

Dosimetry Characteristics in Space

Nuclear Physics Institute CAS

Department of Radiation Dosimetry



Nuclear Physics Institute of the Czech Academy of Sciences, public research institute

- basic and applied research and education
- nuclear physics and related scientific disciplines and the use of the nuclear physics methods and procedures in interdisciplinary fields of science and research
- Departments: Theoretical Physics, Nuclear Spectroscopy, Nuclear Reactions, Neutron Physics, Radiopharmaceuticals, Radiation Dosimetry, Accelerators
- services using beams of gamma rays and charged particles
- principal investigator of the Research Center of Cosmic Rays and Radiation Events in the Atmosphere (CRREAT) that addresses so far unanswered questions of detection and dosimetry of ionising radiation both of cosmic and terrestrial origin







Nuclear Physics Institute

- Cyclotron U120M (p, d, 3He, 4He; up to 37 MeV)
- Tandetron (ions up to tens MeV)
- Reactor LVR-15 (thermal neutrons)
- Microtron (electrons up to 25 MeV)
- Cyclotron TR-24 (protons up to 24 MeV)







Department of Radiation Dosimetry

- radiation biophysics, radioecology, external exposure
- dosimetry and monitoring of cosmic radiation at high-mountain observatories, onboard aircraft, and onboard spacecraft and satellites
- evaluation and analysis of obtained data
- improvement and development of new dosimetric methods, testing and calibration in various radiation fields
- theoretical calculation using various Monte Carlo codes











Motivation for our activities in space

- very complex environment in space, mixed radiation field composed of large scale particles and energies
- very high intensities and dose rates
- increased health risks (exposure onboard spacecraft several hundreds times higher than on the Earth's surface)
- radiation protection of spacecraft crews
- knowledge of the physical characteristics of the space radiation field and their variation with different parameters (solar activity, orbital parameters, shielding configurations...)
- need for experimental data in real flight conditions



Experience with radiation measurements in space

- DOBIES, DOSIS I&II, DOSIS-3D (ESA projects)
- BION M1, M2
- Foton-M3
- Chandrayaan
- SOCRAT-R
- MARE
- International Space Station
 - Protective Curtains
 - o Matroshka
 - SpaceDos



What can we offer?

- dosimetry characterization of the radiation field in space missions
- cosmic radiation measurements
 - on ground, continuously, on Milesovka and high-mountain observatories with our detectors
 - o onboard aircraft, long-term
 - stratospheric balloon flights
- radiobiology experiments and laboratory
- accelerators (testing on radiation hardening, calibrations, ...)
- international collaborations (HIMAC, CERF, Loma Linda, TRIUMF, Chornobyl...)
- perspective team of both young and experienced researchers
- key foreign researcher Prof. Lembit Sihver as PI of the project



What do we want to do?

- Space Weather, Solar Particle Events forecasting and nowcasting
- TGF (Terrestrial Gamma-ray Flashes) observations
- Development of new dosimetry methods for improvement of the radiation protection of spacecrew using tissue-equivalent detectors



