EPSC Abstracts,
Vol. 4, EPSC2009-400, 2009
European Planetary Science Congress,

Multi-Instrument Radiometer (MIR) for JGO and JEO space components of the EJSM mission

I.Mitrofanov(1), A.Behar(2), L.Evans(3), L.Gurvits(4), M.Hecht(2), Tra-Mi Ho(5), M.Litvak(1), A.Kozyrev(1), A.Malakhov(1), G.McSmith(2), M.Mokrousov(1), J.Plaut(2), L.Richter(5), A.Sanin(1), R.Schulz(6), V.Shvetsov(7), R.Starr(3), V.Tretyakov(1), J.Trombka(3), A.Vostrukhin(1)

(1) Space Research Institute, Russia, Moscow (mitrofanov@l503.iki.rssi.ru), (2) NASA/Jet Propulsion Laboratory, USA, (3) NASA/Goddard Space Flight Center, USA, (4) Joint Institute for VLBI in Europe, The Netherlands, (5) German Aerospace Center (DLR), Institute of Space Systems, Germany, (6) ESA ESTEC Research & Scientific Support Department RSSD, The Netherlands, (7) Joint Institute for Nuclear Research, Russia

An investigation of ***Multi-Instrument Radiometry (MIR)*** is proposed for both the anticipated space components of EJSM mission: JGO and JEO. This remote sensing instrument comprises a number of advanced sensors in a highly integrated suite, which address the measurement and characterization of high energy particles, neutrons, X-rays and gamma-rays within the same package. The rate, spectra and angular distribution of energetic charged particles will be determined within the Jovian magnetosphere and in the vicinity of the Galilean moons. This package will also perform measurements of neutrons, X-rays and gamma-rays from these celestial bodies so as to provide mapping of the entire chemical composition of Ganymede and Europa and the reference composition data for Io and Callisto.

The two key goals of the MIR investigation onboard both the JGO and JEO spacecraft are determined. The ***Goal (1)*** is to perform comparative characterization of the surface composition of the Galilean moons. The following scientific results should be accomplished for this ***Goal (1):***

(1.1) Determination of the fraction of ice/non-ice composition over the subsurface of each moon.

(1.2) Determination of the content and distribution of soil constituting elements of the non-ice fraction in the shallow subsurface.

(1.3) Estimation of the content and distribution of natural radioisotopes *K*, *Th* and *U* in the non-ice fraction of the shallow subsurface.

(1.4) Estimation of the content and distribution of radioactive volatile ^{222}Rn over the surface of the moons.

(1.5) Comparison of the compositions of the top-most layer about several microns and 1 meter layer of a moons' subsurface.

(1.6) Comparison of the shallow subsurface composition for the Galilean moons.

The ***Goal (2)*** is to characterize the radiation environment of the Jovian magnetosphere including in the vicinity of the Galilean moons. The following scientific results should be accomplished for this ***Goal (2):***

(2.1) Determination of the distribution of high energy protons, neutrons and ions inside the Jovian magnetosphere, along the cruise flight paths of the EJSM spacecraft and in their orbits around Ganymede and Europa.

(2.2) Determination of the electron component of the radiation environment inside the Jovian magnetosphere along the cruise flight paths of the EJSM spacecraft and in their orbits around Ganymede and Europa.

(2.3) Determination of neutron emission from the Galilean moons.

(2.4) Investigation of transient radiation events in the Jovian and Jovian/Ganymede magnetospheres.

The concept of the highly integrated multi-instrument radiometer, MIR, will be presented. MIR will perform all necessary measurements onboard the JGO and JEO spacecraft in the

EPSC Abstracts,
Vol. 4, EPSC2009-400, 2009
European Planetary Science Congress,

conditions of the Jovian magnetosphere using state-of-the-art X-ray, gamma-ray, neutron and charged particle sensors. Also, special collimation and shielding elements of MIR will be described for getting the best possible spatial resolution in mapping of nuclear composition of Europa and Ganymede. Instrument capabilities will be discussed and main parameters will be presented. Finally, it will be shown that MIR could also provide real-time alerts during strong radiation transients in the Jovian/Ganymede magnetosphere in support of spacecraft safety and operations.