**Electrostatic Regolith Interaction Experiment (ERIE) Electrometer Instrument Development**

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The Electrostatic Regolith Interaction Experiment (ERIE) is a joint venture between the University of Central Florida (UCF) Center for Microgravity Research (CMR) and the NASA Kennedy Space Center (KSC) Electrostatics and Surface Physics Laboratory (ESPL) seeking to examine charged dust grain behavior in a microgravity environment. Two separate systems have been combined for this suborbital flight experiment: the COLLisions Into Dust Experiment (COLLIDE) developed by the UCF CMR and the Wheel Electrostatic Spectrometer (WES) developed by the NASA KSC ESPL. This combination will advance the understanding of the natural and induced charged grain behavior on the Moon, asteroids, and other low gravity bodies comprised of charged dust particles.

COLLIDE retains granular material under vacuum in a shallow tray behind a metal door, which then opens and releases the particles into a larger open volume when microgravity is achieved. The experiment is observed with a high-speed camera, such that the motions of these particles can then be tracked so the kinematics of each grain may be analyzed. The original application for this apparatus was to study cratering events into granular beds, but electrostatic repulsion was detected in the early frames of the video data returned from completed experiments, so a re-flight with a focus on these events was proposed. Agitation of the grains during launch combined with the frictional charge transfer between the grains and the door as it slides open provides an opportunity to use this setup to observe material tribocharging and charged particle behaviors in microgravity. In this updated version, the charged particles released into the chamber will traverse through an electric field produced by high voltage parallel plates and their resulting trajectories will be determined by their net charges.

WES was originally developed to characterize the triboelectric properties of the Martian regolith through the contact of a rover wheel with the surface as it rotates. Improvements were made upon this legacy system to develop a sensor suite that will be installed within the COLLIDE door to measure charge transferred between the granular material and insulating disks protruding through the door. These insulator disks span the triboelectric series so, as they slide across the particulate matter when the door opens, each will accumulate a charge consistent with its relative position to the grains within the series. This charge on each insulator is distributed between two capacitances in series with an electrometer amplifier returning an analog voltage proportional to the charge accumulated. Calibration of this system has been performed using applications of known charge to the inputs and characterization of the frictional charge transfer between various regolith simulants and the sensor insulators is currently being examined in the lab.