

Estimating the number of debris in the geostationary ring

Rüdiger Jehn^a, Shahram Ariafar^b, Thomas Schildknecht^c, Reto Musci^c, Michael Oswald^d

^a*European Space Operations Centre, Mission Analysis Office, Robert-Bosch-Street 5, D-64293, Darmstadt, Germany*

^b*Corona Space Surveillance Centre, Marselis gate 24, N-0551 Oslo, Norway*

^c*Astronomical Institute of the University of Bern, Sidlerstrasse 5, CH-3012, Bern, Switzerland*

^d*Institute of Aerospace Systems (ILR), Technische Universität Braunschweig, Hermann-Blenk-Street 23, D-38108, Braunschweig, Germany*

Abstract

Two thousand seven hundred and ninety uncorrelated targets brighter than magnitude 18.5 were detected by the European Space Agency (ESA) 1-m space debris telescope at Tenerife during more than 1000 observation hours between February 2001 and December 2004. The number of detections can be approximated by a Gaussian distribution. Probabilities to detect individual objects during an observation campaign are determined by propagating 10 debris clouds of the ESA MASTER model and two other fictitious background populations. Based on these probabilities, a 95% confidence interval for the total number of unknown debris in the geostationary ring is derived. It is estimated that there are between 450 and 540 uncatalogued objects brighter than visual magnitude 18.5.