II.3. ASTROPHYSICS AND EXTRATERRESTRIAL ASTRONOMY

SOLAR-ORIENTED RESEARCH («CONTEST» Project)

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Introduction. In the second half of the 20th century due to progress of space technology and engineering, astronomy has expanded to cover all the wave ranges of the electromagnetic radiation. New observational data concerning particular celestial objects and the Universe as a whole has been collected during the last decades. With advances in space observational techniques (Hubble Space Telescope, Infrared Space Observatory, etc.) the amount of data is continuously growing. Nevertheless, a short duration of space experiments is a substantial disadvantage, not allowing the long-term processes in the near-Earth space and in the Universe to be studied. Therefore, astronomical experiments onboard the ISS could solve some of these problems.

Studying the Sun astronomers encounter both quite specific and typical problems. It was found that processes occurring in the solar interior and in near-Sun space are typical for the other space objects. For examples, solar type phenomena were found in the stars, namely stellar oscillations, spots, flares, corona and wind. The Sun and heliosphere are a unique laboratory for conducting observations and experiments to verify scenarios and models of stellar evolution and for studying fundamental problems of magnetohydrodynamic, atomic physics and cosmology. During the last years significant data indicative of the correlation between the phenomena across the wide range of heights of the solar atmosphere has been amassed.

Observations of the solar plasma intensity in the temperature range from 10^3—10^6 K and higher, and subsequent theoretical analysis of the data, as well as study of non-thermal processes are necessary to understand the real nature of various solar formations. To progress toward these goals, simultaneous observations across broad wavelength bands from the extreme UV to radio wavelength range should be carried out. These observations can not be performed by the ground-based instruments due to the Earth's atmosphere interference.

Spectral observations of the Sun in the range of 10.0 — 160 nm to determine the physical parameters of various solar formations have not been yet conducted. Therefore, observations of the Sun carried out onboard the ISS in this wavelength range will provide the basis for extensive studying the active and non-active regions of the Sun and their evolution over a wide range of spatial and temporal scales.