

GammaLib - COSI_interface - # 4

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COSI interface

This page summarises a couple of thoughts on a possible COSI instrument interface

COSI event types

There are different event types that need to be handled by the interface, including Compton events, pair events, photo effect events, muon events and unidentified events.

For each of the event types a specific GCOSEventList and GCOSEventAtom class needs to be implemented to cope with the different data structures of the event types. If needed, GCOSEventList and GCOSEventAtom base classes may be implemented for common services. For example, GCOSEventList could handle the generic reading of [[tra]] and fits files. For convenience, reading of both file types should be supported.

Each event type would then be handled by a specific instance of GCOSObservation. While the GCOSObservation will probably be generic for any kind of COSI event type, it will hold the specific GCOSEventList class that corresponds to a single event type.

Since the response for a given event type will be quite specific, separate response classes for specific event types will be implemented, possibly derived from a GCOSResponse base class.

Therefore we expect that the following classes will be implemented ultimately:

```
GCOSObservation
GCOSEventList
+- GCOSComptonEvents
+- GCOSPairEvents
+- GCOSPhotoEvents
+- GCOSMuonEvents
+- GCOSUnidEvents
GCOSEventAtom
+- GCOSComptonEvent
+- GCOSPairEvent
+- GCOSPhotoEvent
+- GCOSMuonEvent
+- GCOSUnidEvent
GCOSResponse
+- GCOSComptonResponse
+- GCOSPairResponse
+- GCOSPhotoResponse
+- GCOSMuonResponse
+- GCOSUnidResponse
```

It remains to be seen whether actually all response classes need to be implemented, as not all event types will be used for science.

Some functionality should be implemented to define ranges for the number of hits for GCOSComptonEvents and the associated GCOSComptonResponse. This will allow to handle different hit numbers as different observations, combining all information in a joint maximum likelihood analysis.

Event selections

The following event selections need to be supported (list to be completed):

- Earth Horizon Cut
- Distance between first 2 interactions (default is 0.5 cm according to Zoglauer et al. 2021)
- Distance between any interaction (>0.3 cm used in Carolyn's thesis)
- Compton scatter angle
- Number of interactions

Data-space

The following data-space dimensions could be considered

- 2D data-space (as used in Carolyn's thesis)
- 3D standard COMPTEL data-space
- +energy (could be realised as for COMPTEL, i.e. different observations)
- +distance between first two interactions (could also be realised by different observations)

Response

Here a few considerations for the response:

- COSI is a scanning instrument, i.e. it always points upward and does not stare at a fixed location (Zoglauer et al. 2021)

Questions

- Is scanning mode the only operating mode, or are targeted observations planned?