specadd

August 15, 2005

Abstract

It creates a multiple X-ray spectrum FITS file either by stacking or putting together two single spectrum files or by stacking a single spectrum on top of an existing multiple spectrum file.

1 Instruments/Modes

Instrument	Mode
EPIC-MOS	Imaging
EPIC-MOS	Timing
EPIC-pn	Imaging
EPIC-pn	Timing

2 Use

pipeline processing	no
interactive analysis	yes

3 Description

specadd creates a multiple X-ray spectrum FITS file by stacking or putting together ("adding") two single spectrum files. It can also be used to add a single spectrum file to an already existing multiple spectrum file.

This type of spectral files is particularly useful when the user wants to simultaneously analyse different observations of the same object carried out with the same instrument or with different instruments. It would be easier to handle a large number of spectral datasets if they form a single data file than if they reside in different spectral files. For example, ten observations (performed with the same instrument and at the same observing mode) of a source taken at different epochs would require to handle ten different spectral files to be able to attach a different response file to every epoch. This would happen also if the user wants to analyse the spectra of a source taken with different instruments (example MOS1 and MOS2).

With a multiple spectrum file all the spectra could be stored together (in a unique file) since the response files (ancilliary and redistribution matrix) and background files are attached to every single spectrum.

The Data extension for a multiple spectral dataset stores one single spectrum per row, instead of one channel per row as it is the case of single spectrum files. It has at least the three mandatory columns: SPEC_NUM (scalar giving the reference number of the spectrum in the particular row), CHANNEL (variable length array column containing channel numbers for the spectra in the COUNTS column),COUNTS (variable length array column with the count values observed in each channel). Other columns (STAT_ERR (variable length array column giving the statistical error of COUNTS), ROWID, QUALITY, GROUPING,BACKFILE, BACKSCAL, CORRFILE, CORRSCAL, RESPFILE, ANCRFILE, ANCRFILE) are optional and they can be substituted by keywords if all the spectra share these values (i.e., same background file, same response file, etc.). This is the default case for STAT_ERR. Provided that none of the input spectra have this column, the output multiple spectral file will substitute it by a keyword POISSERR=T within the extension header. **specadd** will keep the remaining optional and mandatory columns as columns to provide the highest flexibility. This will allow the user, for example, to attach a different response or background file to each of the spectra being considered.

The resulting multiple spectrum file that can be read into XspecV.10 and higher.

Example: there are three observations of a source with three different instruments the user wants to analyse simultaneously (it is left to the user the decision of which type of simultaneous analysis is scientifically correct). The observations were carried out with MOS1 (specm1.fits), MOS2 (specm2.fits) and PN (specpn.fits). The single spectra should have their ANCRFILE, RESPFILE keywords filled out with their respective response matrices so that **specadd** can write these names in the appropriate columns.

The first step would be adding two of the single spectrum files into a multiple spectrum file. Then the third single spectrum and this newly created file could be added together.

```
specadd sets=''specm1.fits specm2.fits'' useoldsumset=false sumset=''specm1m2.fits''

specadd sets=''specpn.fits'' useolsumset=true oldsumset=''specm1m2.fits''
sumset=''specm1m2pn.fits''
```

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
sets	yes	filename	spectrum_s1.fits spectrum_s2.fits	

List with the single spectrum files to be "added"

useoldsumset	no	boolean	false	

If true, an existing multiple spectrum set will be included in the output set

oldsumset	no	filename	spectrum_mold.fits	

Existing multiple spectrum set that will be included in the output set

sumset	yes	filename	spectrum_mnew.fits	

Name of output multiple spectrum set

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.

NotSpecFile *(fatal)*
Files in `sets` are not spectral files

NotSingleSpecFile *(fatal)*
Any of the files in `sets` is a multiple spectrum file

NotMultipleSpecFile *(fatal)*
File in `oldsumset` is a single spectrum file

NoExposure *(warning)*
Input spectral file has no `EXPOSURE` attribute. Taking exposure value:1.00E+00
corrective action:

6 Input Files

1. `sets` List of FITS single spectrum files
2. `oldsumset` Input multiple spectrum FITS file

7 Output Files

1. `sumset` Multiple spectrum FITS file

8 Algorithm

specadd is a F90 module which does the following

```
module specadd

Read input sets

Check that they are spectral files

Create an output multiple spectrum file
```

```
If (useoldsumset) is true

    copy oldsumset in output sumset

    create those columns not present in oldsumset
else

    create all necessary columns

endif

Insert n (n=numberOfSingleSpectra) new rows in sumset

For each of the n single spectra in sets

     add  single spectrum to sumset

End

end module  specadd
```

9 Comments

10 Future developments

References