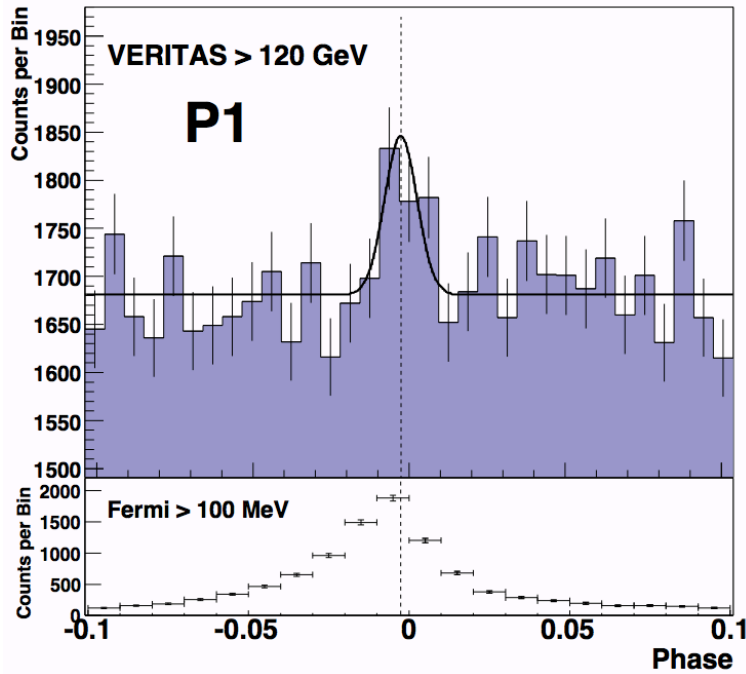




Testing Lorentz Invariance Violation (LIV) Using the Crab Pulsar

Scott Griffiths



Crab Main Pulse (Otte 2012)

- Many Quantum Gravity (QG) theories predict new physics occurs at $E_{QG} \sim E_p$, where $E_p \sim 10^{19}$ GeV (Amelino-Camelia et al. 1998)

$$p^2 c^2 = E^2 \left[1 + \xi \frac{E}{E_{QG}} + O\left(\frac{E^2}{E_{QG}^2}\right) \right] \quad \text{Modified Dispersion Relation for Light}$$

$$\Delta t \approx \xi \frac{E}{E_{QG}} \frac{L}{c} + O\left(\frac{E^2}{E_{QG}^2}\right) \quad \text{Time of Flight Delay}$$

- Usually astrophysical LIV done with GRBs & AGN
- Can also be done with pulsars (Kaaret 1999)
- Excellent Fermi paper using GRB 090510 sets the current best linear LIV limit (Abdo et al. 2009)