NEUTRON RADIATION ENVIRONMENT AROUND THE MOON FROM LUNAR EXPLORATION NEUTRON DETECTOR ONBOARD LRO

M.L Litvak[1] , I.G. Mitrofanov[1] , A.B. Sanin[1], V.I. Tretyakov[1], A.S. Kozyrev[1], A.V. Malakhov[1], M.I. Mokrousov[1], A.A Vostrukhin[1], D. V. Golovin[1], A.B. Varenikov[1], V. N. Shvecov[2], W.V. Boynton.[3], K Harshman[3], R.Z. Sagdeev[4], G. Milikh[4], G. Chin[5], J. Trombka[5], T. Mcclanahan[5], R. Starr[6], L. Evans[7], V. Shevchenko[8], [1]Space Research Institute, RAS, Moscow, 117997, Russia, litvak@mx.iki.rssi.ru , [2]Joint Institute for Nuclear Research, Dubna, Russia, [3]University of Arizona, Tucson, AZ, USA, [4]University of Maryland, College Park, MD, USA, [5]Goddard Space Flight Center, Greenbelt, MD, USA., [6]Catholic University, Washington, DC, USA, [7]Computer Sciences Corporation, Glenn Dale, MD, USA. [8]Sternberg Astronomical Institute of Moscow State University, Moscow, Russia.

Introduction: The Lunar Exploration Neutron Detector is designed to perform orbital mapping of Moon neutron flux in wide energy range starting from thermal neutron up to high energy neutrons above 10 MeV [1]. It consists of 8 gas filled proportional counters of neutrons and one organic scintillator (Stylbene crystal), see figure 1. The primary goal of this experiment is a search of enhanced content of hydrogen inside polar Moon shadow regions which are suspected to be a signature of comet relict water ice. LEND is installed onboard Lunar Reconnaissance Orbiter (LRO) which has been successfully launched in June 2009 and now has completed three months commissioning phase and started primary mapping observations [2].
In parallel, data from LEND detectors may be used to deconvolve neutron spectra on the orbit (30-50 km) as well as on the surface of Moon. This information may be used to monitor neutron component of radiation environment starting from low energies up to 10 MeV. Here we have tried to concentrated on the discussing this subject estimation neutron radiation dose around Moon and comparing it with measurements of near Earth and near Mars radiation environment

Data Analysis: The model dependent deconvolution of the accumulated LEND data has been used to deconvolve neutron spectra and estimate radiation dose related to the neutron component of Moon radiation background. We have used numerical simulation of orbital observations based on MCNPX code and known response functions for each LEND detector. The results of numerical simulations have been compared with real observational data to find best fit parameters of the neutron spectra shape. Multiplying with known radiation dose coefficients and integrating by energy we have estimated neutron radiation dose around Moon at different energy bands. These results have been compared with other components of Moon radiation background measured both by the previous Lunar missions and data gathered onboard LRO (CRATER experiment onboard LRO). We also made comparison with measurement of the neutron component of near Earth and near Mars radiation background using measurements from HEND instrument onboard Mars Odyssey mission (start of operation in February 2002) [3] and BTN instrument onboard International Space Station (start of operation in February 2007) [4].

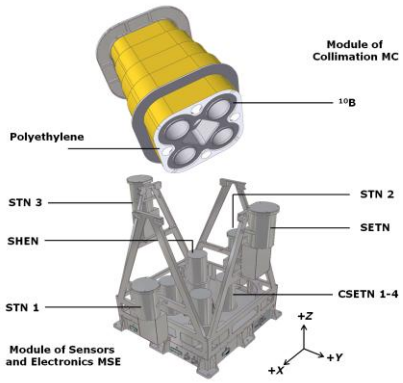

Figure.1. LEND instrument.

References:

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