Multi-Frequency Observations of a TeV blazar, Mkn421, from a big campaign in 1998

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We present results of the recent multiband campaign of a TeV blazar, Mkn421. Judging by the results of previous campaigns, correlations of inter-band variability of Mkn 421 have proven to provide our best opportunity to understand the high energy emission from blazar jets. In particular, the rapid intra-day variability seen in both X–ray and TeV energy bands gives us clues to study the physics of blazar jets. However, the sparse sampling of the previous campaigns has prevented us from obtaining definitive conclusions. With this in mind, we performed an unprecedented seven-day continuous observations with *ASCA*, coordinated with *EUVE*, *RXTE* and *SAX* in April 1998. At the same time, TeV detectors (CAT, HEGRA, Whipple), optical telescopes, and 22 GHz radio antennae attempted to observe the source every night.

In the campaign, we detected a historical high activity of the source. The 2 - 10 keV flux in the beginning of the observation was 1.2×10^{-10}erg cm^{-2}s^{-1} and increased up to 5.0×10^{-10} erg cm^{-2}s^{-1} at the maximum. More than 10 flares are clearly seen superimposed on the general increasing trend. The doubling time scale of each flare is about 0.5 days. The continuous light curve of 7 days implies that the source actually flares daily, and perhaps more often. *ASCA* data clearly reveal spectral variability. The 2 – 7 keV energy index ranges from 1.4 to 1.8.

Importantly, we discovered that the amplitudes of soft X–ray lag, which allows further constraints on the parameters of the emitting region, varied flare by flare. Hard X–ray lag does exist in some flares. The comparison of the data from *ASCA*, *EUVE* and *RXTE* indicates that the variability amplitudes in the LE (synchrotron) component are larger at higher photon energies. We clearly detected the correlation between TeV flux and X–ray flux from truly simultaneous observations.