Z318a Overview and status of SMILE-3 project

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The SMILE project aims to pioneer the next generation of MeV gamma-ray astronomy by developing the Electron-Tracking Compton Camera (ETCC), the first Compton camera capable of bijective imaging spectroscopy. The ETCC consists of a gaseous electron tracker and pixel scintillator arrays that provide complete information (energy and direction for both the recoil electron and the scattered gamma ray) for Compton event reconstruction, allowing us to specify the arrival direction of the gamma rays. So far, we have conducted an ETCC-equipped balloon experiment in 2018 and successfully detected gamma rays from the Crab Nebula and the Galactic Center region, demonstrating that this observing technique guarantees accurate sensitivity prediction even in high-noise environments. Therefore, we are finally planning the next balloon experiment, SMILE-3, for scientific observations, where we expect to carry out a 30-day flight with a super-pressure balloon in the 2030s, in addition to the one-day flights between 2027 and 2029. In this experiment, we will improve the ETCC to achieve gamma-ray observations with five times the effective area and three times the angular resolution of our previous work in the energy range of 0.2–10 MeV, resulting in the best sensitivity for this band. Here, we provide an overview of SMILE-3 and report on its development status.