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GRISP Scientific Instrument Suite for High-Energy Solar Radiation Studies and Monitoring aboard the ARKA Space Complex

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Studies of solar activity and prediction of the effects of coronal mass ejections and high-energy radiation from solar flares on near-Earth space and the biosphere are among the major objectives of solar and solar–terrestrial physics. The GRISP (Gamma -, X-radianion and Solar Protons) instrument suite is designed to measure the energy and time distributions and intensities of electromagnetic radiation from solar flares over the energy range from 50 keV to 200 MeV, and to detect solar protons with energies above 20 MeV and neutrons with energies above 30 MeV. $CeBr_3$ and CsI(Tl) inorganic scintillation detectors measure X-ray and gamma-ray radiation in the energy ranges 0.05–15 MeV and 0.2–200 MeV, respectively. Neutrons with energies above 30 MeV are additionally identified in the CsI(Tl) detector from the scintillation pulse shape. Solar protons are detected by a multilayer detector composed of polystyrene scintillators. The proton energy is determined from the particle range and energy losses in the individual layers. This technique enables reconstruction of the energy spectrum and measurement of the flux intensity of solar protons above 20 MeV, as well as studies of their temporal behaviour. Simultaneous measurements in these energy ranges are important for understanding particle-acceleration models in solar flares and for identifying precursor signatures relevant to space-weather forecasting, in particular solar proton events (SPEs) and ground-level enhancements (GLEs). The energy resolution and detection efficiency of GRISP enable measurements of line and gamma-ray emission from X-class solar flares, as well as solar-proton fluxes above 100 MeV at intensities exceeding 1 particle cm^{-2} s^{-1} sr^{-1} (pfu), while the detection system supports a maximum counting rate of 10^5 s^{-1}.

Primary author(s) : Dr. YUROV, Vitaliy (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute))

Co-author(s) : Dr. KOROTKOV, Mikhail (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)); Dr. KOSTIN, Andrey (P.N. Lebedev Physical Institute of the Russian Academy of Sciences (LPI)); LUPAR, Evgeniy (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)); OLSHEVSKY, Egor (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)); Dr. PAPPE, Nikolay (P.N. Lebedev Physical Institute of the Russian Academy of Sciences (LPI)); Dr. SUCHKOV, Sergey (P.N. Lebedev Physical Institute of the Russian Academy of Sciences (LPI)); Dr. YURKIN, Yuuriy (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute))

Presenter(s) : Dr. KOROTKOV, Mikhail (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute))

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