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Ultra-intense Pair Creation using the Texas Petawatt Laser and Applications[1] EDISON LIANG, ALEXANDER HENDERSON, TAYLOR CLARKE, WILLIE LO, PETR CHAGUINE, Rice University, GILLISS DYER, NATHAN RILEY, KRISTINA SERRATTO, MICHAEL DONOVAN, TODD DITMIRE, University of Texas at Austin — Pair plasmas and intense gamma-ray sources are ubiquitous in the high-energy universe, from pulser winds to gamma-ray bursts (GRB). Their study can be greatly enhanced if such sources can be recreated in the laboratory under controlled conditions. In 2012 and 2013, a joint Rice-University of Texas team performed over 130 laser shots on thick gold and platinum targets using the 100 Joule Texas Petawatt Laser in Austin. The laser intensity of many shots exceeded 10^{21} W.cm^{-2} with pulses as short as 130 fs. These experiments probe a new extreme regime of ultra-intense laser - high-Z solid target interactions never achieved before. In addition to creating copious pairs with the highest density ($>10^{15}$/cc) and emergent e+/e- ratio exceeding 20% in many shots, these experiments also created the highest density multi-MeV gamma-rays, comparable in absolute numbers to those found inside a gamma-ray burst (GRB). Potential applications of such intense pair and gamma-ray sources to laboratory astrophysics and innovative technologies will be discussed.

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