

## GammaLib - Bug #3199

### Fix ambiguity in position angle

04/03/2020 08:14 PM - Knödlseeder Jürgen

<b>Status:</b>	Closed	<b>Start date:</b>	04/03/2020
<b>Priority:</b>	Urgent	<b>Due date:</b>	
<b>Assigned To:</b>	Knödlseeder Jürgen	<b>% Done:</b>	100%
<b>Category:</b>		<b>Estimated time:</b>	0.00 hour
<b>Target version:</b>	1.7.0		
<b>Description</b>			
The GSkyDir::posang() returns different position angles depending on whether coordinates are present in the celestial or the galactic frame. If galactic coordinates are present the position angle is with respect to Galactic North, if celestial coordinates are present the position angle is with respect to celestial North.			

### History

#### #1 - 04/08/2020 10:09 AM - Knödlseeder Jürgen

It's probably best to introduce a GSkyVector class that associates a sky position to a direction on the sky. This class can then handle the transformation from the celestial to the Galactic coordinates, and there would be no ambiguity anymore. The posang() methods should then be removed from GSkyDir.

Note that adding a length attribute to that class could then be used to deal also with polarisations.

#### #2 - 04/13/2020 04:27 PM - Knödlseeder Jürgen

- Status changed from New to In Progress

Here a list of GammaLib classes where posang() is currently used:

```
include/GSkyDir.hpp
src/model/GModelSpatialElliptical.cpp => impacts computation in eval() method
src/sky/GSkyDir.cpp
inst/cta/src/GCTAOnOffObservation.cpp => no impact since not used
inst/cta/src/GCTAPointing.cpp => impacts detx/y computation in instdir() method
inst/cta/src/GCTAResponseCube.cpp => impacts position angle in irf_elliptical() method
inst/cta/src/GCTAResponseIrf.cpp => impacts nroi_radial(), nroi_elliptical() and irf_elliptical() methods
inst/spi/include/GSPIResponse.hpp => impacts azimuth() method
inst/spi/src/GSPIResponse.cpp => impacts set_cache() method
inst/cta/test/dev/test_irf_elliptical.py
inst/cta/test/dev/test_irf_radial.py
inst/cta/test/dev/test_npred_elliptical.py
inst/cta/test/dev/test_psf_radial.py
```

And here where posang\_deg() is used:

```
include/GSkyDir.hpp
inst/com/include/GCOMOad.hpp => impacts phi() method
cscripts/csphagen.py
```

**#3 - 04/13/2020 05:25 PM - Knödseder Jürgen**

- % Done changed from 0 to 50

I added a coordsys argument to the posang() and posang\_deg() methods that either can take the value "CEL" or "GAL", returning the position angle either with respect to celestial North or to Galactic North. In all cases the position angle is counted counter clockwise.

I added some unit tests to the test\_GSky.cpp file to test the computations.

make check does not reveal any problem.

**#4 - 04/13/2020 05:51 PM - Knödseder Jürgen**

- Status changed from In Progress to Pull request

- % Done changed from 50 to 100

I check all uses of posang() and posang\_deg() and in general no impact is expected. Importantly, the orientation of the ellipse in GModelSpatialElliptical::eval() depends on the definition of the position angle, hence we have to see whether the orientation of the ellipse in fit is changed.

**#5 - 04/13/2020 07:16 PM - Knödseder Jürgen**

- Status changed from Pull request to Closed

Merged into devel.