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PDV-based estimation of high-speed ejecta particles density from shock-loaded tin plate JEAN-ELOI FRANZKOWIAK, GABRIEL PRUDHOMME, PATRICK MERCIER, SVERINE LAURIOT, ESTELLE DUBREUIL, CEA, DAM, DIF F-91297 Arpajon - France, LAURENT BERTHE, PIMM, CNRS-ENSAM Paristech, 151 Boulevard de l'Hopital, 75013 Paris, France — A machine-grooved metallic tin surface is explosively driven by a detonator with a shock-induced pressure of 25 GPa. The resulting dynamic fragmentation process called micro-jetting is the creation of high-speed jets of matter moving faster than the bulk metallic surface. The resulting fragmentation into micron-sized metallic particles generates a self-expanding cloud of droplets, whose areal mass, velocity and size distributions are unknown. Lithium-Niobate (LN) piezoelectric pin measured areal mass and Photonic Doppler Velocimetry (PDV) was employed to get a time-velocity spectrogram of the cloud. We present both experimental mass and velocity results and relate the integrated areal mass of the cloud to the PDV power spectral density under the assumption of a power law distribution for particle sizes. A model of PDV spectrograms is described, for which speckle fluctuations are averaged out. Finally, we use our model for a Maximum Likelihood Estimation of the cloud's parameters from PDV data. The integrated areal mass deduced from the PDV analysis is in good agreement with piezoelectric results. We underline the relevance of analyzing PDV data and correlating different diagnostics to retrieve the macro-physical properties of ejecta particles.

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