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Compton MeV Gamma-ray Source on Texas Petawatt Laser-Driven GeV Electron Accelerator[1] JOSEPH M. SHAW, HAI-EN TSAI, RAFAL ZGADZAJ, XIAOMING WANG, VINCENT CHANG, NEIL FAZEL, WATSON HENDERSON, M.C. DOWNER, The University of Texas at Austin, TEXAS PETAWATT LASER TEAM — Compton Backscatter (CBS) from laser wakefield accelerated (LWFA) electron bunches is a promising compact, femtosecond (fs) source of tunable high-energy photons. CBS x-rays have been produced from LWFAs using two methods: (1) retro-reflection of the LWFA drive pulse via an in-line plasma mirror (PM) [1,2]; (2) scattering of a counter-propagating secondary pulse split from the drive pulse [3]. Previously MeV photons were only demonstrated by the latter method, but the former method is self-aligning. Here, using the Texas Petawatt (TPW) laser and a self-aligned near-retro-reflecting PM, we generate bright CBS γ-rays with central energies higher than 10 MeV. The 100 μm focus of TPW delivers 100 J in 100 fs pulses, with intensity 6x10^{18} W/cm^2 (a0=1.5), to the entrance of a 6-cm long Helium gas cell. A thin, plastic PM immediately following the gas cell exit retro-reflects the LWFA driving pulse into the oncoming 0.5 - 2 GeV electron beam to produce a directional beam of γ-rays without significant bremsstrahlung background. A Pb-filter pack on a thick, pixelated, CsI(Tl) scintillator is used to estimate the spectrum via differential transmission and to observe the beam profile. Recorded beam profiles indicate a low divergence. [1] H.-E. Tsai et al., Phys. Plasmas 22, 023106 (2015). [2] K. Ta Phuoc et al., Nat. Photon. 6, 308 (2012). [3] N.D. Power et al., Nat. Photon. 8, 28(2014).

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