

TESTING OF A POLAR NEPHELOMETER FOR USE IN THE CREATION OF A DUST DATABASE SUPPORTING LUNAR SCIENCE APPLICATIONS. G. Berlanga¹, D. T. Richard², J. Marshall³, S. Davis⁴, ¹Mount Holyoke College/NASA Ames (berla20g@mtholyoke.edu), ²Lawrence Livermore National Laboratory/NASA Ames, ³SETI/NASA Ames, ⁴NASA Ames.

Introduction: In support of the Lunar Atmosphere and Dust Environment Explorer (LADEE) mission, the NASA Ames Lunar Dust Laboratory is developing a dust database for various materials and lunar simulants.[1] Using a polar nephelometer that includes a halogen light source and a UV/VIS spectrometer, we seek to derive dust particle mass, diameter, size distribution, and density from light scattering data. Efforts to program the software, automatize data acquisition, and improve the experimental setup are underway. Dust scattering data will provide an in situ reference for spectrometer behavior and dust data acquired in orbit around the moon.

Digital Formats:

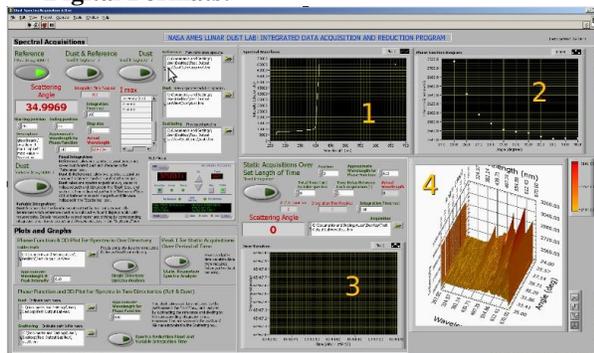


Figure 1: NASA Ames Lunar Dust Lab: Integrated Data Acquisition and Reduction Program

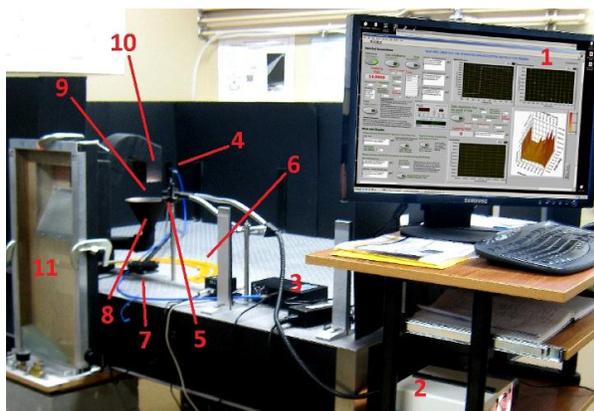


Figure 2: Red numbers correspond with listed descriptions below.

1. NASA Ames Lunar Dust Lab: Integrated Data Acquisition and Reduction Program A custom written program using Labview, a graphical programming interface, controls the optical sensor's position, and

the spectrometer's integration time and number of spectral acquisitions, as well as processes and displays real time data.

2. Halogen light Schott II Light Source Contains a halogen EKE 21V 150W bulb.

3. Spectrometer Ocean Optics QEC65000 UV/VIS spectrometer with a minimum integration time of 8 ms and a maximum integration time of ~15 minutes. This is the same spectrometer that will make up part of the LADEE orbiter's equipment.

4. Optical Sensor A collimating lens sits atop the rotating stage and is connected to the spectrometer that acquires light scattering spectra from 0-180° around the sampled material.

5. Snake Lights Two fiber optic snake tubes guide the light generated by the light source.

6. Protractor 0-180°

7. Rotating Stage Motor Thor Labs The motor moves clockwise from 0 to 180 degrees while spectral acquisitions occur and returns home to 0 degrees at the culmination of the spectral data set.

8. Vacuum Funnel Suctions particles into vacuum dust bag located below lab table.

9. Material Sampled Utilizing high air pressure, ballotini comminution products were streamed through the overhead duct to generate a "cloud" or "stream" at the site of spectra sampling.

10. Overhead Duct Guides the ballotini from the pressure chamber to the site of spectral sampling.

11. Comminution Chamber Holds ballotini while they are ballistically weathered and chipped due to pressure generated particle collisions (comminution). Air flow causes the chipped particles to rise and exit at the top opening connecting to the overhead duct.

References:

[1] NASA (2008) NASA HQ. NASA Solicitation: Instruments for LADEE Lunar Mission

The complete RFI including background, requested information, and instructions for responding may be found at <http://nspires.nasaprs.com/> (select "Solicitations" then "Open Solicitations" then "Request for Information (NNH08ZDA006L): Instruments for LADEE Lunar Mission").