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GEANT4 Monte Carlo Simulation of Pair Creation Using Petawatt Lasers[1] ALEXANDER HENDERSON, EDISON LIANG, PABLO YEPES, Rice University, HUI CHEN, SCOTT WILKS, Lawrence Livermore National Laboratory — Irradiating high-Z targets such as gold with ultra-intense lasers creates electron-positron pairs. First the laser heats the target surface and creates a plasma. The laser then accelerates electrons to relativistic energies out of the plasma and through the target, creating pairs emerging on the opposite side. The positron density in the outgoing plasma created by this procedure is higher than that obtained via other laboratory-based methods, with theoretical maximum densities exceeding 10^{18} per cubic centimeter. All of the pair production processes are well-known. Hence we can study this phenomenon using Monte Carlo simulations. Here we present simulation results using the CERN GEANT4 Monte Carlo code to model the experimental data obtained at the Titan (LLNL) laser. Once this code is successfully calibrated against existing data, we will use it to perform parameter studies, and design future targets to optimize the positron yield, density and e+/e- ratio.

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