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Laser driven high energy density radiative blast waves launched in clustered gases 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, DANIEL SYMES, Rutherford Appleton Laboratory, ROLAND SMITH, Imperial College London — Intense lasers deposit energy efficiently in clustered gases creating hot plasma with low density, conditions ideal for launching radiative blast waves (BWs) of interest for laboratory astrophysics (LA). We report measurements in a range of gases irradiated by the Astra-Gemini laser with energies >10J. Optical imaging, self emission and temporally resolved x-ray spectra are used to characterise BW evolution. The high repetition rate of the laser allows us to explore the influence of atomic number and density on the BW dynamics. Altering the emitted radiation and opacity of the medium has a strong effect on the BW profile and energy loss. Strongly radiative BWs exhibit shell thinning, increasing their susceptibility to instabilities. We have demonstrated the onset of a velocity instability, driven by the exchange of energy between the shock and precursor in krypton BWs. We discuss the threshold conditions for this behaviour and the potential to study spatial shock front instabilities. Our results will be compared to simulations and analytical calculations with a view to designing scalable LA experiments.

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