EMC STUDY OF SMALL SATELLITES – METHODOLOGY AND INSTRUMENTATION

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The decreasing of weight and dimensions of the new generation of space vehicles – micro- and nanosatellites – allows us to place the sensors of scientific payload on short and simple booms or even on the satellite body. By this the electromagnetic cleanliness (EMC) of these satellites becomes a first priority question. High EMC of small satellites (SS) gives such an advantage that it becomes possible to realize very accurate electromagnetic measurements in space. Besides the corresponding SS construction design, it is very important to execute its EMC study when all payload is already assembled. The attempts to investigate the state of this problem showed that, according to the existing publications, it is rather poorly developed and neither special instrumentation nor corresponding theoretical basement and software exist for exact determination of SS inner interference sources parameters and location. The special problem is how to estimate EMC in very low frequency band and at DC inside the tested body with high enough sensitivity and precision The presented study shows that EMC problem for small satellites can be solved with good precision for high enough signal to noise ratio. It implies the special requirements to the test site and the best possible one seems to be the magnetic observatory. These are placed in specially selected places with as low as possible magnetic interference level. The described system was realized at Nurmijarvi Geophysical Observatory (Finland). Taking into account very favorable surrounding the calibration system successfully operating already some years there was completed last year by a new magnetic cleanliness measuring system. Its application was supposed to serve both to the local and European satellite instrumentation manufacturers. An existing reference coil system and electronic equipment for vector magnetometers calibration were utilized as basic components for the new instrument. A non-magnetic rotating table with both manual and pecker gear and a high-sensitive three-components flux-gate magnetometer were installed there additionally. Such a combination allows to execute the EMC test with very high sensitivity, practically limited by the reference magnetometer noise. The EMC test system composition is described as well as developed theoretical basis is discussed. The extended tests using this system were made and it was shown that the error level of the SS internal magnetic impurities location (both of the positioning place and magnetic moment value) can be reduced lower than 5%. The research work in Ukraine was partly supported by the INTAS 97-1769.