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O4.206 Production of collimated gamma ray beams for e- e+ pair creation.

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Despite being one of the most basic process of quantum electrodynamics (QED), and being responsible of the universe opacity to high energy photons [1], the electron-positron pair production by two photons collision (gamma-gamma -> e-e+, linear Breit-Wheeler [2] process, LBW) has never been observed directly in the laboratory.
However, increasing available intensity at laser facilities make possible to create high brilliance MeV ray sources that could be used to observe this process for the first time [3].
We propose [4] to detect e+ produced by LBW using two crossing ray beams (see Fig. 1). Those sources could be created in typical laser-solid experiments: some target e- are accelerated from laser field and their propagation near a high Z atomic nuclei in the material can produce gamma rays through the Bremsstrahlung process. However, e- and gamma propagation in a high Z material can also produce background e-e+ pairs through the Trident (e-Z -> e-Ze-e+) and Bethe-Heitler (gammaZ -> Ze-e+) processes.
In this work, a semi-analytical model to estimate LBW pair production, and a complete simulation setup (using hydrodynamics, Particle-In-Cell and Monte Carlo codes) have been developed to simulate LBW and background e+ production.
These tools could be used to investigate pair plasma jets in Active Galactic Nuclei [5], and further developments could help to test more advanced theoretical predictions [6] or measure the LBW cross section (widely used in QED) for the first time.

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