



Following water and hydrated minerals along a path of MSL rover by DAN Instrument

M.L. Litvak, I.G. Mitrofanov, A.S. Kozyrev, M.I. Mokrousov, A.V. Malakhov, A.B. Sanin, V.I. Tretyakov, A.A. Vostrukhin, and A. Varenikov

Space Research Institute, Cosmic gamma-spectroscopy laboratory, Moscow, Russian Federation (max@cgrsmx.iki.rssi.ru)

The Dynamic Albedo of Neutrons instrument is designed to perform an in-situ analysis of the hydrogen content of the bulk Martian subsurface at depths down to 0.5-1 meter. DAN is also designed to perform an in-situ analysis of the layering structure of hydrogen bearing minerals (or water) in the Martian subsurface, with horizontal resolution up to 1 m as MSL traverses on Mars.

In 2008 the flight model of DAN has been assembled, tested, calibrated and delivered to Jet Propulsion laboratory (USA, NASA) for the integration with MSL rover. But in the end of 2008 NASA has announced decision to shift launch of MSL to 2011. Taking this into account we decided focused on the additional field tests with spare flight models of DAN to provide fine adjusting and calibration of DAN. We would like to improve our knowledge about instrument response functions and its sensitivity to the presence of Hydrogen in the different form (water, chemically bound water, hydrated materials) and in the different soils (various compositions and structure). The first results of the field tests including sensitivity to the layered regolith and discovery of water rich spots along MSL path are already presented in this investigation. In addition we also discussed the different possibilities to perform field tests with DAN instrument in Martian like conditions (dry deserts, permafrost areas, Antarctica).

Based on first field tests and calibrations we have created numerical model of DAN which can be used for various predictions showing how DAN will be able to find water and locations of layered deposits of hydrated minerals. The most interesting areas of such investigation are MSL landing site candidates (Nili Fossae Trough, Holden crater fan, Mawrth Vallis, Eberswalde Crater, Miyamoto, S Meridiani, Gale Crater) selected during last MSL landing site workshop. Practically all of these candidates are considered (based on the orbital observations from MGS, Odyssey, Mars Express and MRO missions) as a places with the presence of layered deposits of hydrated minerals (phyllosilicates and sulfates).

First of all for these places we have used HEND/Odyssey and GRS/Odyssey data to estimate average content of water in vicinity of landing ellipses. After that we have used different regolith models (composition, structure, presence of hydrated minerals) corresponding to the current orbital observations and combine it with last numerical model of DAN instrument to predict how DAN instrument will observe different layering structures with different distribution of chemically bound water.