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The Effect of Laser Focusing Geometry on the Direct Laser Acceleration of Electrons

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Direct laser acceleration (DLA) is capable of generating super-ponderomotive energy electrons to hundreds of MeV, as well as secondary particles and radiation from high-intensity picosecond laser pulses interacting with underdense plasma. The dynamic and complex process of DLA is strongly dependent on a combination of plasma and laser parameters. Experiments performed on the OMEGA EP facility using apodized beams and 2D particle-in-cell simulations study the effect of laser focusing geometry on DLA. Simulations reveal the laser channel creation, channel fields evolution, as well as the laser fields' contributions to the corresponding electron dynamics. Our results show an optimal laser focusing geometry and a path towards optimizing DLA conditions.

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