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Laser Design for Next Generation Compton Scattering Source at LLNL MIRO SHVERDIN, FELICIE ALBERT, SCOTT ANDERSON, ANDY BAYRAMIAN, SHAWN BETTS, RICK CROSS, CHRIS EBBERS, DAVID GIBSON, ROARK MARSH, MICHAEL MESSERLY, FRED HARTEMANN, RAY SCARPETTI, CRAIG SIDERS, CHRIS BARTY, LLNL — We describe laser systems designed for the next generation Mono-Energetic Gamma-Ray (MEGa-ray) Compton scattering light source at LLNL. An 80 fs Yb:doped fiber oscillator seeds a photogun drive laser (PDL) and a high energy interaction system laser (ILS). Utilizing chirped pulse amplification (CPA) in fiber, the PDL will generate 80 μJ, spatially and temporally shaped pulses at 263 nm at 120 Hz precisely synchronized to the linac RF. The PDL system employs large mode photonic bandgap fibers and large area multi-layer dielectric gratings to generate over 1mJ per pulse with high recompression fidelity prior to frequency quadrupling. The high energy, 120 W ILS utilizes (CPA) in Nd:YAG to amplify a sub-nanometer bandwidth 20 μJ pulses from a fiber system to 1 J. A novel pulse stretcher provides a dispersion of over 7000 ps/nm to expand a several picosecond wide seed pulse to 6 ns. After amplification, the pulse is recompressed to 10 ps with a hyper-dispersive pulse compressor. 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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