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Design and optimization of MeV class Compton scattering MEGa-ray sources FELICIE ALBERT, S.G. ANDERSON, S.M. BETTS, R.R. CROSS, C.A. EBBERS, T.L. HOUCK, D.J. GIBSON, R.A. MARSH, M. MESSERLY, M.Y. SHVERDIN, S.S. WU, F.V. HARTEMANN, C.W. SIDERS, R.D. SCARPETTI, C.P.J. BARTY, Lawrence Livermore National Laboratory —
The design and optimization of a Mono-Energetic Gamma-Ray (MEGa-Ray) Compton scattering source are presented. A new precision source with up to 2.5 MeV photon energies, enabled by state of the art laser and x-band linac technologies, is currently being built at LLNL. Various aspects of the theoretical design, including dose and brightness optimization, will be presented. In particular, while it is known that nonlinear effects occur in such light sources when the laser normalized potential is close to unity, we show that these can appear at lower values of the potential. A three dimensional analytical model and numerical benchmarks have been developed to model the source characteristics, including nonlinear spectra. Since MEGa-ray sources are being developed for precision applications such as nuclear resonance fluorescence, assessing spectral broadening mechanisms is essential. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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