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Characterisation of the interaction of 40fs, 10J laser pulses with gases of atomic clusters DANIEL SYMES, Rutherford Appleton Laboratory, STEFAN OLSSON-ROBBIE, Imperial College London, HUGO DOYLE, Oxford University, HAZEL LOWE, CHRIS PRICE, DAMIEN BIGOURD, SIDDHARTH PATANKAR, KATALIN MECSEKI, Imperial College London, NICOLA BOOTH, ROBBIE SCOTT, Rutherford Appleton Laboratory, ALASTAIR MOORE, AWE plc, Aldermaston, MATTHIAS HOHENBERGER, Laboratory for Laser Energetics, Rochester, RAFAEL RODRIGUEZ, Universidad de Las Palmas de Gran Canaria, EDWARD GUMBRELL, AWE plc, Aldermaston, ROLAND SMITH, Imperial College London — The interaction of short, intense laser pulses with clustered gas is distinct from that with monatomic gases since the high density in the cluster enables efficient energy deposition. The dramatic heating of the clusters transfers a large portion of the laser energy into ions and, with deuterated gases, can provide a pulsed neutron source. After the laser pulse, hot plasma remains that provides a debris-free EUV and K-alpha x-ray source. The subsequent explosion launches radiative shock waves that are suitable for laboratory astrophysics experiments. Our experiment uses the Astra-Gemini laser with energies above 10J, whereas most studies have been limited to of order 1J. We will characterise blast waves through optical imaging and time-resolved x-ray measurements to determine thresholds for radiative instabilities. We will also study secondary source generation by measuring x-ray, electron and ion yields. In particular we will investigate wakefield acceleration and the associated betatron hard x-ray emission and present a direct comparison with a helium gas experiment to determine the influence of clusters.

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