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X-Ray and electron beam source characterization from Self-Modulated Laser Wakefield Acceleration experiments at Titan[1] PAUL KING, Lawrence Livermore National Laboratory/ University of Texas at Austin, NUNO LEMOS, FELICIE ALBERT, Lawrence Livermore National Laboratory, JESSICA SHAW, AVI MILDER, Laboratory for Laser Energetics, KEN MARSH, University of California Los Angeles, ART PAK, Lawrence Livermore National Laboratory, BJORN HEGELICH, University of Texas at Austin, CHAN JOSHI, University of California Los Angeles — The development of a directional, low-divergence, and short-duration (ps and sub-ps) x-ray probes with energies of tens of keV is desirable for the fields of astrophysics, High Energy Density Science and Inertial Confinement Fusion. In this work we focused the Titan laser beam (1 ps and 150 Joules) into a 4mm helium gas jet to produce an electron beam that in turn generates an x-ray beam. The measured Raman Forward Scattering satellites present in the laser spectrum after the interaction, indicate the generation of a Self-modulated laser wakefield accelerator. This accelerator produced an electron beam with energies up to 250 MeV, a divergence of 16 x 40 mrad and a total charge of 6 nC. Using this high-charge relativistic electron beam we explored the combination of three mechanisms to produce an x-ray beam: Betatron, Compton scattering and Bremsstrahlung. We show the generation of a low divergence (mrad), small source size (um) broadband (keV to MeV) x-ray beam that can be used as a backlighter for time-resolved spectroscopy, imaging, and Compton radiography.

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