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Spectral Bandwidth Reduction of Thomson Scattered Light by Pulse Chirping

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Based on single particle tracking in the framework of classical Thomson scattering with incoherent superposition, we developed a fully relativistic, three dimensional numerical code that calculates and quantifies the characteristics of emitted radiation when a relativistic electron beam collides head-on with a focused counter-propagating intense laser field. The developed code has been benchmarked against analytical expressions, based on the plane wave approximation to the laser field, derived in (1). For sufficiently long duration laser pulses, we find that the scattered radiation spectrum is broadened due to interferences arising from the pulsed nature of the laser. We show that by appropriately chirping the scattering laser pulse, the spectral broadening could be minimized.

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