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Effects of colliding laser pulses polarization on e-e+ cascade development in extreme focusing

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The onset and development of electron-positron cascade in a standing wave formed by multiple colliding laser pulses requires tight focusing in order to achieve the maximum laser intensity. There, steep spatiotemporal gradients in the laser intensity expel seed particles from the high-intensity region and thus can prevent the onset of a cascade. We show that radially polarized laser pulses ensure that the seed electrons are present at the focal plane at the moment of the highest amplitude even in the case of extreme focusing. This feature reduces the required laser power for the onset of a cascade 100 times (80 times) compared to circularly (linearly) polarized laser pulses having the same focal spot radius and duration.

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