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Luminosity Spectra of Multi-TeV PWFA Gamma-Gamma Colliders

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There is growing interest in the gamma-gamma configurations of multi-TeV PWFA colliders since they do not require positrons or flat beams and may have the same particle physics potential as multi-TeV electron positron or muon anti-muon colliders. In this report the CAIN Monte Carlo is used to study the luminosity spectra of several gamma-gamma configurations assuming a round beam 15 TeV PWFA electron electron collider with a geometric luminosity of $1.5e36 \text{ cm}^{-2} \text{ s}^{-1}$. As a starting point, the parameters for optical laser and X-ray laser gamma gamma Higgs factory designs are scaled to 15 TeV center-of-mass energy. Wide variations in the luminosity spectra are observed as the laser wavelength is varied. Large beam-beam electromagnetic fields strengths –approaching 60% of the Schwinger field in some cases –play a major role in determining the size and shape of the gamma-gamma luminosity spectra.

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