

A systematic study of laser ablation for space debris mitigation

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The increase in the number of artificial objects in orbit around the Earth represents a serious threat to the future utilization of space. The Trento Institute of Fundamental Physics (TIFPA) participates in a study of laser ablation for space applications, propulsion and space debris mitigation, in the context of the NEW REFLECTIONS an interdisciplinary experiment of the CSN5 group of the Italian Institute of Nuclear Physics (INFN). The members of the TIFPA group possess a large experience in the field of space applications: the AMS01 experiment flown on the space shuttle Discovery in 1998, the AMS02 experiment on the ISS, the LIMADOU experiment on the Chinese Seismological Satellite and active magnetic shields studies for long-term manned space missions with ESA, NASA and the Union European. The IdEA laboratory of the Physics Department of the University of Trento is specialized in the field of laser ablation. The coupling coefficient C_m , relating the mechanical force generated by the energy fluence of the incident laser beam, has been measured for aluminium, a common satellite construction material. An evaluation of the performance of laser ablation for debris removal in Low Earth Orbit (LEO), for different scenarios of ground and space-based lasers is presented. The coupling coefficient is a fundamental parameter for the evaluation.