MODELING THE UV SIGNAL SCATTERED INTO THE LUNAR DUST EXPERIMENT (LDEX) FROM THE SURFACE.

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Introduction. The Lunar Dust EXperiment (LDEX) instrument onboard the Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft is currently characterizing the distribution of dust around the Moon and its temporal variability. LDEX is an impact ionization dust detector with a sensor area of ~ 0.01 m^2, **Fig. 1**. The impact target is of a hemispherical shape and a radial electric field is used to focus the generated ions onto a microchannel plate (MCP) detector. LDEX has two modes of detecting dust: Particles larger than about $r > 0.3$ μm produce sufficiently large charges and can be detected as individual impact events. A potentially large population of smaller grains, $r < 0.3$ μm, can be identified by measuring their collective signal by *integrating* the MCP signal for ~100 ms periods. This integrated signal then enables the identification of regions with a high-density of particles that are too small to be detected individually.

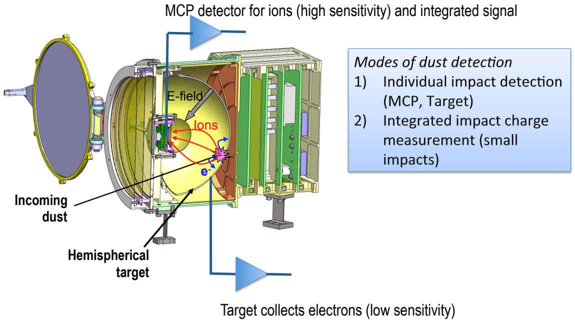

Figure 1. The schematic drawing of LDEX. UV photons can enter through the aperture, scatter from the target into the MCP ion detector, and contribute to background noise.

UV background signal. The LDEX instrument is sensitive to the UV light that enters the instrument and can scatter into the MCP detector. LADEE is on a low-inclination orbit and the LDEX instrument it turned off while the Sun is in its field-of-view (FOV). Shortly after passing the subsolar point the LDEX instrument is turned on and flies over the sunlit lunar surface until it crosses the terminator. **Figure 2** shows two examples of the recorded integrated signal from such cases. The preliminary data show that on some orbits the background signal is quiet, while on other obits there are contributions from additional sources, possibly ions beams. The motivation for the present work is to remove the contribution from UV backscattered from the lunar surface in order to identify and characterize the signal sources of interest. The preliminary calculation of the UV background signal is based on the photometric properties of the lunar surface derived by Hapke [1] and Lucke et al. [2], using parameters measured by previous space missions, and the calibrated sensitivity of the LDEX instrument. The preliminary model reproduces the general shape of the data, however, the model needs to be updated to obtain better agreement.

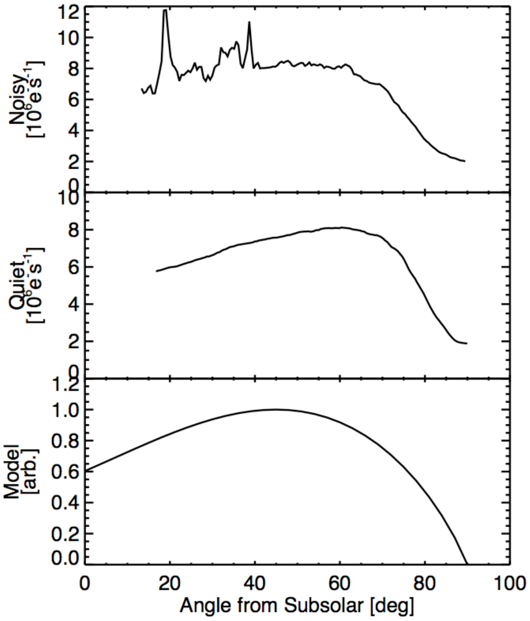

Figure 2. The measured signal on the integrated channel when LDEX is flying over sunlit areas. Depending on the orbit the signal can be "noisy" indicating contribution from sources other than UV (top panel), or "quiet" where the UV background dominates (mid panel). The bottom panel illustrates the general shape of the UV background signal from the existing model.

References: [1] Hapke, B.W., Theory of reflectance and emittance spectroscopy (Cambridge University Press, 2nd ed., 2005)., [2] Lucke, R.L., R. C. Henry, and W. G. Fastie, Far-ultraviolet albedo of the Moon, Astron. J. 81, 1162 (1976).