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(G*) Generation of focused LWFA electron and gamma beams using a triplet quadrupole magnet system

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Tajima and Dawson proposed the idea of laser-wakefield accelerators (LWFAs) during the late 1970s. LWFAs produce low transverse emittance, ultrashort electron bunches of few femtoseconds duration with the potential to drive free electron lasers and compact X-ray and gamma-ray sources. Through the implementation of high-gradient quadrupole magnets, it is possible to focus and transport LWFA electron beams with minimal degradation over long distances. In this research work, we examine the focusing of LWFA electron beams using a triplet quadrupole system. We also look at the subsequent generation of collimated gamma beams. We analyse the changes in electron beam divergence, charge and pointing stability with and without the quadrupole system. Copper autoradiography was performed to look into the generation of intense gamma ray beams through the propagation of focused electron beams through a lead converter. Finally, Monte Carlo simulations will be performed to investigate gamma ray generation and peak gamma ray intensity.

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