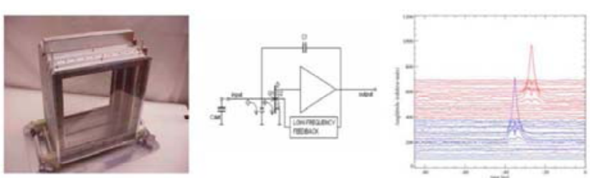
**THE LUNAR DUST OBSERVATORY.** E. Grün[1,2], R, Srama[2], M. Horanyi[1], Z. Sternovsky[1], S. Auer[3] ([1]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO 80309-0392, USA [2]MPI-K, Heidelberg, Germany, and [3]A&M Associates, Basye, USA; e-mails: eberhard.gruen@mpi-hd.mpg.de; ralf.srama@mpi-hd.mpg.de; horanyi@colorado.edu, Zoltan.Sternovsky@colorado.edu, dusty789@shentel.net )

**Introduction:** The lunar surface provides an ideal platform for a large-scale Dust Observatory to investigate the interplanetary and interstellar dust environment. Dust particles, like photons, carry information from remote sites in space and time. This approach could be called 'Dust Astronomy.' Targets for a dust telescope are the local interstellar medium and nearby star forming regions, as well as comets and asteroids. Dust from interstellar and interplanetary sources is distinguished by accurately sensing their trajectories. Trajectory sensors use the electric charge signals that are induced when charged grains fly through the detector. The Dust Telescope will: (a) distinguish between interstellar dust and interplanetary dust of cometary and asteroidal origin; (b) determine the elemental composition of impacting dust particles. In addition to the study of these external sources of dust, similar techniques can be applied to the study of the local lunar dust environment. By use of pick-up detectors in combination with electrostatic deflectors, the migration of low-velocity charged grains can be analyzed on the surface of the Moon.

**Components of a Dust Observatory** 1) Dust Trajectory Sensor (DTS): The trajectory sensor consists of four sensor planes mounted between two electrical shielding grids. Each sensor plane consists of parallel wire electrodes with each electrode being connected to a separate charge-sensitive amplifier.



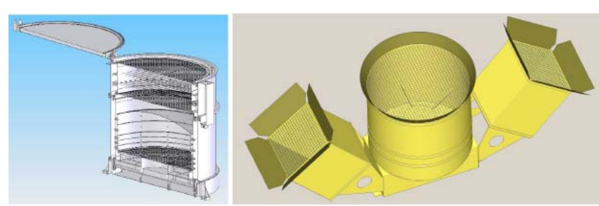
*left*: The laboratory version of DTS, *middle*: the charge sensitive amplifier (CSA), and *right:* Signals from a dust particle with an electrical charge of 4 fC.

2) Large-Area Mass Analyzer (LAMA): The large-area mass spectrometer consists of the impact target area (0.1 $m^2$) with acceleration grid and a single-stage reflectron. The reflectron consists of two parabolic grids, the central 22 cm diameter ion detector, and an appropriate number of potential rings. Mass spectra where obtained at the Heidelberg dust accelerator. Laboratory tests demonstrated a mass resolution of $M/\Delta M > 150$.

*left:* Schematics of the LAMA instrument. *middle:* The working laboratory version of LAMA. *right:* Measured mass spectra from an uncleaned brass target.

3) Dust Trajectory, Charge and Mass Sensor (DTQMS), an enhanced version of DTS, is to measure the charge-to-mass ratio, q/m, of slow moving dust grains on the lunar surface. In order to measure q/m, the grains are subjected to an electric field and the deflection of the grain's path is measured. A transverse field of strength 100 kV/m and length of 0.1 m is applied behind the fourth plane of charge sensing electrodes of a DTS and an additional position-sensing grid is added behind the electric field region. The trajectory is measured both before and after the electric field region and grain's mass can be calculated from the deflection due to the force in the electric field.

**The Dust Telescope (DT):** the combinations of DTS and LAMA could open up an entirely new class of observations Dust particles of cometary, Kuiper-belt, or interstellar origin can be identified form their trajectories, and their composition measured and compared. The flux of micron-sized ($m \geq 10^{-12}$ g) interplanetary dust particles covers a broad distribution around the apex of the Earth (and lunar) motion around the Sun. The peak flux is about $10^{-4}\ m^{-2}s^{-1}$.



*left:* Cut through of the dust telescope. *right:* Preliminary design of the dust observatory.

These dust instruments, combined with imaging, plasma and electric field measurements could be used to characterize the near surface dusty plasma environment of the Moon.