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The Derivation of Frequency Modulation Equations for Compton Sources[1] TODD HODGES, Arizona State University/Thomas Jefferson National Accelerator Facility, GEOFF KRAFFT, Old Dominion University/Thomas Jefferson National Accelerator Facility, WALLY MELNITCHOUK, Thomas Jefferson National Accelerator Facility, BALSA TERZIC, Old Dominion University/Thomas Jefferson National Accelerator Facility — Thomson sources of electromagnetic radiation utilizing relativistic electrons have seen increased use in fundamental physics research in the past several years. The small frequency range, or bandwidth, of the emitted radiation is highly desirable for applications in nuclear and particle physics. However, as the intensity of the incident laser pulse involved in the scattering event increases, the bandwidth of the emitted radiation increases. In accelerators, this increase in bandwidth may be negated through frequency modulation of the incident laser pulse. Current analytic solutions governing this frequency modulation are only applicable when the energies of the individual photons in the laser pulse are within the Thomson limit. We derive analytic solutions applicable to laser pulse frequency modulation both within, and beyond, the Thomson limit using Quantum Electrodynamics (QED). Currently, the derived expression pertains to polarized scattering events in which one photon emitting processes significantly contribute to the overall reaction. At energies beyond the Thomson limit, processes involving the emission of multiple photons may play a more important role, and we will report on recent progress made in estimating their significance.

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