

What Racing Distant Fermi GRB Photons Can Tell Us About our Universe

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Do photons of different energies disperse as they race across the universe? Potential reasons for dispersion include violations of Lorentz invariance, violations of the weak equivalence principle, and electromagnetic interactions with the intervening matter. Which parameters make GRBs the most sensitive to these potential differences: their great distance, being seen over such a wide range of energies, or their fast time scale of variation? Also, how can we find a fair race where GRB photons were emitted at nearly the same time? Are higher or lower energy photons expected to win the race? Could racing distant GRB gravitational waves tell us something different from photons? Which Fermi GRBs, so far, have probed the universe the best – and why? A review of these Fermi GRBs and the limits they impose on fundamental physics is reviewed, along with a comparison of similar limits from other – and likely future – GRB detectors.

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