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# High Resolution Radiography with Self-Modulated and Blowout Regime Laser Wakefield Acceleration generated X-ray sources

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We aim to develop a diagnostic capable of high spatio-temporal resolution, specifically to be used in High Energy Density Science (HEDS) experiments. A Self-Modulated laser wakefield acceleration (SM-LWFA) driven broadband X-ray source was observed at the Titan target area, Jupiter Laser Facility. The spectral range was between 10 KeV to > 1 MeV, and took advantage of Betatron, Inverse Compton Scattering, and Bremsstrahlung processes to create X-rays. In order to design an X-ray source we can apply to dynamic radiography in HEDS experiments, we must thoroughly examine spectral and spatial attributes. Our results include a comparison of spectral output and source size for each method of generating X-rays from SM-LWFA. An inertial confinement fusion hohlraum and modified Air force resolution target were imaged to demonstrate potential for applications. The radiographs are also used to determine the X-ray source size, or resolution capability. The modified Air Force target is approximated as a "knife edge" and the Fresnel diffraction formalism is used to model the diffraction pattern at different source sizes, and compare to the experimental data. In order to minimize error induced by misalignment in the z plane [1], a curved object (the hohlraum) was also used to determine source size. A modified X-ray ray tracing code creates a line out of a curved object radiograph. In the future, we will apply these analysis tools to compare blowout regime wakefield with other injection schemes and potentially SM-LWFA on the Texas Petawatt.

[1] R. Tommasini et al. POP 24, 053104 (2017).

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