GammaLib - Bug #1848

Modelcube from Table-PSF

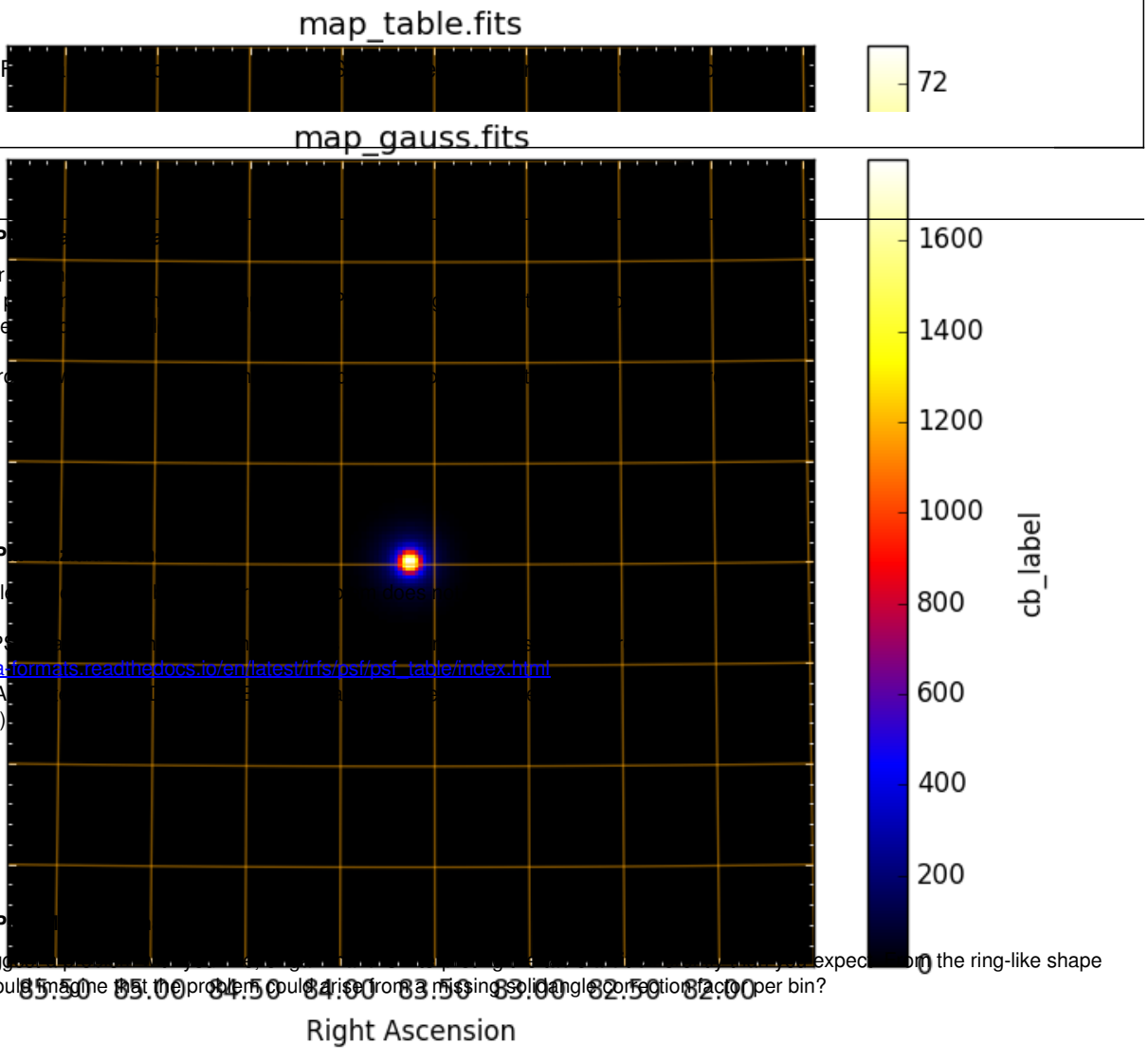
08/29/2016 10:39 AM - Tiziani Domenico

Status:	Closed	**Start date:**	08/29/2016
Priority:	Normal	**Due date:**	
Assigned To:	Knödlseder Jürgen	**% Done:**	100%
Category:		**Estimated time:**	0.00 hour
Target version:	1.2.0		

Description

When generating a model cube for an observation that uses a GCTAPsfTable as IRF,
there seems to be a problem with the calculation of expected counts.
For the model of a point source, the counts at the position of the
source are zero and reach a maximum at some distance.
An exemplary model map looks like this:

Using a gaussian PSF



History

#1 - 08/29/2016 02:03 P

Hi Domenico, thanks for
Can you reproduce this
- $GAMMALIB/inst/cta/te
This way one could narr

#2 - 08/29/2016 02:39 P

OK, with the test-PSF-fil does!

The differences to the PS
http://gamma-astro-data-formats.readthedocs.io/en/latest/irfs/psf/psf_table/index.html
so ENERGY/THETA/RA
1/sr instead of 1/(deg^2)

#3 - 08/29/2016 03:10 P

Ok great, this might sug expec on the ring-like shape on the model maps, I could imagine that the problem could arise from a missing solidangle correction factor per bin?

#4 - 08/29/2016 03:24 PM - Tiziani Domenico

user#77 wrote:

> From the ring-like shape on the model maps, I could imagine that the problem could arise from a missing solidangle correction factor per bin?

I would think so too, but I don't see why it would then work for the "old" file since the conversion from 1/(deg^2) to 1/sr is just a constant factor. So I guess that there is a problem with the different axis order, although I have not been able to locate an issue in the gammalib code yet.

#5 - 08/29/2016 03:31 PM - Mayer Michael

> I would think so too, but I don’t see why it would then work for the “old” file since the conversion from 1/(deg^2) to 1/sr is just a constant factor.

Good point, maybe there is an issue with the increasing solid angle per "RAD" bin? Jürgen should have an idea how the exact requirement in gammalib is.

> So I guess that there is a problem with the different axis order, although I have not been able to locate an issue in the gammalib code yet.

The axes are read in the GCTAPsfTable::read() function ($GAMMALIB/inst/cta/src/GCTAPsfTable.cpp, line 287 in current devel branch). Since gammalib loads the axes by names, the order shouldn't be an issue.

#6 - 08/30/2016 12:53 AM - Knödlseder Jürgen

I would have the same suspicion as Michael. Could you post the PSF file you're using to check the content?

To see if the units are right you may sum over all bins as follows:

sum = sum + PSF(RAD) * sin(RAD) * (RAD_HI - RAD_LO) * 2 * pi

where

RAD = 0.5 * (RAD_LO + RAD_HI)

and the sum should be 1. In this formula sin(RAD) comes from the transformation to polar coordinates. Maybe you have already included the sin(RAD) in your file?

#7 - 08/30/2016 12:39 PM - Tiziani Domenico

- File psf_table_test.fits.gz added

Unfortunately I can not post my PSF file but I changed the file from the gammalib repository accordingly.
You can find the result in the attachment. The problem still occurs with this file.

I checked the sum as described by user#3 and obtained a value of 1 for each energy and offset bin.

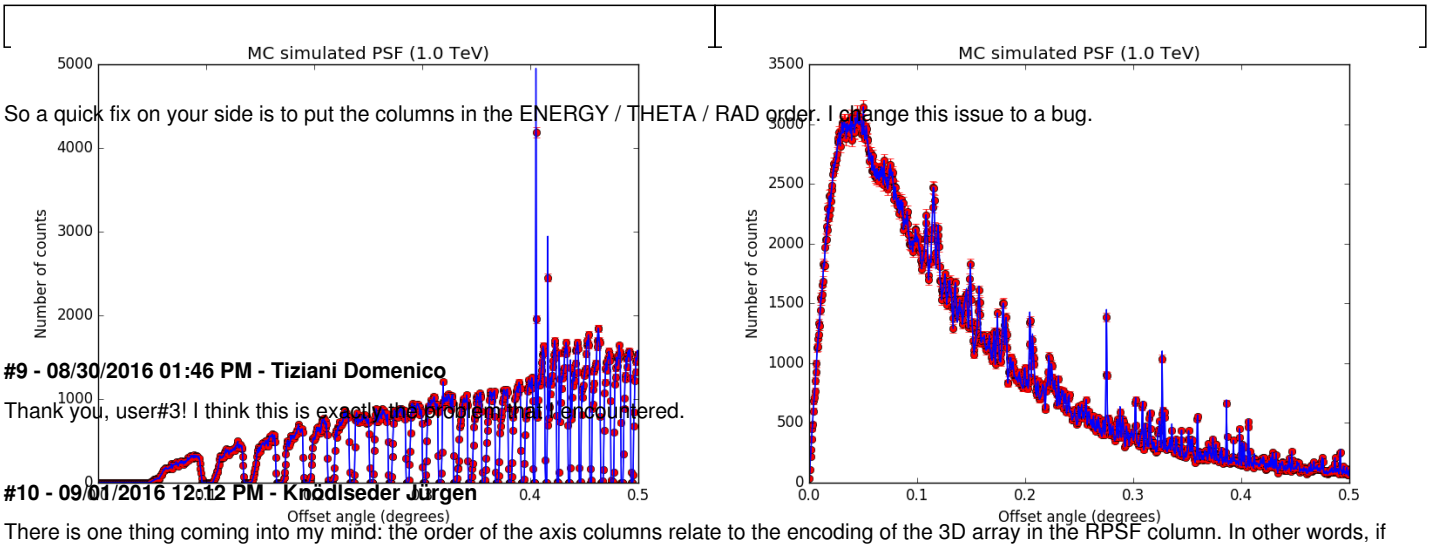
#8 - 08/30/2016 01:27 PM - Knödlseder Jürgen

- File psf_table_original.png added

- File psf_table_modified.png added

- Tracker changed from Support to Bug

I checked the file and confirm that there is a problem with the order of the columns. See the attached plots. The first is with RAD_LO and RAD_HI as first and second columns, the second with RAD_LO and RAD_HI as fifth and sixth columns. Only the later is okay.



So a quick fix on your side is to put the columns in the ENERGY / THETA / RAD order. I change this issue to a bug.

#9 - 08/30/2016 01:46 PM - Tiziani Domenico

Thank you, user#3! I think this is exactly the problem that I encountered.

#10 - 09/01/2016 12:12 PM - Knödlseder Jürgen

There is one thing coming into my mind: the order of the axis columns relate to the encoding of the 3D array in the RPSF column. In other words, if RAD is the first column, the radial axis must be the most rapidly varying axis of the RPSF array. At least in the example file you sent this is not the case, and that's the reason why the file was wrong.

How about the file you are using? Have you encoded the array in the order you defined the axis columns?

#11 - 09/01/2016 01:29 PM - Tiziani Domenico

The file that I am using has exactly the same array encoding and the same order of the axis columns.
You are right, if I change the order to ENERGY / THETA / RAD, everything works fine.

If this relation is a convention for fits files, I should rather adjust the generation of the Table-PSF files.

#12 - 09/26/2016 10:04 AM - Knödlseder Jürgen

Indeed, this is a convention. The order of the axis columns need to reflect the dimension of the table.

#13 - 09/26/2016 11:44 AM - Knödlseder Jürgen

- Status changed from New to Closed

- Assigned To set to Knödlseder Jürgen

- Target version set to 1.2.0

- % Done changed from 0 to 100

I added a check to the GCTAResponseTable class that verifies that the data columns are consistent with the axis columns. I check on the that now an exception is thrown for the test data provided, and that are correct table passes the tests.

Merged into devel.

Files

map_table.png	66.3 KB	08/29/2016	Tiziani Domenico
map_gauss.png	55.5 KB	08/29/2016	Tiziani Domenico
psf_table_test.fits.gz	259 KB	08/30/2016	Tiziani Domenico
psf_table_original.png	84.1 KB	08/30/2016	Knödlseder Jürgen
psf_table_modified.png	89.9 KB	08/30/2016	Knödlseder Jürgen