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An open-source code for modeling the extragalactic background light

Extragalactic very high-energy (VHE; $E > 100$ GeV) gamma rays suffer absorption in interactions with photons of the Extragalactic Background Light (EBL). The EBL is an isotropic diffuse field spanning the optical and infrared regions of the electromagnetic spectrum. Observational data allow for uncertainties in the current EBL models, which in turn affect VHE analyses. We present an open-source code to compute the EBL using a forward-folding model. The dominant contribution to the optical background is stellar emission, which we compute by evolving the spectrum of a single stellar population, using the mean metallicity evolution and the star formation rate through redshift. Additional EBL sources can be provided by the user. The code already includes optional contributions from sources such as stripped stars, intrahalo light, and axion dark matter decay. The optical emissivity is then absorbed by interstellar dust and reemitted in the infrared regime. We offer multiple modeling options for this process, by using either spectral templates or a combination of blackbodies. We present a use case where we simulate an observation of Markarian 501 in a high-flux state using the Large High Altitude Air Shower Observatory array. The observed VHE spectrum is highly sensitive to the EBL opacity coming from the infrared, allowing us to distinguish between different dust reemission models and constrain model parameters.

Collaboration(s)

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