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Generation of narrow-band x- and γ-rays by inverse Compton scattering of chirped laser pulses ISAAC GHEBREGZIABHER, University of Nebraska-Lincoln — Based on single particle tracking in the framework of classical Thomson scattering with incoherent superposition, we developed a fully relativistic, three dimensional numerical model that calculates and quantifies the characteristics of emitted radiation when a relativistic electron beam (EB) interacts with an intense laser focus [I. Ghebregziabher, B. Shadwick, & D. Umstadter, *arXiv* **1204.1068** (2012)]. Predictions of the model are in excellent agreement with theoretical analysis and our recent experimental measurements. For laser pulses of sufficient duration, we find that the scattered radiation spectrum is broadened due to interferences arising from the pulsed nature of the laser. We find that by appropriately chirping the scattering laser pulse, spectral broadening can be minimized, and the peak brightness of the emitted radiation is increased by a factor approximately five times. Furthermore, the effect of EB divergence on the spectral bandwidth of the scattered x-rays/γ-rays is investigated. We find that the bandwidth of the scattered radiation from an EB with divergence $\theta_e \approx 1/\gamma$ (typical for EBs generated with conventional accelerators) may be obtained with$(\Delta\omega/\omega)_\gamma \approx \sqrt{4(\Delta\gamma/\gamma)^2 + \gamma^4\theta_e^4/4}$. The use of this formula in the regime $\theta_e > 1/\gamma$ (typical for EB's generated with laser-wakefield accelerators) overestimates the bandwidth of the scattered radiation.

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