



# rgsspecplot

April 16, 2023

## Abstract

Produces annotated display of RGS spectra

## 1 Instruments/Modes

RGS	Spectroscopy
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## 2 Use

pipeline processing	yes
interactive analysis	yes

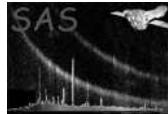
## 3 Description

This task plots the first and second order spectra (Counts/channel versus BETA CHANNEL) for an RGS source, overlaying the source dependent energy and wavelength scales if the data are provided in radians or counts/channel against wavelength if the data are provided in wavelength space. The data can be represented in original format, or rebinned, to contain a minimum number of counts (specified by the user) per bin. In this case, the counts/channel for each bin are plotted versus the centre of that bin, as a histogram. The error values are plotted in gray and are always the square root of the counts. Details of the observation and source are also plotted. Any valid PGPlot graphics device may be specified for the output.

### 3.1 Examples

To create a postscript plot, called plot.ps, which contains the first and second order spectra for source 1, where the spectra have been rebinned to contain at least 10 counts per bin, a command such as,

```
rgsspecplot spectrumsets="SPECTRUM0101.FIT SPECTRUM0102.FIT" sourcelistset=rgssources.ds
sourceid=1 plotfile=plot.ps device=/VCPS rebin=yes mincounts=10
```



can be used.

## 4 Parameters

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

Parameter	Mand	Type	Default	Constraints
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<b>spectrumsets</b>	yes	string		
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Input spectrum files list to be plotted. These are output from the **evselect** or **rgsproc** List: first\_order.fits second\_order.fits (until DSS procedures are implemented).

<b>sourcelistset</b>	yes	string		
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Input RGS source list file (required until DSS procedures are implemented).

<b>sourceid</b>	no	integer	1	constraints
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source number in sourcelist to be used for wavelength/energy scales (until DSS procedures are implemented).

<b>group</b>	no	Boolean	False	constraints
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Should the spectrum be grouped according to the existing grouping column?

<b>device</b>	no	string	/XW	
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A valid PGPLOT graphics device for the output (e.g /XSERVE, /VCPS)

<b>plotfile</b>	no	string		
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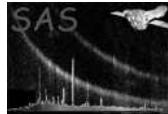
Name of hardcopy plot filename

<b>rebin</b>	no	Boolean	False	constraints
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Rebin the data to contain mincounts/bin?

<b>mincounts</b>	no	integer		constraints
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Minimum number of counts per bin



## 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.

**badDevice (error)**

Unrecognized PG PLOT device

**Incorrect number of spectrum sets given (error)**

Has to be either 1 or 2

**No plot file supplied (error)**

Hard copy device selected

**Plot file already exists (error)**

SAS-CLOBBER set

**Surplus filename (warning)**

plotfile parameter value ignored

*corrective action:* -

**Rebin requested to be less than 1 (warning)**

No rebinning will take place

*corrective action:* -

**Rebinning results in less than 5 bins (warning)**

Replacing minimum counts per bin by a smaller number

*corrective action:* -

**Keyword HDUCLAS2 missing (warning)**

*corrective action:* -

**Keyword TCUNI1 missing (warning)**

*corrective action:* -

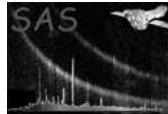
**Average counts per bin less than 1 (warning)**

Replacing minimum counts per bin by (counts specified)

*corrective action:* -

## 6 Input Files

1. RGS order/source specific spectrum files (output of **evselect** or **rgsproc**)
1. RGS source list file (output of **rgsregion**)



## 7 Output Files

1. Hardcopy plot (optional)

## 8 Algorithm

```
subroutine rgsspecplot
```

```
  For each spectrum
```

```
    Get observation details from KEYWORDS  
    Get source details from KEYWORDS
```

```
    Get a handle on CHANNELS, COUNTS/RATE and GROUPING columns
```

```
    if (group) then group CHANNELS
```

```
    if (rebin) then rebin to a minimum counts/bin, specified by the user
```

```
    Plot spectrum
```

```
    Plot chip boundaries
```

```
    Plot source dependent energy and wavelength scales using RGSLIB call lambda2beta (if spectrum
```

```
        betaCor = lambda2Beta(wavelength, order, offaxis(1))
```

```
    end loop
```

```
end subroutine rgsspecplot
```

## 9 Comments

Error checking for file consistency also required until DSS implemented.

## 10 Future developments

Once the DataSubSpace has been implemented the code should access the following source-dependent data from the extraction region file stored in the DSS of the spectrum file. The required keywords will be/are added by **rgsregion**.

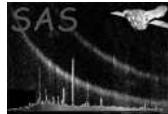
1. off-axis angle
2. sourceID



### 3. orderID

The sourcelist and sourceid command line parameters will become defunct.

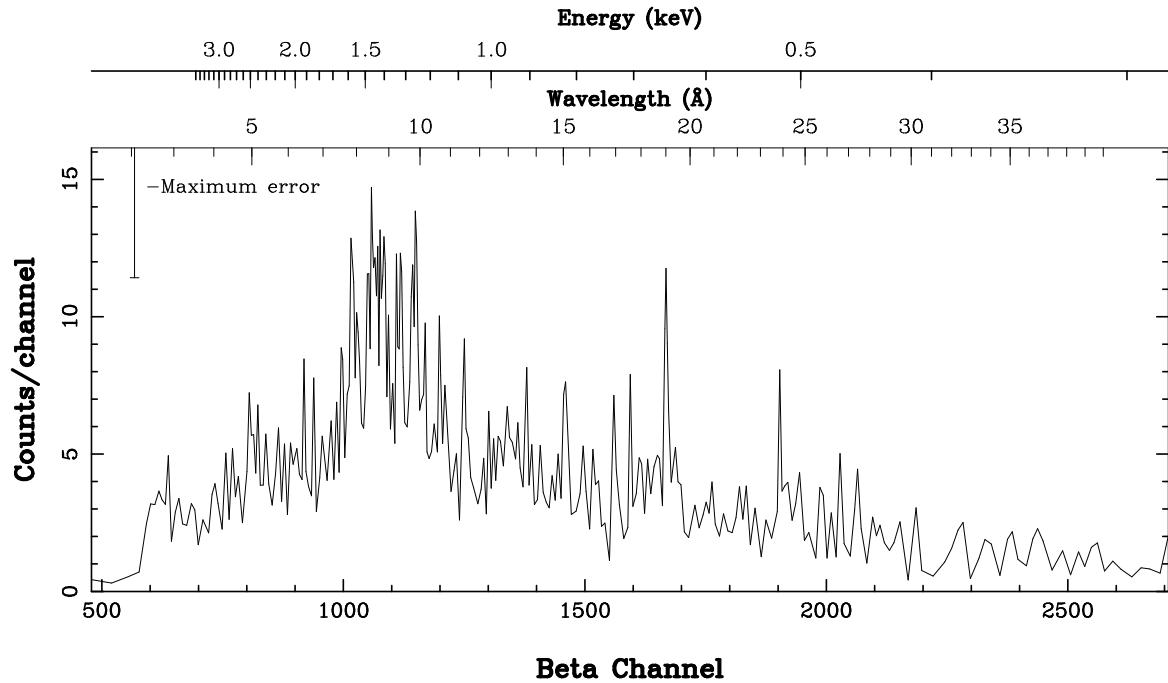
## References



XMM - RGS1 - OBJECT: Indef - RA: Indef - DEC: Indef  
EXP-ID 0123900101001 Exp. Time: 44890

DATE-OBS 2000-05-11T01:50:29  
DATE-END 2000-05-11T14:20:44

SOURCE ID 1 SPECTRUM ORDER 1  
NET SPECTRUM

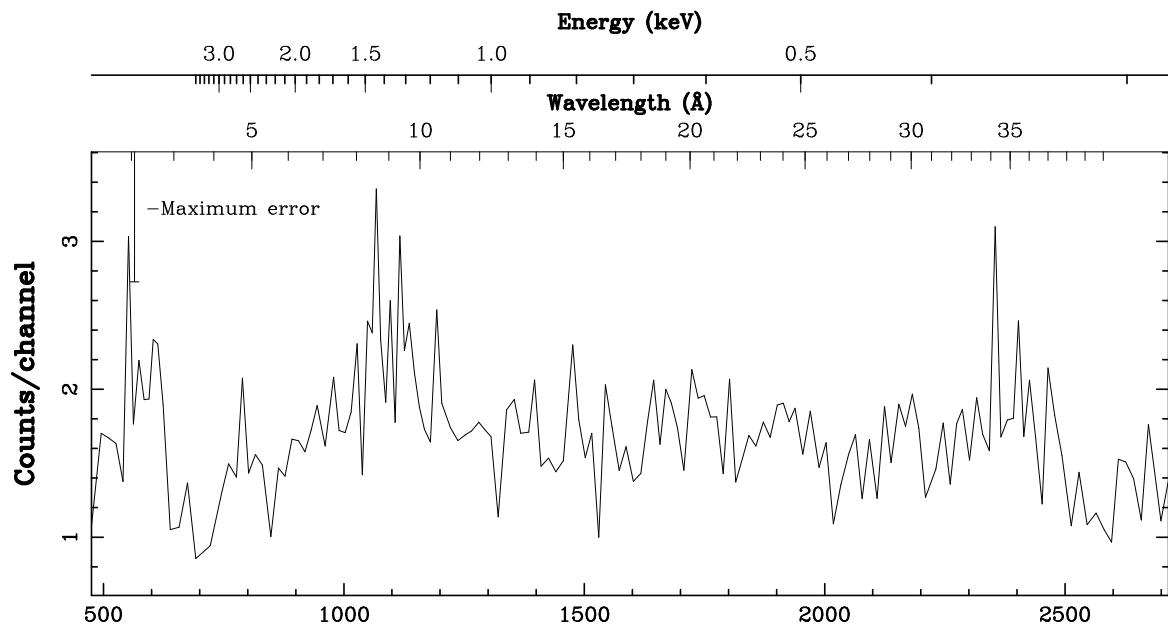


Beta Channel

XMM - RGS1 - OBJECT: Indef - RA: Indef - DEC: Indef  
EXP-ID 0123900101001 Exp. Time: 44890

DATE-OBS 2000-05-11T01:50:29  
DATE-END 2000-05-11T14:20:44

SOURCE ID 1 SPECTRUM ORDER 1  
BACKGROUND SPECTRUM



rgsspecplot v2.16.1

Beta Channel

Figure 1: Examples of RGSSPEC PPS product: Plot showing both spectra plots.