GammaLib - Bug #2181

Light curve normalisation is used twice when doing Monte Carlo simulations

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

Status:	Closed		**Start date:**	08/24/2017
Priority:	Immediate		**Due date:**	
Assigned To:	Knödlseder 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 - Knödlseder 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 - Knödlseder Jürgen

- Target version set to 1.4.2

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

After removing the multiplication with the normalization factor in the GModelTemporalLightCurve::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 - Knödlseder 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 - Knödlseder Jürgen

- Status changed from New to Closed

- % Done changed from 0 to 100

Code is integrated into devel.