

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Space Environmental Effects and Spacecraft Protection (6)

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DEVELOPMENT OF A PRECISE MEASUREMENT SYSTEM FOR THE DIMENSIONAL CHANGE  
OF THE HIGH STABLE TELESCOPE STRUCTURE IN SPACE ENVIRONMENT**Abstract**

Some space structures are required to have extremely high dimensional stability in spite of a number of harsh environments. For example, slight dimensional change in the metering structures for space telescope may cause serious performance degradation of the telescope. A High Stable Telescope Structure (HSTS) is being developed for the major metering structure of the telescope of the Korea Multi-purpose Satellite III (KOMPSAT-III). In the course of the development, the dimensional change of HSTS needs to be precisely measured in the simulated space environment. The typical requirement for the dimensional stability of HSTS is that the de-spacing between primary and secondary mirrors should not be larger than  $10\mu\text{m}$ . In this research, we designed a precise measurement system for the dimensional change of HSTS(High Stable Thermal Structure) and verified the performance of the developed sensor module component. The sensor module employs an optical scale sensor, and the detail geometry of the sensor module was determined through the iterative numerical analysis. A series of performance evaluation tests have been performed including the comparison with a high precision optical interferometer in simulated space environment. The sensor module was used to measure the thermal expansion of a dummy HSTS (a steel bar of 30mm length). Temperature change of simulated space environment is from 293K to 303K and the corresponding length change of the dummy HSTS was from 0 to  $5.3\mu\text{m}$ . The measurement using the developed sensor module was in very good coincident with the results using the optical interferometer.