

Probing ultra-fast ionization and homogenization of near-critical density foams at relativistic intensities at the HED/HiBEF instrument

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Here we will show a study of the ultra-fast homogenization process of foams targets when irradiated by a high intensity optical laser. Foam targets are of large interest due to their larger laser energy absorption compared to overcritical density target. However, the evolution of the foam during irradiation has not been directly observed until now. We will show the analysis of X-ray small angle scattering patterns, and how we can follow the physical processes of the interaction during the prepulse (~ns time scale), leading flank (~ps time scale) and main pulse (~fs time scale) followed by a fast homogenization (~500 fs after main pulse). We will also present results of 2D and 3D PIC simulations as well as forward calculations of the X-ray scattering patterns, comparing them with experimental data, and how it allows us to spatially and temporally resolve the laser-plasma interaction.

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