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Integrated Electronic System for Ultrasonic Structural Health Monitoring

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A fully integrated on-board electronic system that can perform in-situ structural health monitoring (SHM) of aircraft's structures using specifically designed equipment for SHM based on guided wave ultrasonic method or Lamb waves' method is introduced. This equipment is called Phased Array Monitoring for Enhanced Life Assessment (PAMELA III) and is an essential part of overall PAMELA SHM™ system. PAMELA III can generate any kind of excitation signals, acquire the response signals that propagate throughout the structure being tested, and perform the signal processing for damage detection directly on the structure without need to send the huge amount of raw signals but only the final SHM maps. It monitors the structure by means of an array of integrated Phased Array (PhA) transducers preferably bonded onto the host structure. The PAMELA III hardware for SHM mapping has been designed, built and subjected to laboratory tests, using aluminum and CFRP structures. The 12 channel system has been designed to be low weight (265 grams only), to have a small form factor, to be directly mounted above the integrated PhA transducers without need for cables and to be EMI protected so that the equipment can be taken on board an aircraft to perform required SHM analyses by use of embedded SHM algorithms. Moreover, the autonomous, automatic and on real-time working procedure makes it suitable for the avionics field, sending the corresponding alerts, maps and reports to external equipment.

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Ключевые слова:

Содержание.

Abstract
Introduction
PAMELA system overview
Analysis techniques by PAMELA SHM
Test results
Conclusion
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