R10b The diffuse extragalactic gamma-ray background radiation: star-forming galaxies are not the dominant component

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Star-forming galaxies (SFGs) are considered to be an important component of the diffuse extragalactic gamma-ray background (EGB) radiation observed in 0.1 – 820 GeV, but their quantitative contribution has not yet been precisely determined. In this study, we aim to provide the currently most reliable estimate of the contribution of SFGs based on careful calibration with γ-ray luminosities of nearby galaxies and physical quantities (star formation rate, stellar mass, and size) of galaxies observed by high-redshift galaxy surveys. Our calculations are based on the latest database of particle collision cross-sections and energy spectra of secondary particles, and take into account not only hadronic but also leptonic processes with various radiation fields in a galaxy. We find that SFGs are not the dominant component of the unresolved EGB measured by *Fermi*; the largest contribution is around 50% – 60% in the 1 – 10 GeV region, and the contribution falls rapidly in lower and higher energy ranges. This result appears to contradict a previous study, which claimed that SFGs are the dominant component of the unresolved EGB, and the origin of the discrepancy is examined. In calculations of cosmic-ray production, propagation, and interaction in a galaxy, we try models developed by two independent groups and find that they have little impact on EGB.