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Author: Mr. Fabrizio Paolillo
Scuola di Ingegneria Aerospaziale, Italy, fabrizio_paolillo@yahoo.com

Mr. Andrea Conte
University of Rome "La Sapienza", Italy, Andrea.Conte@roma1.infn.it
Dr. Chantal Cappelletti
G.A.U.S.S. Srl, Italy, chantal.cappelletti@gmail.com
Prof. Marco De Petris
University of Rome "La Sapienza", Italy, Marco.DePetris@roma1.infn.it
Prof. Filippo Graziani
Sapienza University of Rome, Italy, filippo.graziani@gaussteam.com

MICROSATELLITE OPTICAL PAYLOAD FOR IN-SITU SPACE DEBRIS MONITORING

Abstract

Space debris are a concern for operative satellites and human missions. This problem, arisen in the last 25 years and enhanced in LEO orbit by recent space debris-creation events (ASAT-test of 2007, Iridium33-Cosmos2251 collision of 2009), requires specific strategies to know accurately the orbital debris environment, with the main intent of avoiding collisions between orbital debris and spacecrafts. Since nineties, the Group of Astrodynamics of the University "Sapienza" (GAUSS) of Rome has been involved in optical surveillance of space debris from SpaDE ground based observatory and in UNISAT microsatellite projects (four satellites have been launched from Baykonur cosmodrome in Kazakistan using the Dnepr space launch vehicle). In 2008 GAUSS group started the feasibility study of an UNISAT mission with the aim to identify small LEO space debris with a LEO space based optical system, taking advantage of an observation above Earth's atmosphere. During the last two years, the mission configuration and the main satellite subsystems features has been selected. Recently the joint activity between GAUSS and the Department of Physics of the University "Sapienza" of Rome results in the development of the optical payload to be boarded in the next UNISAT 5 microsatellite. Moreover, due to the recent interest in the development of CUBESAT standard technologies, the proposed payload has been also designed for triple cubesat (3U) dimensions. This paper deals with the payload optical system features, analysing the best trade off between low cost, low burden and high performance. Large FOV and high resolution are required to maximize the number of objects that can be detected and to increase the sensitivity to small debris ($<$ 1 cm size).