



# rgsimplot

January 27, 2025

## Abstract

Displays RGS Spectroscopy diagnostic plots.

## 1 Instruments/Modes

Instrument	Mode
RGS	Baseline Spectroscopy
RGS	High Time-resolution Spectroscopy

## 2 Use

pipeline processing	yes
interactive analysis	yes

## 3 Description

This task displays an RGS Spectroscopy spatial–dispersion plot (displaying photon position in beta or lambda space) and an energy–dispersion plot (displaying photon energy against beta angle or lambda in the dispersion direction) created from an RGS event list by **evselect**. These plots provide extremely useful diagnostics of RGS spectroscopy data, allowing the user to gauge the potential cross-contamination of the RGS orders by pileup, scattering and partial events.

Details of the observation are also displayed in each plot. These include the observation and exposure IDs and the observation start and stop times.

The plots may be displayed in monotone or using a number of colour tables (e.g grey-scale, rainbow, heat), and any valid PGPLOT graphics device may be specified for the output. A linear, sqrt or logarithmic colour mapping can be specified by the user.

**rgsregions** extraction region files are overlaid on the energy–dispersion and spatial–dispersion plots. Examples of these are shown in Figure 1. in which a spatial extraction region and order extraction regions are overlaid on the full images.

rgsimplot produces an energy-dispersion plot in a format defined by the device parameter.



## 4 Parameters

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

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

<b>withspatialset</b>	no	boolean	T	
-----------------------	----	---------	---	--

Is a spatial–dispersion imageset going to be given to the task?

<b>spatialset</b>	no	string		
-------------------	----	--------	--	--

Input spatial dispersion image (output of **evselect**)

<b>withendispset</b>	no	boolean	T	
----------------------	----	---------	---	--

Is an energy–dispersion imageset going to be given to the task?

<b>endispset</b>	no	string		
------------------	----	--------	--	--

Input Energy–dispersion image (output of **evselect**)

<b>srclistset</b>	no	string		
-------------------	----	--------	--	--

Input sourcelist (produced by **rgssources**) containing source dependent extraction regions produced by **rgsregions**.

<b>orderlist</b>	no	string		
------------------	----	--------	--	--

List of orders to be displayed.

<b>withspatialregionsets</b>	no	boolean	T	
------------------------------	----	---------	---	--

If **withspatialregionsets** is true then the spatial extraction region for the source specified by **sourceid** will be read from the sourcelist and overlaid on the spatial–dispersion plot.

<b>withendispreionsets</b>	no	boolean	T	
----------------------------	----	---------	---	--

If **withendispreionsets** is true then the order extraction regions for the first two orders of the source specified by **sourceid** will be read from the sourcelist and overlaid on the energy–dispersion plot.

<b>srcidlist</b>	no	string		
------------------	----	--------	--	--

List of Source IDs in **srclistset** used to acquire source dependent extraction regions.



<b>plotfile</b>	no	string		
-----------------	----	--------	--	--

Name of hard copy plot file.

<b>device</b>	no	string	/XW	
---------------	----	--------	-----	--

A valid PGPLOT graphics device for the output (e.g /XSERVE, /CPS)

<b>invert</b>	no	boolean	False	
---------------	----	---------	-------	--

Invert colour table?

<b>colourmap</b>	no	string	LOG	
------------------	----	--------	-----	--

Choose a colour mapping type. either LIN, SQRT or LOG.

<b>colour</b>	no	integer	1	1-6
---------------	----	---------	---	-----

Defines the palette type to be used (gray scale, rainbow, heat, IRAF, AIPS, TJP)

<b>paperxmin</b>	no	real	0.1	0.0-1.0
------------------	----	------	-----	---------

Defines the position on the page of the bottom left corner of the image.

<b>paperymax</b>	no	real	0.15	0.0-1.0
------------------	----	------	------	---------

Defines the position on the page of the top left corner of the image.

<b>paperxmax</b>	no	real	0.89	0.0-1.0
------------------	----	------	------	---------

Defines the position on the page of the bottom right corner of the image.

<b>paperymax</b>	no	real	0.8	0.0-1.0
------------------	----	------	-----	---------

Defines the position on the page of the top right corner of the image.

## 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.



**Unable to plot the coordinates of more than 3 sources** (*warning*)

*corrective action:*

**Unable to plot more than 11 fits regions in different colours** (*warning*)

*corrective action:* Rest drawn in black

**Failed to delete temporary file** (*warning*)

Warn user

*corrective action:*

**No spatial set supplied** (*fatal*)

Spatial plot requested - not supplied

**No energy dispersion supplied** (*fatal*)

Energy dispersion requested

**No Source list provided** (*fatal*)

Region sets requested

**No plot file supplied** (*fatal*)

Hard copy device selected

**Plot file already exists** (*fatal*)

SAS-CLOBBER set

**Unrecognised PGPLOT device** (*fatal*)

value in device parameter not recognised

**Nothing to plot** (*fatal*)

no plots chosen

**Invalid graph size** (*fatal*)

paperxmin=paperxmax

**Invalid graph size** (*fatal*)

paperymax=paperymin

## 6 Input Files

1. PPS RGS Spatial–Dispersion FITS Image (output from `evselect`)
1. PPS RGS Energy–Dispersion FITS Image (output from `evselect`)
1. RGS FITS sourcelist (output from `regsregions`)

## 7 Output Files

1. RGS Spectroscopy diagnostic plot.



## 8 Algorithm

```
subroutine rgsimplot

read parameters

check for hardcopy filename if device requires.

set up the plotting page and colourmap

IF spatial and energy--dispersion imageset both available THEN
  split page.
END IF

IF spatial imageset available

  get a handle on the image dataset
  read observation information keywords
  get a handle on the image array
  read plotting information keywords and set up pgplot transformation matrix
  set up plotting window and viewport
  plot the image
  annotate the plotting axis using plotting information keyword values
  annotate plot with observation information

  IF spatial extraction region sets available

    get a handle on the sourcelist dataset
    look for block containing spatial region for designated sources
    from srcids parameter

    IF block present

      if source = srcid parameter

        plot region in red

      else

        plot region in green

      end if

    ENDIF

  END IF

ENDIF

IF energy--dispersion imageset available

  get a handle on the image dataset
```



```
read observation information keywords
get a handle on the image array
read plotting information keywords and set up pgplot transformation matrix
set up plotting window and viewport
plot the image
annotate the plotting axis using plotting information keyword values
annotate plot with observation information

IF order extraction region sets available

    get a handle on the sourcelist dataset

    FOR EACH order look for block containing order region for designated source

        IF block present

            if source = srcid parameter

                plot region in red

            else

                plot region in green

            end if

        ENDIF

    END FOR

END IF

ENDIF

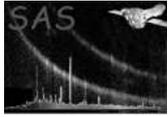
end subroutine rgsimplot
```

## 9 Comments

This task has now become purely a display task. **evselect** creates images from columns in the input eventlist.

## 10 Future developments

- It might be useful to allow the user to overlay more than just the target source extraction regions in order to judge contamination from other sources in the field of view.
- A list of source IDs could be given and looped internally, plotting each additional region with a different colour to the target source and an ID subscript. **–NOW IMPLEMENTED–**

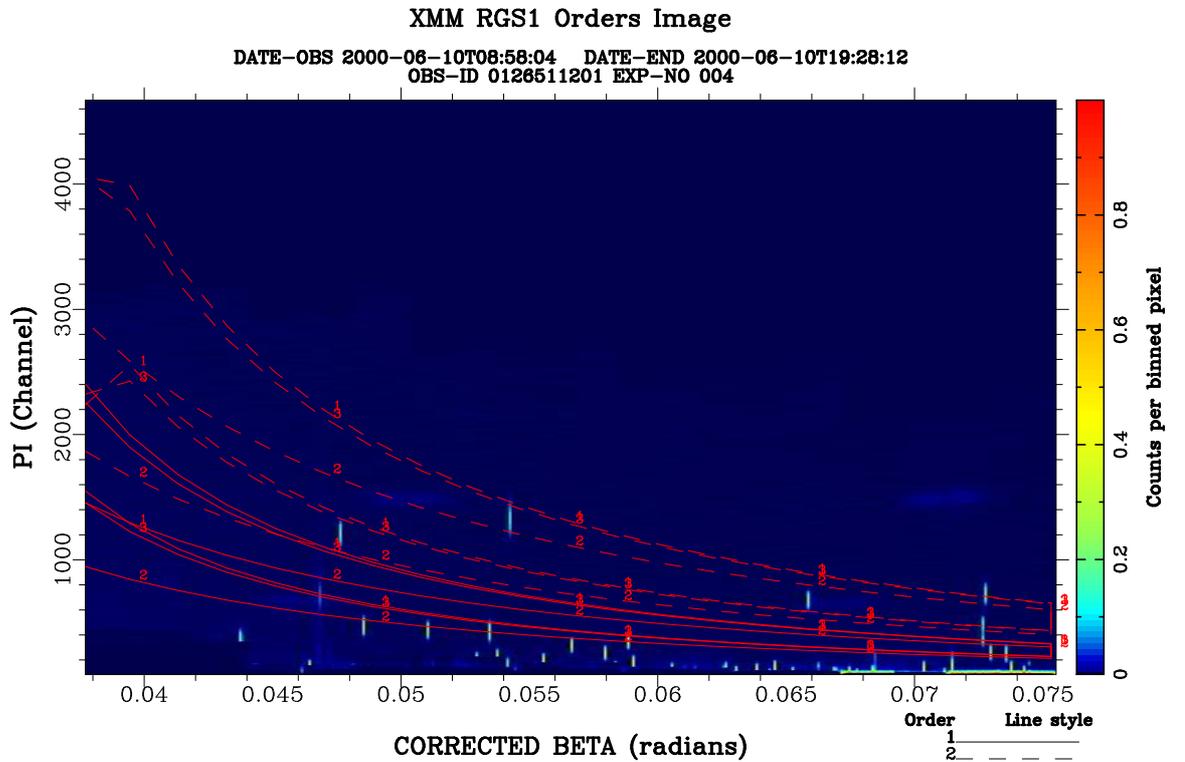
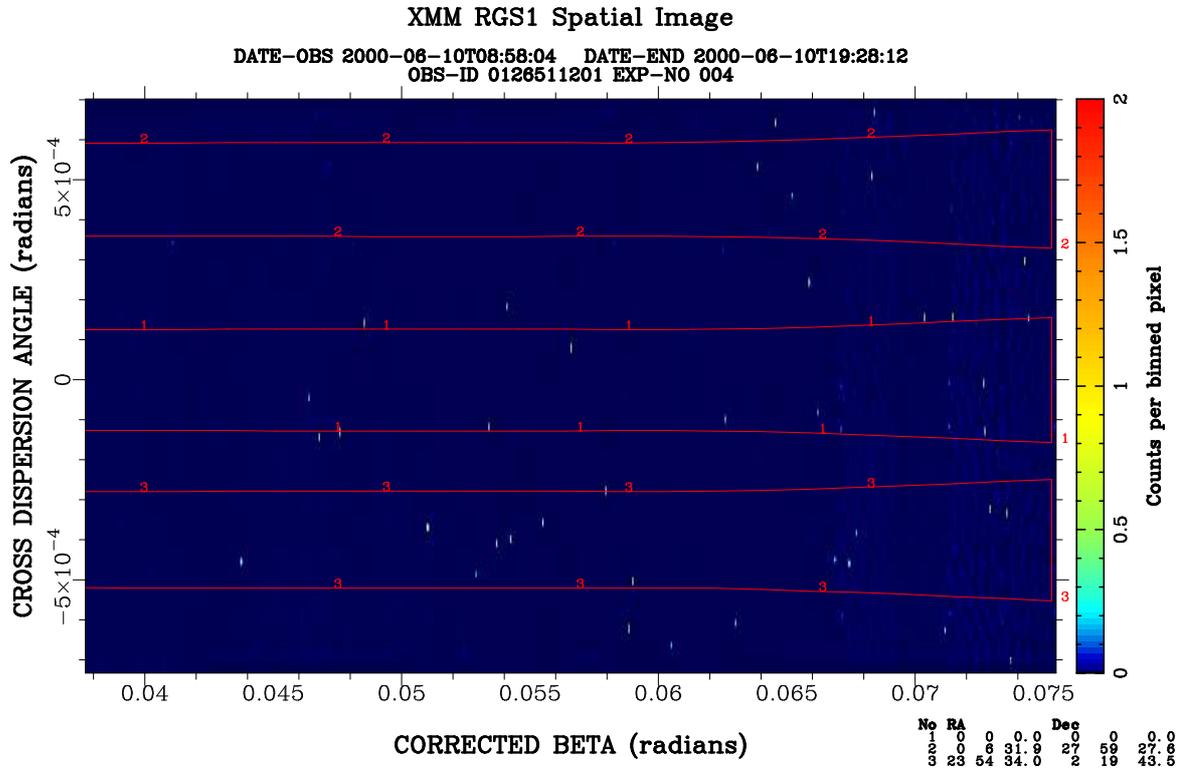


- It might also be useful to add an additional axis Channels describing the channels used to construct the spectrum so that this plot can be compared to the spectral plots produced by **rgsspecplot**.

## 10.1 CAL usage

- None

## References



rsimplot version 1.16

Figure 1: Examples of **rgsimplot** PPS product: Plot showing both diagnostic plots with overlaid extraction regions.