

## Hypervelocity Dust Trajectories Measured by the Dust Coordinate Sensor at IMPACT

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The Dust Coordinate Sensor (DCS) is a dual-location instrument installed on the beamline of the dust accelerator at the Institute for Modeling Plasma, Atmospheres and Cosmic Dust (IMPACT) at the University of Colorado. This instrument measures the individual trajectories of charged, hypervelocity (3-5 km/s), micron-sized dust particles while in flight. In order to calculate trajectories, DCS records the x-y coordinates of each particle at two locations along the beamline, 4 m apart. The coordinate measurements utilize the image charge induced by each dust particle as it passes through two 24 mm<sup>2</sup> grids of wire electrodes. The resulting peak voltages of each wire are measured by charge sensitive amplifiers (CSAs) and compared to a series of lookup tables (created using COULOMB simulations) via interpolation software in order to determine the x-y coordinate at each grid's location. The coordinate measurements are matched by timestamp with separate measurements of charge and velocity for each launched dust particle. Real-time information on individual particles' positions anywhere along the beamline as well as aggregate statistics such as beam width and position can thus be determined. Future applications of DCS will include studies of impact craters on a variety of targets; the DCS will enable one-to-one matching of individual craters with specific particle characteristics (mass, velocity), even in targets impacted by many particles in a given experiment.