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Development of a low debris x-ray backlighter source via laser irradiation of a cluster gas medium HAZEL LOWE, SIDDARTH PATANKAR, SAMUEL GILTRAP, NICHOLAS STUART, TIMOTHY ROBINSON, Imperial College London, EDWARD GUMBRELL, AWE, ROLAND SMITH, Imperial College London, IMPERIAL COLLEGE TEAM, AWE COLLABORATION — X-ray backlighter sources, typically based on laser irradiated solid targets, are of great importance for radiography of transient plasmas produced in high power laser-target interactions. Here we report on the development of an atomic cluster gas based x-ray source and assess its viability for x-ray point projection imaging motivated by the debris free, high repetition rate nature of laser-cluster gas interactions. The dependence on cluster size and atomic number of the anisotropic radial x-ray distribution, 100μm x-ray source size and multi-keV free electron temperatures produced by the interaction of a 1TW short pulse (500fs), high contrast laser system operating at 1054nm with high density Ar, Kr and Xe cluster gas media have been investigated. Previously, when propagated through a large (10mm) volume cluster gas medium at 10ˆ17 atoms/cc, >95% of the laser energy contained in a short pulse was absorbed launching a strong, radiative cylindrical blast wave. At 10ˆ19 atoms/cc, the absorption of the laser energy by the cluster gas medium was high (>85%). However, optical probing at 2ω showed that the laser energy was predominantly absorbed at the edge of the gas volume where the energy absorbed per unit length rapidly changed over a scale length of 2mm launching a radiative, elliptical blast wave.

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