GLAST

The Gamma-ray Large Area Space Telescope (GLAST) is a next generation gamma-ray observatory designed to make observations of celestial gamma-ray sources in the energy range extending from 10 keV to about 300 GeV. The expected launch is in the beginning of 2008 from the Kennedy Space Center in Florida, USA. This poster describes the GLAST satellite, the two major beam test campaigns at CERN in 2006, performed by the GLAST LAT collaboration, and preliminary results from the analysis of the collected beam test data.

Analysis

Many analysis topics are possible with the collected beam test data. One important topic is the study of the different sources of background that the LAT will encounter in orbit. There, only a small fraction of the signals are due to gamma-rays. The science requirements for LAT demand a rejection power of 10^9 to 1 at 10 GeV. The following areas have therefore been studied using the collected beam test data:

- **Hadronic interactions**
  Protons can interact with the instrument or the spacecraft, generating a hadronic cascade that can mimic an electromagnetic shower in the calorimeter. To reject this type of events, the transverse size of the shower and the distance between the first hit in the tracker and the ACD are used.

- **Charged particles interacting in the Microcalorimeter Shield**
  If a charged particle enters the instrument, the ACD can be used to reject it. However, if the charged particle interacts with the MM3, photons can be produced within the LAT field of view.

- **Heavy ions**
  Heavy ions deposit a well known amount of energy through ionization in the CAL and the ACD. Therefore, these subdetectors can be calibrated with heavy ions.

Beam tests at CERN

During the year 2006, two beam tests were performed at CERN by the GLAST-LAT collaboration, the first one in the Proton Synchrotron (PS) facility in July and the second one in the Super Proton Synchrotron (SPS) facility in September.

The tests were performed on the LAT Calibration Unit (CU), which consists of space-flight modules and flight electronics. Two full towers, with a tracker (TR) module and a calorimeter (CAL) module, an additional calorimeter, and a few anti-coincidence detector (ACD) tiles were included in the CU. At CERN it was exposed to a variety of beams, representing the different signals that the LAT will detect in space. A beam of photons was, however, not directly available at CERN. Therefore one was created by deflecting electrons with a magnet, thereby leaving only bremsstrahlung photons created in the detector upstream. Gas threshold Cherenkov counters (C1, C2) were used for particle identification, plastic scintillators (S0, S1, S2, S3, S4, S5, S6) were used for triggering and vetoing and in the PS beam test, Silicon Strip Detectors (SSD) hodoscopes were used for photon tagging.

The CU was later also used in a third beam test at PSI in Gmunden, Germany (not described in this poster), where it was exposed to beams of different heavy ions. This test was of importance since part of the calibration procedure of LAT in orbit involves measuring heavy ions.

The purpose of the whole campaign was to validate the advanced Monte Carlo simulation of the LAT, which is based on the Geant4 package, before the actual launch of the GLAST satellite. By measuring the physical processes occurring in the detector, the processes in the Monte Carlo simulation can eventually be fine-tuned.