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Instrument Study of the Lunar Dust Experiment (LDX) for the ESA Lunar Lander

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Abstract

The future exploration of the lunar surface by an ESA lander requires the measurement of dust transport phenomena above the surface. Therefore an instrument study investigates the properties of a dust sensor (LDX) with low mass which is based on charge induction. In this work, we used simulation software Coulomb V91 to study the possible charge signals for the dust detector-LDX. Lunar Dust eXplorer (LDX) is a hybrid trajectory sensor, with two instruments, one is used for the detection of lunar dust rising from lunar surface and the other one is used for the dust transmitting through horizontal direction of lunar surface. A dust detector landing on lunar surface supports a direct way to study this process. The Coulomb V91 software was used as a tool to simulate the induced charge signals, when a charged ejecta particle flies through LDX grid segments and wires. Grain trajectories close to the wall and to segment edges have a strong influence to the signal shapes. The wires diameters and total number of wires both influence the signal values of wires plant. A relatively better result comes out from the plate with 40 wires (0.1mm in diameter). According to our results, LDX provides a trajectory resolution of approx. 4 degrees for dust flying through the horizontal direction, and for the dust rising from lunar surface, this value is about 25 degrees.

References

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