MEASUREMENTS ON THE ION-CLOUD LEVITATING ABOVE THE LUNAR SURFACE: EXPERIMENTS AND MODELLING ON HUNVEYOR EXPERIMENTAL LANDER. T. Földi[1], Sz. Bérczi[2], [1]FOELDIX, H-1117 Budapest, Irinyi J. u. 36/b. Hungary, [2]Eötvös University, Dept. G. Physics, Cosmic Materials Space Research Group, H-1117 Budapest, Pázmány Péter sétány 1/a, Hungary, (bercziszani@ludens.elte.hu)

Introduction: Solar UV radiation, solar wind and micrometeorite bombardment, and many other sources contribute to the producing of an ion-cloud like quasiatmosphere above the lunar surface. Hunveyor experimental lander [1,2] made it possible to plan new measurements for ion-cloud and lunar dust electrostatic and electrodynamic characteristics.

Ion-cloud origin: The main object of these measurement is the gas-dust-water-vapor ion-cloud, a mixed quasiatmosphere levitating above the lunar surface. We call it ion-cloud. The origin of these ion-clouds may be the the Solar flares, the solar wind, small interplanetary gas clouds from cometary materials, and may come from X-ray and gamma-ray influences on the lunar surface.

Life-time of ion-cloud: The lifetime of such ion-clouds is determined by the ion-production inside the cloud, the recombination, the monopolar and ambipolar diffusion and thermodynamic transports. In the terrestrial environment the physical conditions (energy, velocity) in the ion-cloud can be described by the Maxwell distribution of ion molecules in the cloud. To the electrostatic and light emission phenomena of Lunar ion-clouds above the surface the Terrestrial Aurora Borealis is a similar counterpart phenomenon. In such a cloud the strong streams and the large free ion concentration induces self magnetic fields and from the interaction of the sterams and magnetic fields "closed" virtual fields are produced. This increase the lifetime of the ion-cloud with an order of two magnitude. The long lifetime makes possible for gamma and X-ray radiation to excitate the ions of the clouds. The recombination emittes radiation with characteristic wavelength: the ion-cloud is lighting. But only in the total darkness is it possible to observe this radiation. The aim of one of our instrument is measure this light effect.

New instruments for Hunveyor: We prepared two instrumentations on Hunveyor (Hungarian University Surveyor) to measure the electric properties of the lunar ion-cloud. One experiment uses a rod antenna equipped by a radioisotope on the top of the rod. The antenna is very well insulated (by amber holder) from the other parts of Hunveyor. The spherical radiating radionucleid source makes conductive the gas in its environment, therefore the antenna takes up the potential of the neighbouring gas or ion-cloud. The characteristics of the electrometer are: Inner resistance: 100 TOhm, Capacity: 6 pF. [3] This is a simpler experiment.

The second experiment is the observation of the electric field of the ion-cloud [4] using the field-mill principle. According to this principle the electric field strength is measured by a rotational cross, which serves as a modulator: it transforms the static electric field into an alternating electric field which can be more easily measured by its amplified signals which will be recorded. (For the changing field strength experiment with the field-mill principle see [4].) We integrate both experiments onto Hunveyor and we hope more understanding of the physical processes inside the ion-clouds on the Moon.

References: [1] Bérczi Sz., et al.. (1998): LPSC XXIX, #1267; [2] Drommer B., et al. (1999): LPSC XXX, #1606; [3] Experiments on the Adriatic Sea on Szent István Cruiser of the Austro-Hungarian Monarchy. (1908) [4] Földi T., et al. (2001): LPSC XXXII, #1301;

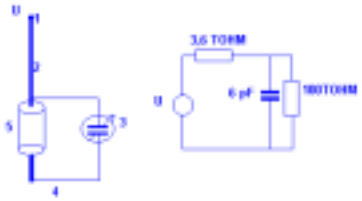

Fig.1. The antenna and the electric network substituting it for the first experiment. 1. Radionucleid isitopic souce at the top of the antenna rod. 2. The antenna rod, 3. The electrometer, 4. The ground potential, 5. Amber insulator for the antenna rod.