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Using Gamma-Rays to Probe the EBL & New Physics

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The Extragalactic Background Light (EBL) encompasses the light emitted by stars and other astrophysical objects throughout the history of the Universe. From this we can learn about star formation rate as well as galactic evolutionary traits. As gamma-rays travel from distant blazars they can maximally interact with this background light and create an electron-positron pair. This creates a measurable attenuation in the blazar's energy spectrum. As Cherenkov detectors become more prevalent, we are now finding more very high energy (VHE) blazars (E> 100s GeV). In turn we are now able to better probe the higher energy (UV) portion of the EBL. Using seven VHE blazars we test three different attenuation models and find they fit the sources well – within one standard deviation in likelihood space. We also show a simple way to put constraints on the parameters of axion-like particles (ALPs) by the observation of high energy objects such as blazars. We consider the scenario of gamma-rays oscillating into ALPS over large distances in intergalactic magnetic fields. We know that gamma-rays are attenuated enroute to Earth due to interactions with background light, but here we also consider the spread in that attenuation to be due to ALP physics.

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