A UNIQUE PHOTON BOMBARDMENT SYSTEM FOR SPACE APPLICATIONS. E. J. Klein, KET Canada Inc./Sol-RF Energy Systems Inc., Box 2550, Winnipeg, Canada, R3C 4B3.

The innovative (patents pending) Electromagnetic Radiation Collection and Concentration System (EMRCCS) described here is the foundation for the development of a multiplicity of space and terrestrial system formats. The system capability allows its use in the visual, infrared, and ultraviolet ranges of the spectrum for EM collection, concentration, source/receptor tracking, and targeting.

The nonimaging modular optical system uses a physically static position aperture for EM radiation collection. Folded optics provide concentration in windowing and targeting applications. Other system designs that incorporate a phased RF and/or the system array include designs that incorporate a phased RF and/or the system array. However, the technology for building them into arrays with readouts needs development. The other approach is to use silicon CCDs. These already exist as arrays. However, the required photometric precision technology has yet to be demonstrated. Data processing complexity can be reduced by using the local-area-readout technique to obtain the flux for a few hundred stars per CCD.

By employing an integrated X-ray instrument on a future Mars mission, data obtained will greatly augment those returned by Viking; details characterizing the past and present environment on Mars and those relevant to the possibility of the origin and evolution of life will be acquired. A combined XRF/XRD instrument has been breadboarded and demonstrated to accommodate important exobiology and geology experiment objectives outlined for MESUR and future Mars missions. Among others, primary objectives for the exploration of Mars include the intense study of local areas on Mars past epochs; and to establish the global chemical and physical characteristics of the martian surface [1].

The XRF/XRD breadboard instrument identifies and quantifies soil surface elemental, mineralogical, and petrological characteristics and acquires data necessary to address questions on volatile abundance and distribution. Additionally, the breadboard is able to...
characterize the biogenic element constituents of soil samples providing information on the biologic potential of the Mars environment. For example, experimental results employing the breadboard indicate that accurate and precise data including the detection, identification, and quantification of elements to trace levels (ppm) from carbon to zirconium (6 < Z < 40), as well as relative abundance of amorphous vs. crystalline minerals in Mars soil surface samples, can be obtained. The breadboard has been designed and built with regard to expected Mars environmental operating conditions, mission constraints, and technical requirements that include general instrument design considerations.

Preliminary XRF/XRD breadboard experiments have confirmed the fundamental instrument design approach and measurement performance. Experimental accomplishments and results include the following: XRD observation of the principal diffraction lines of montmorillonite; XRF measurement of aluminum, silicon, calcium, titanium, and iron abundances in palagonite powder samples commensurate with expectations; and calibration of a carbon-detecting XRF channel with detectability limits in the order of 0.01 wt%.

The breadboard experiments provided valuable confirmation of models used to simulate and optimize the instrument's performance and indicated practical improvements in its design.


REMOTE MEASUREMENT OF PLANETARY MAGNETIC FIELDS BY THE HANLE EFFECT. C. K. Kumar1,2, L. Klein1,2, and M. Giraud3, 1Department of Physics and Astronomy, Howard University, Washington DC 20059, USA, 2Center for the Study of Terrestrial and Extra-Terrestrial Atmospheres, Howard University, Washington DC 20059, USA, 3Département de Physique, Université de Provence/St. Jerome, Marseilles, France.

Resonance fluorescence lines in the spectra of planetary atmospheres are polarized. They will be depolarized by magnetic fields in the scattering medium (Hanle effect). The amount of depolarization has been calculated for some atomic (FeI, Cal) lines and some molecular lines (NO γ bands) seen in the Earth's dayglow spectra. The results are presented and the potential advantages of LIDAR measurements for obtaining atmospheric magnetic fields are discussed. The depolarization of Na and Ca lines are suitable for measuring magnetic fields in and near Io.

PROPOSAL FOR A UNIVERSAL PARTICLE DETECTOR EXPERIMENT. J. C. Lesho, R. P. Cain, and O. M. Uy, APL, Building 13-5377, Johns Hopkins University, Laurel MD 20723, USA.

The Universal Particle Detector Experiment (UPDE), which consists of parallel planes of two diode laser beams of different wavelengths and a large surface metal oxide semiconductor (MOS) impact detector, is proposed. It will be used to perform real-time monitoring of contamination particles and meteoroids impacting the spacecraft surface with high resolution of time, position, direction, and velocity. The UPDE will discriminate between contaminants