Paper ID: 7693
student

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (5)

Author: Dr. Riccardo Monti
Sapienza University of Rome, Italy, riccardo.monti-somministrato@thalesaleniaspace.com

Prof. Paolo Gasbarri
Università di Roma "La Sapienza", Italy, paolo.gasbarri@uniroma1.it
Dr. Umberto Lecci
Thales Alenia Space Italia, Italy, Umberto.Lecci@thalesaleniaspace.com

HEAT-ELECTRICAL CHARGE CONVERSION VIA PYROELECTRIC DEVICES FOR SPACE EQUIPMENT: CHARACTERIZATION AND EXPERIMENTATION

Abstract

The heat overstocking of space electronic devices and equipment foresees the presence of a heat dissipation system. A novel technology based on the pyroelectric materials is chosen to increase the heat dissipation and to increase the performances of electronics. The pyroelectric materials (which fall in the class of piezoelectric materials) are able to convert a heat flux into electrical charge and they are made up such as a wafer with two external electrodes and a ceramic or polymeric core. The electronic component here proposed is constituted by a multilayered wall where the first layer is made up of an Iron based alloy where a high power amplifier (HPA) is mounted onto. When the HPA is activated it dissipates a thermal flux by Joule Effect, heating the carrier. This pyroelectric lamina is welded or glued onto the electronic package surfaces. In this way the heat flows through the wafer and the heat-charge conversion is performed. In this paper firstly a characterization of the pyroelectric wafer via mechanical, micrographic and chemical laboratory tests will be presented. Secondly an experimental and numerical analysis on the behaviour of the proposed Heat-Electrical charge device will be performed. The obtained data will be compared and analyzed.