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Lorentz Invariance Violation and the Observed Spectrum of Ultrahigh Energy Cosmic Rays FLOYD STECKER, NASA/GSFC, SEAN SCULLY, James Madison University — There has been much interest in possible violations of Lorentz invariance, particularly motivated by quantum gravity theories. It has been suggested that a small amount of Lorentz invariance violation (LIV) could turn off photomeson interactions of ultrahigh energy cosmic rays (UHECRs) with photons of the cosmic background radiation and thereby eliminate the resulting sharp steepening in the spectrum of the highest energy CRs predicted by Greisen Zatsepin and Kuzmin (GZK). Recent measurements of the UHECR spectrum reported by the HiRes and Auger collaborations, however, indicate the presence of the GZK effect. We present the results of a detailed calculation of the modification of the UHECR spectrum caused by LIV using the formalism of Coleman and Glashow. We then compare these results with the experimental UHECR data from Auger and HiRes. We find an upper limit on the amount of LIV of 5×10^{-23} . Within that limit we discuss how a small amount of LIV that is consistent with the experimental data can still lead to a recovery of the cosmic ray flux at higher energies than presently observed.

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