Z316a   Imaging of gamma-ray lines with the upcoming MeV gamma-ray satellite COSI

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Despite its scientific importance, observations in the MeV gamma-ray band are still to be matured. Especially gamma-ray line observations are crucial to understanding cosmic matter production, e.g., 511 keV lines from positron annihilation, nuclear lines originating from nucleosynthesis, and signatures of MeV-scale dark matter. The Compton Spectrometer and Imager (COSI) is a NASA Small Explorer satellite mission and will be planned for launch in 2027. Owing to its wide field-of-view and excellent energy resolution, COSI can achieve an unprecedented line gamma-ray sensitivity, allowing us to enter a new era of MeV gamma-ray observations.

In this talk, we will describe gamma-ray line observations allowed by COSI. One of the challenges in the MeV gamma-ray observations is to image gamma-ray sources quantitatively from complex Compton scattering events. On behalf of the COSI software team, I will explain the data analysis framework of COSI (COSIpy) and the data challenges released yearly by referring to some science cases. Both will be publicly available, providing opportunities to familiarize a broad astronomical community with the MeV gamma-ray data. Finally, we will present the contributions of the Japanese COSI team, e.g., the dark matter science studies and the support of the student-led project, namely Background Transient Observatory.