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Development and Characterisation of a Sapphire Material Graded Areal Density Ramp Loading System MICHAEL GOFF, SIMON FINNEGAN, JEREMY MILLETT, JAMES FERGUSON, AWE — A gas gun launched sapphire material ramp loading system has been experimentally tested and the results compared to 3-D SPH modelling. Impacts onto lithium fluoride targets were performed at 200-700 ms^{-1} and spatially separated Het-V probes observing the buffer/target interface showed that the loading was predominantly uniform across the 1-D zone of the target. The duration of the ramp varied over a range of a few microseconds depending on impact velocity and buffer thickness. These findings offer confirmation of the methodology functioning as intended that was not apparent from previous embedded PV gauge or single Het-V probe experiments using previous iterations of this method. In this technique, a flyer with a graded areal density spiked surface is impacted into a flat disc buffer of similar material using a gas gun, multiple wavelets are formed which coalesce in the buffer. This leads to a ramped/quasi-isentropic loading entering the target which is in intimate contact with the buffer. In these experiments, the flyers were constructed from machined Z-cut sapphire material offering a superior build quality to previous rapid prototype alumina examples. Good agreement was observed between Autodyn 3-D SPH modelling and experimental results, with the exception of low velocity impacts where it is apparent that the material strength models need further tuning.

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