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Accelerator-driven Compton gamma-ray source: High Intensity Gamma-ray Source

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A nearly monochromatic, polarized gamma-ray beam is a powerful tool for nuclear physics research, ranging from collective motions to strong interactions between nucleons, and to the dynamics of quarks and gluons. Laser-driven Compton gamma-ray sources have been developed and operated worldwide since the late 1970s. The High Intensity Gamma-ray Source (HIGS) at the Triangle Universities Nuclear Laboratory is currently the highest flux and most versatile source in operation. Driven by a high peak power storage ring free-electron laser (FEL), the HIGS produces highly polarized gamma-ray beams with energies ranging from 1 to 120 MeV, with a peak performance of total flux up to 3E10 g/s and a spectral flux of more than 1E3 g/s/eV in the 10 MeV region. In this presentation, I will discuss the operation principle of the HIGS facility, developments to achieve a wide energy range, maximum flux, and high resolution, as well as new capabilities being developed such as pulsed mode operation, two-color beams, and precision polarization control. I will also comment on the possible directions for next-generation Compton gamma-ray sources driven by conventional charged particle accelerators.

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