagnostics. Any enhancement of the data over the particle background model at higher energies probably indicates residual soft proton contamination, unless there are really hard and bright sources in the field.

Warning and requirements: *mosback* is part of the *esas* package integrated into SAS, but it is limited to work within the *esas* data reduction scheme. This is specially true wrt the structure and names of the input files. In particular, *mosback* assumes that another task from the package, *mosspectra* has been successfully run for the exposures to be used.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
inspecfile	yes	dataset		mos1S001-fovt.pi

Spectral file (e.g. mos1S001-fovt.pi) from mosspectra.

outspecfile	no	dataset	'default'	

Output spectral file (will derive one if not given)

rmffile	no	dataset	'default'	

Input response file (will derive one if not given)

withplotfiles	no	boolean	yes	T/F

Diagnostic output control (write QDP plotfiles?)

inimgfile	no	dataset	'default'	

Input template image filename (will derive if not given)

outimgfile	no	dataset	'default'	

Output bkg image filename (will derive if not given)

elow	yes	int	400	

Energy low limit (in eV) for the band.

ehigh	yes	int	1250	

Energy high limit (in eV) for the band.

ccds	yes	boolean	yes	T/F

Select ccds to be included.

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.

notM1orM2 *(error)*
    Instrument in input SPEC must be M1 or M2

badArrDims *(error)*
    Input image not 780x780

wrongOrbit *(error)*
    By-ccd spectra not from same revolut as obs spectra

NoCorDataCCD1model *(error)*
    No corner data for chip 1 model

NoDataChipN *(error)*
    No data to create a spectrum for chip N

NoPseudoCCD1cnts *(error)*
    No counts for the pseudo CCD1 corner spec

GoldGaps *(error)*
    Chip 1 background has gold gaps - no CCD3 or CCD7 data

noQPB *(error)*
    CAL QPB file does not contain QPB extension

badColumn *(error)*
    QPB file is missing critical column

noGoodRows *(error)*
    No QPB file rows meet augmentation criteria

NOspecCCDn *(warning)*
    Skip inclusion of CCD
    corrective action: Specfile CCDn missing

6   Input Files

Generally the input files are outputs from the sas task `mosspectra`

- Spectrum from mosspectra (e.g. mos1S001-fovt.pi)

- Response file (e.g. mos1S001.rmf)

- Template image if bkg image produced is desired.

7   Output Files

For the different values of `comp`, the output files are:

- A QDP plot file showing the selected region of hardness/count rate distributions for the various ccds. E.g. mos1S001-augindiv.qdp

- A QDP plot file showing the normalized model background spectrum. E.g. mos1S001-bkgspec.qdp

- A QDP plot file showing the accumulating background spectrum. Chip 1 at the bottom increasing upwards. E.g. mos1S001-bkgaccum.qdp

- A QDP plot file showing the observed spectrum and the model background spectrum. E.g. mos1S001-augspec.qdp

- A QDP plot file showing the the fit for the Al-Si bridge. E.g. mos1S001-bridgefit.qdp

- The model particle background image for the given exposure, selected energy band (`elow` and `ehigh`), and the selected region. The image is in detector coordinates. E.g. mos1S001-bkgimdet-elow-ehigh.fits.

- The model particle background spectrum for the *prefix* exposure and the selected region. E.g. mos1S001-bkg.pi

8 Algorithm

```
Read parameters
Open and read input spectrum file header
Open and read QPB calibration file
if (withplotfiles) open LUNs for ASCII QDP output
Set outer CCFs which will be used as cognates for central CCD
Read in actual input spectrum
Open and read RMF
Set channel ranges for several energy bands (e.g. Au contamination)
do i=1,7 (nCCDs)
 if (selected) then
  Read in FOV spec for CCDi (areafov(i) and expofov(i))
 endif
enddo
do i=1,7 (nCCDs)
 if (selected) then
  Read in FWC spec for CCDi (areafwc(i) and expofwc(i))
  Normalize specFWC(1:4096,i) and specFWCunc(1:4096,i)
 endif
enddo
Remove any chip's data that has less area than limiting area
do i=2,7 Object corner data
 if (selected) then
  Read in Obj Corner spec for CCDi (areacoro(i) and expocoro(i))
  Calculate hardness
  Augment spectra
  Write augmented spectra to output file
 endif
enddo
if (ccd1 selected) then
 create mask for normalizing center chip's spectrum
 determine how many similar chips have data
endif
do i=2,7 FWC corner data
 if (selected) then
  Read in FWC Corner spec for CCDi (areafwcc(i) and expofwcc(i))
 endif
enddo
if (ccd1 selected) then
 create corner spectrum for the center chip
endif
do i=2,7
 Create ratio of obj/corner for FWC data
enddo
```

```
if (ccd1 selected) then
 Determine if center chip has gold gaps
endif
Create masks to remove strong instrumental lines
Remove Al-Si line from all spectra
do i=1,7
 if (withplotfiles) write spectra to QDP output files
  Read in FWC images
  FWC images by ccd are accumulated for the output bkg image
  Write by ccd FWC images (e.g. mos1S001-fwcimccdN-elow-ehigh.fits)
enddo
if (withplotfiles) close some QDP files
Search for and eliminate hot pixels
if (withplotfiles) then
 create output bkg spec QDP file
 write bkg spec to QDP file
 close QDP file
endif
 open output diagnostic bkg image
 write bkg image
 close bkg image
Bridge the Al-Si gap
Fit the spectrum (KDK: describe polfit routine here)
if (withplotfiles) write the bridged spectrum to QDP
Finish the bridge (KDK: describe here)
if (withplotfiles) write augmented spectrum to QDP
Create and open template output bkg spectrum
write created bkg spectrum to FITS
 close FITS
```

9   Comments

The original code for this task appeared in the *esas* task 2009-2021 as the subtask *mos_back*. It was removed from the task *esas*, and modularized as a single task for SAS-21. The *esas* task was removed in SAS-21.

References