

Development of the Tracking Compton/Pair-Creation Camera based on a Gaseous TPC and a Scintillation Camera

In the MeV gamma-ray astronomy, some observation using a Compton or pair-creation telescope has been successful. However, a sensitivity of those in the low and medium energy range from sub to several tens of MeV is worse than those of detectors in the X-ray, GeV, and TeV gamma-ray regions. Therefore a new gamma-ray telescope with better sensitivity in the low and medium energy range is required. We have developed a tracking Compton/pair-creation gamma-ray camera using a gaseous time projection chamber (micro-TPC) and a scintillation camera in order to achieve a sensitivity 10 times better than that of COMPTEL and have an all sky survey. Several prototypes of the gamma-ray detectors with a detection volume of about 10cm×10cm×10cm were developed and their performances with Compton mode in the low energy range were studied. We started to develop a detector with pair-creation mode for the medium energy range. This detector consists of a 10cm×10cm×15cm micro-TPC which obtains tracks of positron and electron, and a 15cm ×15cm scintillation camera which obtains the energy. Using this camera, we had a first beam experiment and succeeded in tracking to positron and electron pair and reconstruction of gamma rays. In this presentation, we will report the fundamental performances of the gamma-ray camera with pair-creation mode, such as angular resolution and detection efficiency.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

http://www-cr.scphys.kyoto-u.ac.jp/member/kazuki/VCI/VCI2010_abst_kazuki_ver2.pdf

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