COMPTEL Observations of the quasar PKS 0528+134

W. Collmar, G. Lichti, V. Schönfelder, H. Steinle, and the COMPTEL Team

Up to now, the EGRET experiment aboard the Compton Gamma-Ray Observatory has detected more than 60 blazars at energies above 100 MeV [Kanbach 1996]. COMPTEL, measuring at 'soft' γ-ray energies (0.75 - 30 MeV), has yet detected 8 of these $\sim$60 EGRET sources [Collmar 1996]. One of them is the anticenter blazar PKS 0528+134.

The COMPTEL observations of PKS 0528+134 carried out between April 1991 and September 1994 have been analyzed in detail [Collmar et al. 1997]. During the first two years, PKS 0528+134 was most significantly detected at energies above 3 MeV. During the last year however, there is only evidence for the quasar at energies below 3 MeV indicating a spectral change. The time-averaged COMPTEL energy spectrum between 0.75 MeV and 30 MeV is well represented by a power-law shape with a photon index α of 1.9$\pm$0.4. However, spectra collected from different observational periods reveal different spectral shapes at MeV-energies: a hard state with α=1.4$\pm$0.4 during flaring observations reported by EGRET, and a soft state of α=2.6$\pm$0.7 during other times.

The combined simultaneous EGRET and COMPTEL spectra indicate these two spectral states as well. During the low luminosity γ-ray state no spectral break is obvious. For the high luminosity γ-ray state however, the combined COMPTEL and EGRET data themselves require a spectral bending at MeV-energies (left figure below). By fitting a broken power-law shape, the best-fit values for the break energy range between $\sim$5 MeV and $\sim$20 MeV. This spectral turnover at MeV-energies is clearly obvious in the multiwavelength spectrum of PKS 0528+134 for one γ-ray flaring observation. It also shows that the major energy release across the entire electro-magnetic spectrum occurs at MeV-energies (right figure below).

Because the flux values measured by COMPTEL below 3 MeV during γ-ray flaring and non-flaring observations are roughly equal, the measurements would be consistent with an additional spectral component showing up during γ-ray high states of PKS 0528+134. Such a component could be introduced by e.g. a high-energy electron-positron population with a low-energy cutoff in their bulk Lorentz factor distribution.

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