Light Sources driven by Laser-Plasma Accelerators

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Laser Plasma Accelerators (LPAs), see Refs. [1-2], offer an attractive technology towards production of short (few-fs) and energetic (GeV-class) electron beams. The high-quality LPA e-beam production has spurred the development of unique radiation sources, enabling compactness (due to the high accelerating gradient in the plasma), few-fs radiation pulse lengths (from the high-current ultra-short electron bunches), and intrinsic femtosecond synchronization to the drive laser and its secondary products. The LPA-based radiation mechanisms, ranging from betatron radiation (X-rays), Thomson scattering (gamma rays), to the free-electron laser (XUV and soft X-ray photons), have attracted interest for applications throughout medicine, industry, biology, material science, and nuclear science. Both small-scale (universities, hospitals, etc.) and large-scale facilities will benefit from such configurable and versatile sources.

In this presentation I will present recent highlights from the BELLA Center and LPA community, with emphasis on the photon source development. Key aspects of the LPA light source concept, namely control of the laser system, the accelerator [3], novel beam diagnostics [4], and the LPA production of photons, will be discussed.

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