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*Daniel Symes*

*STFC Rutherford Appleton Laboratory, UK*

## Laser-driven high energy density radiative blast waves launched in clustered gases

The interaction of short, intense laser pulses with clustered gas is distinct from monatomic gases since the solid density inside the cluster enables efficient energy deposition. The dramatic heating of the clusters transfers a large portion of the laser energy into the plasma leading to an energetic explosion launching a radiative blast wave into the surrounding medium. Low average gas density means that these blast waves are optically thin to most of the radiation, placing them in a regime of particular interest for laboratory astrophysics because of their similarity to supernova remnants. Shock evolution is characterized using interferometry and plasma emission as well as temporally streaked Schlieren imaging to obtain the entire shock trajectory in single shot. Varying the atomic number from hydrogen through to xenon alters the emitted radiation and opacity of the medium which has a strong effect on the blast wave profile and energy loss. Strongly radiative blast waves exhibit shell thinning, increasing their susceptibility to instabilities and I will present observations of the onset of a velocity oscillation, driven by the exchange of energy between the shock and precursor in krypton. Using a second laser beam to selectively destroy clusters we have imposed a periodic modulation on the shock front that can act as a seed for spatial instabilities. Shock collisions were also initiated by focusing two spatially separated laser pulses to drive adjacent blast waves which were tomographically imaged. The data are interpreted with the aid of radiation-hydrodynamic code simulations.

### Biography

Daniel Symes is the operations manager of the Gemini Laser Facility at STFC Rutherford Appleton Laboratory and has over 15 years of experience in laser-plasma research with a current emphasis on plasma acceleration experiments. He completed his PhD at Imperial College London in 2003 before a research position at the University of Texas at Austin studying high power laser interactions. He has authored research papers on strong-field interactions with clusters, microdroplets and structured targets, the application of shock waves in clusters as a laboratory astrophysics analogue and the use of optical gating for advanced plasma probing.

dan.symes@stfc.ac.uk

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