Results from Radiation Environment Investigation in a Human Phantom aboard the International Space Station during the Minimum of 23-rd Solar Cycle

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The radiation field in the International Space Station (ISS) is complex, composed by galactic cosmic rays (GCR), trapped radiation of the Earth radiation belts, solar energetic particles, albedo particles from Earth's atmosphere and the secondary radiation produced in the shielding materials of the spacecraft and in human body. The biological impact of space radiation to humans depends strongly on the particle's linear energy transfer (LET) and is dominated by high LET radiation. Especially important is the effect of the high energy heavy ion component of GCR, possessing high LET and highly penetrating in human body. An essential parameter for assessment of radiation risk to humans in space is the organ dose determination. Human phantoms equipped with active and passive radiation detectors are used to obtain a better knowledge of the dose distribution inside the human body. The radiation environment in the spherical –tissue equivalent phantom of MATROSHKA-R international project on ISS has been directly observed by the Liulin-5 particle telescope. The objectives of Liulin-5 experiment are studying the dynamics of depth-dose distribution of the different components of the orbital radiation field in a human phantom and mapping the radiation environment in the phantom and its variations with time and orbital parameters (such as solar cycle, solar flare events, inclination and altitude). The particle telescope Liulin-5 measures the time resolved LET spectrum, flux and absorbed dose rates for electrons, protons and the biologically relevant heavy ion components of the cosmic radiation simultaneously at three depths of the phantom's radial channel. Presently data are available for the period June 2007-September 2009. In this report we present new results for radiation quantities obtained from different components of the complex radiation field in ISS at the minimum of the 23-rd solar cycle and comparison with data from some passive radiation detectors of MATROSHKA-R.

Keywords: space radiation measurement; human phantom; ISS.