Photon Doppler velocimetry of ejecta from shock-loaded samples
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Experimental Physics — The report addresses the problem of recovering the ejecta
parameters from PDV data. The results of PDV-measurements of ejecta produc-
tion from shock-loaded Pb samples are presented. Shockwaves were generated by
a flyer-plate accelerated up to 3 km/s. Depending on the sample thickness, the
shock-breakout pressure varied from 23 to 45 GPa. The ejecta transport occurred in
air. Spectral profile $E(\omega)$ of heterodyne beats underlies our analysis of the experi-
ments. Under the assumption that ejected particles are disordered, the profile square
$|E(\omega)|^2$ is subject to the transport equation which accounts for multiple scattering
and absorption of the probing beam in the ejecta cloud. We solve the transport
equation with the discrete-ordinate code. Adjusting the free surface velocity, the
optical thickness and the parameters of the velocity distribution of the ejecta scat-
tering coefficient, we gain a good fit of the calculated profile to the PDV-measured
one. Such an approach enables us, based on the ejecta optical model, to recover the
areal density and the density-velocity distribution from PDV data, e.g., to determine
how this distribution changes in time due to the particle slowing-down in air.

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