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Gamma-ray absorption and photon archeology

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Abstract content

Ongoing deep surveys of galaxy luminosity functions, spectral energy distributions and backwards evolution models of star formation rates can be used to calculate the past history of intergalactic photon densities and, from them, the present and past optical depth of the universe to gamma-rays. Stecker, Malkan & Scully have recently done this calculation for pair-production interactions of gamma-rays with intergalactic background light (IBL) photons of energies from 0.03 eV to the Lyman limit at 13.6 eV and for redshifts $0 < z < 6$. This procedure can also be reversed by looking for sharp cutoffs in the spectra of extragalactic gamma-ray sources such as blazars at high redshifts in the multi-GeV energy range with GLAST. Determining the cutoff energies of sources with known redshifts and little intrinsic absorption may enable a more precise determination of the IBL photon densities in the past, i.e., the “archo-IBL”, and therefore allow a better measure of the past history of the total star formation rate, including that from galaxies too faint to be observed. Conversely, observations of sharp high energy cutoffs in the gamma-ray spectra of sources at unknown redshifts can be used instead of spectral lines to give a measure of their redshifts.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

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