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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (9)

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THERMO-MECHANICAL GUIDELINES FOR ENHANCED SPACE HYBRID TR MODULES DESIGN

Abstract

In last decades SAR (Synthetic Aperture Radar) antenna technology is fully oriented to the improvement of resolution and flexibility of the service. The more and more challenging civilian and military applications represent a continuous stimulus to better all the research fields related to satellite synthetic aperture radar technology. The core of the SAR technology are the transmitting and receiving modules, commonly named TRM, where the receiving and transmitting radio frequency chains are hosted into. The signals coming from and toward the Earth surface are processed and amplified by the integrated circuit mounted on the TR modules. This technology is normally known such as Hybrid Technology by exploiting different material and different sub-techniques in order to reduces the drawbacks and to magnify the advantages. The performances improvement is directly related to the increment of the power consumption and of course to the power dissipation. More powerful amplifiers (multi-stage HPAs) have an higher dissipation and the use of them implies a dedicated strategy for the thermal management. The common materials are not suitable to guarantee the correct functioning and they not ensure the capability to be compliant with standard derating rules. In this paper a fully coupled thermo-elastic problem relevant to a multi-materials hybrid modules will be proposed and discussed in order to suggest a different and innovative solution for high dissipative TR modules. The main topics that will be discuss and investigated are about the hypothesis to design a multi-material assembly where the thermal characteristics and thermo-elastic response plays a central role in the thermo-mechanical design. A preliminary theoretical investigation and a further numerical simulation campaign will be presented in order to suggest a possible methodology and the range of applicability of the proposed technology.