

GeV-radio correlation in Markarian 421

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Markarian 421 is a high-synchrotron-peaked blazar showing relentless variability across the electromagnetic spectrum from radio to gamma-rays. We use 5 years of radio and GeV observations to study the correlation and connected variability in radio and GeV bands. Radio data was obtained in a 15GHz band by the OVRO 40-m radio telescope and GeV data is from Fermi Large Area Telescope. To determine the location of the gamma-ray emission regions in Mrk 421 we correlate GeV and radio light curves. We found that GeV light curve varies independently and accurately leads the variations observed in radio. Using a fast-rise-slow-decay profile derived for shock propagation within a conical jet, we manage to reproduce the radio light curve from GeV variations. The profile rise time is comparable with the Fermi-LAT binning, the decay time is about 7.6 days. The best-fit value for the response profile also features a 44 days delay between the GeV and radio, which is compatible with the wide lag range obtained from the correlation. Such a delay corresponds to 10^{17} cm/c, which is comparable with the apparent light crossing time of the Mrk 421 radio core. Generally, the observed variability matches the predictions of the leptonic models and suggests that the physical conditions vary in the jet. The emitting region is moving downstream the jet while the environment becomes first transparent to gamma rays and later to the radio.

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Collaboration

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Experimental Results

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