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APPLICATION OF SOLAR SAIL AS A REFLECTOR FOR NANO SATELLITE ANTENNA SYSTEM

Abstract

Solar sailing is a novel alternative for orbit maneuvering of satellites. Solar sails are lightweight, highly reflective metal coated sheets about 10-15 microns thick. These sails are generally folded and stowed in the satellite and hence are wrinkled after deployment. The radiation pattern of a communication antenna is affected by the presence of this reflective solar sail material in its vicinity. This effect can be utilized to improve the performance of the antenna by modifying the design such that the sail acts as a reflector. This will improve directivity of the antenna. The effect of the undulating surface of a solar sail is also analyzed to determine the expected variations in the antenna characteristics as the satellite is maneuvered. This paper proposes a simple design of a UHF and VHF antenna system along with a solar sail suitable for a nano satellite with active orbital control. During the initial tumbling motion of the satellite, the sail remains stowed and the antenna system exhibits omnidirectional characteristics. Post stabilization, when the satellite pointing is under active control, the sail is deployed and the antenna system exhibits directional characteristics. This design will be used as the primary antenna system for College of Engineering, Pune Satellite Initiative's second satellite mission which will demonstrate orbit maneuvering using solar sails.