

SPACE DEBRIS SYMPOSIUM (A6)  
Measurements (1)

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## PHYSICAL CHARACTERIZATION OF SPACE DEBRIS IN THE GEOSYNCHRONOUS REGION

**Abstract**

Several hundreds of objects populate the geosynchronous region. The population of spacecraft and debris in the GEO region is still partly uncertain, mainly due to the physical distance which prevents its mapping by radars. Dedicated optical observation campaigns are performed to characterize the environment in this region. A peculiar population of objects having mean motion around 1 and high eccentricity was detected by the ESA OGS telescope. It was shown that these are objects with very high area to mass ratio whose dynamics is strongly perturbed by the solar radiation pressure that significantly affects their eccentricity. Most probably these objects are remnants of thermal blankets or multi-layer insulation (MLI) either detached from aging spacecraft or ejected by explosive fragmentations of old spacecraft, but their exact nature remains currently elusive due to lack of physical, spectroscopic studies.

A pilot program for the physical characterization of the space debris population in high Earth orbits was started at the 152cm G.D. Cassini Telescope in Loiano, operated by the INAF Astronomical Observatory of Bologna, Italy. The Ritchey - Chretien optical system has a 70-arcminute corrected field and is equipped with BFOSC (Bologna Faint Object Spectrograph and Camera), a multipurpose instrument for imaging and spectroscopy, with an EEV CCD (1340x1300 px). The size of the Loiano telescope is on the verge of the instruments currently used for space debris studies and so we can foresee highly rewarding results from these observations.

Several BVRI photometric images of active satellites, disposed spacecraft and upper stages were acquired during one night in February 2011. Low resolution spectra were also acquired for some of the above mentioned targets, mostly for test and comparison purposes. Where both data types are available, the aim is to compare the results of the BVRI photometry data with the spectral ones, in order to assess the capability of the photometry to give hints on the physical composition of the targets. Of course, a number of photometric calibration fields and Solar analogue stars (spectral standards) were observed for calibration purposes.

The paper presents the obtained data and the discussion on how to establish the physical nature and hence, possibly, the origin of the targets. The analysis of the light-curves of these objects, to achieve

information on their shape, is also given in the paper. If available, the results of two more nights, planned at the end of April 2011, will be added to the above analysis.