The MEGA Event Types

The MEGA telescope detects gamma-rays via Compton scattering and via pair creation in the energy range from 400 keV up to 50 MeV. It consists of two different detector systems:

1. A tracker, where the initial interaction takes place and where the direction of the electrons is determined.
2. A calorimeter, where most of the secondary particles are stopped.

The Compton Response

Right: Calculating a response matrix $\{r_{nm}\}$ means taking into account all probabilities, which lead to exactly the measured parameters of event $n$ after a photon was emitted in image bin $m$. This includes all scattering and interaction probabilities as well as the measurement process itself (energy resolution, etc.).

Left: Beside the Compton process, two factors dominate the response: The width and shift of the cone section $w_{nm}$, which is mainly determined by the energy and position measurement and, for tracked Comptons, the length of the cone section $l_{nm}$, which is mainly determined by the direction and energy of the electron and therefore by Molière-scattering.

Conclusions

It has been shown that the List-Mode MLEM algorithm in combination with a basic response of the MEGA telescope allows to:

- Accurately retrieve positions of point sources
- Recover extended sources
- Retrieve point sources on high background
- Reproduce relative intensities

Furthermore the high flexibility of the implementation allows to easily exchange the detector geometry as well as to switch between near and far field. Thus, the algorithm is well suited for calibration measurements as well as for astrophysical purposes.

References