

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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ELECTROMAGNETIC ABSORPTION PROPERTIES OF SPACECRAFT AND SPACE DEBRIS

Abstract

The aim of the work is to present a method to evaluate the electromagnetic absorption properties of spacecraft and space debris. For these objects, the radar detection ability depends mainly on volume, shape, materials type and other electromagnetic reflecting behaviour of spacecraft surface components, such as antennas or thermal blankets, and of metallic components in space debris. The higher the electromagnetic reflection coefficient of such parts, the greater the radar detection possibility. In this research an electromagnetic reverberation chamber is used to measure the absorption cross section (ACS) of a small satellite and of a carbon-based composite antenna dish, which may represent operating space objects as well as examples of space debris. The ACS mainly depends on geometrical characteristics like apertures, face numbers and bulk porosity, as well as on the type of the material itself. The ACS, which is an electromagnetic measurement, is expressed in squared meters and thus can be compared with the objects' geometrical cross section. A small ACS means a quite electromagnetic reflective tendency, which is beneficial for radar observations; on the contrary, high values of ACS indicate a strong absorption of the electromagnetic field, which in turn can result a critical hindering of radar tracking. In this paper were analysed two typical space structures: the first is the sub-reflector antenna of HOTBIRD 6 satellite launched on 2002 and the second one is the micro-satellite URSA MAIOR that will launched on 2017.