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A New Frequency Modulation Function for High Energy Compton Scattering JEFFREY MCKAIG, Christopher Newport University, BALA TERZI, Old Dominion University, GEOFFREY KRAFFT, Old Dominion University and Thomas Jefferson National Accelerator Facility — When a relativistic electron beam and a low energy laser pulse interact, narrow bandwidth back scattered radiation is produced through Compton Scattering. It has been shown that when the frequency of the laser pulse is modulated, a narrow bandwidth spectrum can be produced in the regime of high laser energies. However, this modulation function only corrects the spectrum for on axis scattering. Here a new frequency modulation function was developed to compensate for on and off axis scattering. This new function was derived using the method of stationary phase on the Fourier transform of the electron velocity in the x direction. In this treatment the scattering angle was kept arbitrary in order to account for off axis scattering. It is shown that this function does indeed recover the narrow bandwidth spectrum on and off axis. Unlike the previous modulation function, this function is shown to depend on the speed, and thus energy, of the electron beam. It is also shown that when electron energies are low, this modulation corrects the spectrum for all aperture placements. The findings of this study will allow for wider applications of the resulting spectrum as well as further development of the theoretical background of high energy Compton Scattering.

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