Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Compact spectral characterization of 10-500 MeV γ-rays from the Texas Petawatt Laser-Driven Plasma Accelerator ANDREA HANNASCH, University of Texas at Austin, ALEJANDRO LASO GARCIA, Helmholtz-Zentrum Dresden-Rossendorf, Institute of Radiation Physics, LUC LISI, XIANTAO CHENG, JASON BROOKS, MAXWELL LABERGE, BRANT BOWERS, ISABELLA PAGANO, MICHAEL SPINKS, HERNAN QUEVEDO, MICHAEL DONOVAN, AARON BERNSTEIN, RAFAL ZGADZAJ, TODD DITMIRE, MICHAEL DOWNER, University of Texas at Austin — GeV (γ_e >2000) electron bunches from petawatt-laser-driven plasma accelerators can be converted to tunable, narrowband or to broadband continuum γ-ray (hν >10 MeV) pulses by Thomson backscattering (TBS) or bremsstrahlung, respectively. Inserting a plasma mirror (PM) near the accelerator exit converts electrons to γ-rays compactly and inexpensively, in a TBS/bremsstrahlung mixture determined by PM thickness, material and location. Characterizing the γ-ray spectra accurately is a challenge, usually addressed with bulky pair production/Compton spectrometers. Here, we spectrally characterize PM-generated TBS/bremsstrahlung γ-rays from 1-2 GeV Texas-Petawatt-Laser-accelerated electron bunches using a compact stack calorimeter, to record energy-dependent particle showers generated by incoming γ-rays. An iterative Bayesian algorithm, based on a calorimeter response matrix built from GEANT4 simulations, reconstructs TBS and bremsstrahlung contributions for each shot, as PM and electron parameters vary. The method should be widely applicable to plasma-accelerator-based radiation with MeV photon energies.

Andrea Hannasch
University of Texas at Austin

Date submitted: 09 Jul 2019

Electronic form version 1.4