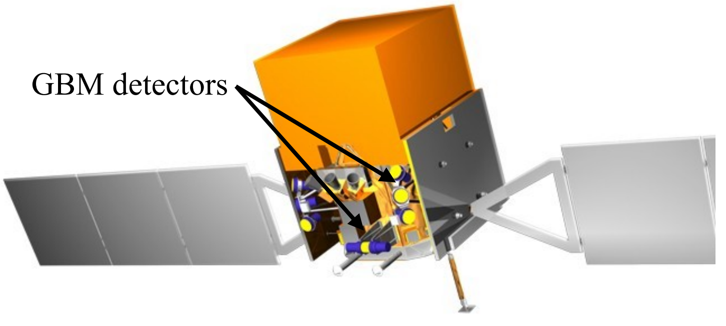
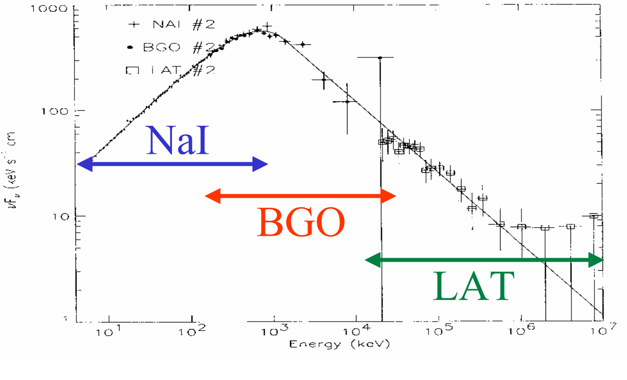
GBM – a Burst Monitor for GLAST

GLAST is scheduled for launch in 2007. It is one goal of the main GLAST instrument, the LAT, to study the high-energy (~20 Mev - ~300 GeV) emission of GRBs. A second instrument, the GLAST burst monitor (GBM), will extend the energy measurements towards lower energies (~10 keV - ~25MeV) and will allow the exploration of the relation between the keV and the MeV-GeV emission from GRBs over 6 energy decades. This will give new insights into the unknown aspects of the high-energy emission of GRBs and its relation to the well-studied low-energy emission and after glow properties.

The GBM will be realised by a collaboration between MSFC and MPE. The MPE is responsible for the manufacturing of the detectors and the power supply, while MSFC is responsible for the digital processing unit. The calibration, the operation and the analysis of the data will be shared equally between both groups. The GBM consists of 12 NaI crystals (~10 keV - ~1 MeV) and 2 BGO crystals (~150 keV - ~25 MeV). The NaI crystals are aligned such that each is viewing the sky in a different direction. From the measured relative counting rates the arrival direction of a GRB can be determined. The mounting configuration and a NaI detector is shown in the two figures below.



The emission characteristics of GRBs below ~1 MeV are known from BATSE. However, the knowledge at larger energies is sparse. From EGRET observations it is known that GRBs show delayed high-energy γ-ray emission. But what processes cause this emission is unknown. With the two GLAST instruments the energy spectrum of a GRB can be measured over 6 energy decades and insights into the production processes can be obtained. Especially it may help to disentangle the problem how these high-energy γ-rays can escape their source region without being absorbed via γ-γ interactions with low-energy photons. This requires the precise measurement of the γ-ray spectrum up to the highest energies. A simulated example of such a spectrum is shown in the figure below. The measurement of such spectra allows the determination of the relation between the low-energy and high-energy emission and the investigation of the evolution of the spectral parameters. Especially the hardness-intensity correlation can be better investigated. If the gamma-photometric redshift determination (Bagoly et al. 2003) or the luminosity-variability relation (Reichart et al. 2001) turn out to be correct then even the evolution of these parameters as a function of z can be explored.



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