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DAP Young Star: Intensity and Origin of the Extragalactic Gamma-ray Background

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The gamma-ray sky can be decomposed into individually detected sources, diffuse emission attributed to the interactions of cosmic rays with gas and radiation fields in our Galaxy, and a residual all-sky emission component commonly called the isotropic diffuse gamma-ray background (IGRB). The IGRB comprises all extragalactic emissions too faint or too diffuse to be resolved in a given survey, as well as any residual Galactic foregrounds that are indistinguishable from isotropic. The sum of the IGRB and individually resolved extragalactic sources represents our best estimate of the total extragalactic gamma-ray background. The first IGRB measurement with the Large Area Telescope (LAT) on board the Fermi Gamma-ray Space Telescope used 10 months of sky-survey data and considered an energy range between 200 MeV and 100 GeV. Improvements in event selection and characterization of particle backgrounds, better understanding of the diffuse Galactic emission, updated emission models for the Earth atmosphere, Sun, and Moon, as well as a longer data accumulation of 50 months, allow for a refinement and extension of the IGRB measurement with the LAT, now covering the energy range from 100 MeV to 820 GeV. We discuss the possible presence of a high-energy cutoff (>100 GeV) in the IGRB, as well as systematic uncertainties that impact the shape and normalization of the measured spectrum. Finally, we review the current census of extragalactic source populations and truly diffuse processes contributing to the extragalactic gamma-ray background.