

Increasing the electron charge in Laser Wakefield Acceleration with Orbital Angular Momentum beams

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High-energy electrons have many applications, ranging from medical physics to fundamental research. Laser wakefield acceleration (LWFA) is a new method of accelerating electrons to high energies in mere centimeters, as opposed to hundreds of meters using classic linear accelerators. Electrons accelerated with LWFA can also be used to drive Laser-Driven Neutron Sources (LDNS). In this process, the electrons produce neutrons in a two-step process involving bremsstrahlung and photonuclear reactions, rather than ions accelerated by target normal sheath acceleration. Up to 25% of 350MeV electrons can be converted into neutrons.

However, the electron charge is typically limited to several hundred pC due to beam loading effects in the plasma wake. We are investigating if a beam with orbital angular momentum, which causes a ring focus and thus a ring wakefield, can increase the accelerated charge before beam loading occurs.

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