

GammaLib - Bug #2181

Light curve normalisation is used twice when doing Monte Carlo simulations

08/24/2017 09:15 PM - Knödlseider Jürgen

Status:	Closed	Start date:	08/24/2017
Priority:	Immediate	Due date:	
Assigned To:	Knödlseider Jürgen	% Done:	100%
Category:		Estimated time:	0.00 hour
Target version:	1.4.2		
Description			
While preparing the 1DC test data it appeared that the normalisation may be used twice in the Monte Carlo simulation. This can be tested using ctobssim			

History

#1 - 08/24/2017 09:20 PM - Knödlseider Jürgen

Here a ctobssim analysis that illustrates the problem. The default run gave

```
2017-08-24T19:18:02: MC source photons .....: 3991 [Crab]
2017-08-24T19:18:02: MC source events .....: 1387 [Crab]
2017-08-24T19:18:02: MC identifier 1 .....: Crab
2017-08-24T19:18:02: MC events .....: 1387 (all models)
```

while doubling the normalisation gave

```
2017-08-24T19:18:48: MC source photons .....: 15639 [Crab]
2017-08-24T19:18:48: MC source events .....: 5518 [Crab]
2017-08-24T19:18:48: MC identifier 1 .....: Crab
2017-08-24T19:18:48: MC events .....: 5518 (all models)
```

This is about four times the number of events compared to the default run.

#2 - 08/24/2017 09:20 PM - Knödlseider Jürgen

- Target version set to 1.4.2

#3 - 08/24/2017 09:32 PM - Knödlseider Jürgen

After removing the multiplication with the normalization factor in the GModelTemporallLightCurve::mc method the results look better.

The default run now gives

```
2017-08-24T19:29:43: MC source photons .....: 5269 [Crab]
```

2017-08-24T19:29:43: MC source events: 1868 [Crab]
2017-08-24T19:29:43: MC identifier 1: Crab
2017-08-24T19:29:43: MC events: 1868 (all models)

while doubling the normalization factor gives

2017-08-24T19:29:59: MC source photons: 10548 [Crab]
2017-08-24T19:29:59: MC source events: 3689 [Crab]
2017-08-24T19:29:59: MC identifier 1: Crab
2017-08-24T19:29:59: MC events: 3689 (all models)

which is a factor of 1.97, hence within the statistical fluctuations close to 2. Note that the default run did not produce the same number of events since the time interval was a bit modified.

Here the code:

```
// Compute mean number of times by multiplying the rate with the  
// effective duration. Note that the light curve normalization factor  
// is already included in the effective rate, hence we should not  
// multiply it here again (see #2181).  
double lambda = rate * m_mc_eff_duration;
```

#4 - 08/24/2017 11:28 PM - Knödseder Jürgen

- Subject changed from *It seems that the normalisation is used twice when doing Monte Carlo simulations* to *Light curve normalisation is used twice when doing Monte Carlo simulations*

#5 - 08/24/2017 11:51 PM - Knödseder Jürgen

- Status changed from *New* to *Closed*

- % Done changed from *0* to *100*

Code is integrated into devel.