INVESTIGATION OF THE GASEOUS AND PLASMA ENVIRONMENT OF THE ISS BY MEANS OF CONTACT DIAGNOSTICS («Environment» Project)

Bass V. P.

Institute of Technical Mechanics, NAS of Ukraine — NSA of Ukraine
15 Leshko-Popel St., Dnipropetrovsk-5, 49600 Ukraine
tel: (380) +562 +47 25 88, fax: (380) +562 +47 34 13, e-mail: bass@pvv.dp.ua

Introduction. Interaction of space vehicles with plasma environment and solar radiation results in some effects which should be taken into account during the long-term operation of both the constructions of the ISS itself and of various electromagnetic systems of the station. Such effects include the following:

— polarisation of constructions;

— emission of a wide spectrum of the molecular constituents of structural materials due to bombardment by the solar corpuscular flow, as well as by flows of atmospheric gas and dust microparticles;

— appearance of glow in the ISS environment;

— development of perturbations of the electric and magnetic fields in the vicinity of the moving ISS and of the resultant plasma instability and a wide spectrum of heterogeneity;

— additional ionisation stipulated by chemical emissions of engine systems and by injection of charged particles, as well as by operation of radio transmission systems.

These phenomena call for an integrated approach to measurement and analysis of the basic parameters of gaseous and plasma environment of the station (concentration of particles, mass content, temperatures of electron and ion components, power spectra, effective scattering cross-sections, plasma potentials, pressure, electric and magnetic intensities, etc.).

Most of the above parameters could be measured by means of devices developed in Ukraine by the captive technology. In terms of sensitivity, the sensor devices made in Ukraine are on a par with the best world models and, in some cases, their performance is higher. The need for simultaneous measurements of the local and distant plasma parameters should be emphasised. Comparison of the parameters of the environment disturbed by the presence of the ISS with the natural background values, as well as with their spatial-temporal variations will permit solving technological and scientific problems of a long-term exploration of orbital stations.

«Environment» Experiment
STUDY OF ELECTROMAGNETIC ENVIRONMENT OF THE ISS

Korepanov V. E., Klimov S. I.

Lviv Center of the of Space Research Institute, NAS of Ukraine — NSA of Ukraine
5a Naukova St., Lviv-53 79601 Ukraine
tel/fax: (380) +322 +63 91 63, e-mail: vakor@isr. lviv.ua

Long-term operation of «Mir» OSS has revealed some effects connected with the heterogeneous distribution of charges on its surface and with the higher level of electromagnetic (EM) fields in its environment. A series of active experiments onboard the «Mir» and the STS-3 experiments onboard the Space Shuttle showed the existence of local wakes and turbulence, sometimes provoking the plasma heating and luminescence, etc. Due to non-homogeneous surface conductivity, the active processes onboard