

Space radiation results obtained with R3D-B2 instrument on Foton M2 satellite in June 2005

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On 31 May 2005, the Foton M2 capsule, housing a payload complement of 39 experiments in physical sciences, biology, fluid physics, exobiology, materials sciences and technology, was launched aboard a Soyuz-U rocket from Baikonur Cosmodrome in Kazakhstan, spending 15.6 days in Earth orbit with 62.8° inclination, 262 km perigee and 304 km apogee. Together with colleagues from Germany in STIL-BAS was developed the R3D-B2 instrument, which measure inside the Biopan 5 platform the variation of the space radiation dose and flux along the orbit of Foton M2 satellite. R3D-B2 is a Liulin-4 type spectrometer and is based on 2 cm², 0.3 mm thick silicon detector, which after the opening of the Biopan 5 lid is placed behind the following shieldings: 1 mm thick aluminum shielding plus 0.2 mm plastic plus 0.1 mm cooper plus RADO thermo-luminescence detectors placed behind a layer of special glass. The total shielding is estimated to be between 0.7 and 1.0 g/cm². 26405 measurements with 1 minute resolution were saved in the flash memory of the instrument since it switches ON on 24.05.2005 at ESTEC, ESA, in Nederland. 2 most important periods was found in the data. The lowest doses and fluxes are in the first part of the data and were obtained after the mounting of R3D-B2 in Biopan 5 facility. They are comparable with the natural background radiation. Two aircraft flights from Amsterdam to Moscow and from Moscow to Samara town in Russia were recorded in this period also. The data from the flight of the satellite around the Earth covered 277 hours and 46 minutes. Maximums of doses and fluxes were observed close to magnetic poles and in the South-Atlantic magnetic anomaly (SAA) region where the inner radiation belt populated with high energy protons is encountered. The average dose during this period is 8.75 µGy/hour (0.3 µGy/hour is the recorded minimum dose, while 561.8 µGy/hour is the recorded maximum). It is observed 2 maximums in the region of SAA. The closer to equator maximum is populated by high energy depositing particles (most probably protons), while the second one by low energy depositing particles (most probably electrons and bremsstrahlung).