

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

Author: Mr. Luca Lampani  
University of Rome “La Sapienza”, Italy, luca.lampani@uniroma1.it

Mr. Gianluca Facchini  
Sapienza University of Rome, Italy, gianluca.facchini@uniroma1.it  
Prof. Paolo Gaudenzi  
Sapienza University of Rome, Italy, paolo.gaudenzi@uniroma1.it

WIRELESS STRUCTURAL HEALTH MONITORING OF SPACE STRUCTURES WITH ENERGY  
HARVESTING CAPABILITIES

**Abstract**

A structural health monitor (SHM) system based on a built-in wireless sensor network is proposed to be applied in the framework of space missions. The system aim to offer the capability of a continuous update of the information about the main structural parameters during the operative conditions. These information provide both warnings in real time of critical behaviours and a time history of data for a long term investigation. Such a capability is implemented through the smart structures technology and improved with a self-powered wireless sensors network. In this paper an experimental device has been implemented to record and transmit the vibrational status of a basic structure. A micro-controller unit has been set up in order to acquire signals from piezoelectric sensors integrated on the structure. The power of the system is supplied by an integrated energy harvester device. The acquired signal are post-processed to detect modal characteristic and frequency dependent behaviour. The comparison of the frequency domain pattern with the reference undamaged structure one allows to obtain information about failures or damages of the structure. In this work some theoretical models of the monitoring system are setup. Then an experiment has been performed to validate the models and to prove the effectiveness of the configured device.