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Observation of Betatron radiation in the self-modulated regime of laser wakefield acceleration[1] FELICIE ALBERT, BRADLEY POLLOCK, CLEMENT GOYON, ARTHUR PAK, JOHN MOODY, LLNL, JESSICA SHAW, NUNO LEMOS, KEN MARSH, CHRISTOPHER CLAYTON, UCLA, WILLIAM SCHUMAKER, SIEGFRIED GLENZER, SLAC, ALISON SAUNDERS, LBNL / UC Berkeley, ROGER FALCONE, LBNL, FREDERICO FIUZA, SLAC, CHAN JOSHI, UCLA — We observed multi keV Betatron x-rays from a self-modulated laser wakefield accelerator. The experiment was performed at the Jupiter Laser Facility, LLNL, by focusing the Titan short pulse beam (4-150 J, 1 ps) onto the edge of a Helium gas jet at electronic densities around 10^{19} cm^{-3}. For the first time on this laser system, we used a long focal length optic, which produced a laser normalized potential a_0 in the range 1-3. Under these conditions, electrons are accelerated by the plasma wave created in the wake of the light pulse. As a result, intense Raman satellites, which measured shifts depend on the electron plasma density, were observed on the laser spectrum transmitted through the target. Electrons with energies up to 200 MeV, as well as Betatron x-rays with critical energies around 20 keV, were measured. OSIRIS 2D PIC simulations confirm that the electrons gain energy both from the plasma wave and from their interaction with the laser field.

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