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Narrowband Compton Scattering Yield Enhancement[1] SERGEY RYKOVANOV, Helmholtz Institute Jena, DANIEL SEIPT, Lancaster University, United Kingdom, VASILY KHARIN, Helmholtz Institute Jena — Compton Scattering (CS) of laser light off high-energy electrons is a well-established source of X- and gamma-rays for applications in medicine, biology, nuclear and material sciences. Main advantage of CS photon sources is the possibility to generate narrow spectra as opposed to a broad continuum obtained when utilizing Bremsstrahlung. However, due to the low cross-section of the linear process, the total photon yield is quite low. The most straightforward way to increase the number of photon-electron beam scattering events is to increase the laser pulse intensity at the interaction point by harder focusing. This leads to an unfortunate consequence. Increase in the laser pulse normalized amplitude a_0, leads to additional ponderomotive spectrum broadening of the scattered radiation. The ponderomotive broadening is caused by the $\mathbf{v} \times \mathbf{B}$ force, which slows the electron down near the peak of the laser pulse where the intensity is high, and can be neglected near the wings of the pulse, where the intensity is low. We show that laser pulse chirping, both nonlinear (laser pulse frequency "following" the envelope of the pulse) and linear, leads to compensation of the ponderomotive broadening and considerably enhances the yield of the nonlinear Compton sources.

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Sergey Rykovanov
Helmholtz Institute Jena

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