

Focusing and alignment for a 3 MV dust particle accelerator

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Abstract. The Colorado Center for Lunar Dust and Atmospheric Studies (CCLDAS) has recently constructed a 3MV dust particle accelerator designed to accelerate particles to simulate the hypervelocity micrometeorites that regularly impact the lunar regolith. Planned experiments at CCLDAS, such as instrument calibration, simulated weathering and impact ejecta characterization, require precise control over parameters including particle size, speed, and charge. Detectors in both the beamline and target chamber require the beam to be aligned and focused to a small cross-section. To this end, simulations have been run using the ion-optics simulation program SIMION® to determine the optimal geometries and voltages of an electrostatic Einzel lens to focus the beam. These simulations indicate that the beam can be focused to a diameter of 0.5 mm at the target. To ensure that the focused beam accurately impacts the target, a number of alignment methods are employed, including a line of sight through the entire beam line; a retractable laser/mirror setup for precise placement of targets; and a particle position detector within the beamline.