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Fermi LAT observations of the Crab Nebula during the exceptional April 2011 outburst ELIZABETH HAYS, NASA GSFC, FERMI LAT COLLABORATION — The Crab Nebula, formerly thought to be steady in gamma rays, shows unexpected and occasionally dramatic variability in high-energy gamma rays. The Large Area Telescope (LAT) on Fermi recorded several strong outbursts, including dedicated pointed observations of the brightest yet seen, a spectacular flare in April 2011. These observations provide a particularly detailed look at the temporal and spectral characteristics of the nebula during the flare. The LAT data show an additional component in the spectral energy distribution that peaks at a maximum of 375 ± 26 MeV. In the probable scenario that this component is synchrotron emission, the electrons are accelerated to extreme energies that are difficult to reconcile with the very rapid change in flux and the expectation for acceleration processes and conditions occurring within the pulsar wind nebula. The physical location and mechanism driving the flares remains undetermined despite observations across the spectrum made by a variety of instruments including the Hubble Space Telescope, the Chandra X-ray Observatory, and the Very Large Array. I will present timing and spectral studies of the high-energy gamma-ray data, discuss implications for the origin of the flares, and highlight preparations for the next major flare.

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