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The Compton Spectrometer and Imager: Science Goals and Mission Status

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The Compton Spectrometer and Imager (COSI) is a NASA Small Explorer (SMEX) satellite mission with a planned launch in 2027. COSI operates in the $0.2 - 5\,\mathrm{MeV}$ gamma-ray bandpass and obtains coverage of the entire sky every day. COSI provides imaging, spectroscopy, and polarimetry of astrophysical sources, and its germanium detectors have excellent energy resolution for emission line measurements. COSI science includes four main topics: 1. mapping radioactive elements from nucleosynthesis; 2. studying $511\,\mathrm{keV}$ emission from antimatter annihilation in the Galaxy; 3. making polarization measurements of accreting black holes; and 4. detecting and localizing gamma-ray bursts. In this presentation, I will discuss the scientific advances expected from COSI related to gamma-ray lines, including studies of ^{26}Al and ^{60}Fe emission from massive star clusters in the Galaxy as well as ^{44}Ti from young supernova remnants. I will describe how COSI's measurements of $511\,\mathrm{keV}$ emission will give new information about positron production on Galactic scales. In addition, I will provide a description of the COSI instrument as well as an update on the overall mission.

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