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The Inner Galaxy at MeV with INTEGRAL and COMPTEL: Interstellar Emission or Sources?

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The inner Galaxy seen at high energies is a complex region where the interstellar emission and sources may not be easily disentangled because they may both result as observed diffuse emission. We use the source-subtracted SPI and COMPTEL data and we compare them with our models of the interstellar emission by inverse Compton emission of Galactic cosmic-ray (CR) electrons and positrons on the photons. Our models account for CR propagation in the Galaxy and multifrequency observations from radio, microwaves, and gamma rays, and they are based on the latest CR measurements, such as AMS02 and Voyager. We found that the diffuse emission observed by SPI and COMPTEL is well reproduced by interstellar inverse Compton models with an enhanced CR all-electron density. However, these models are in tension with the observed gamma-rays and with the observed synchrotron emission in radio and microwaves, due to their enhanced CR electrons. This suggests that SPI and COMPTEL diffuse data in the inner Galaxy region are affected by contamination of unresolved sources or source confusion, which would mimic the inverse Compton emission produced by the enhanced electron density in the $\sim 10^2$–10^4 MeV range of some models. We also define the best interstellar model that fits multifrequency data from radio to high-energy gamma rays, and latest CR measurements, and we make predictions for future observations in the keV-MeV energy band with forthcoming telescopes, such as GECCO, AMEGO, and eASTROGAM. (From Orlando 2018 MNRAS 475, 2724)

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