

ACOUSTICS2008/711
Study and development of a low-frequency acoustic sensor
dedicated to the vibratory analysis and the mechanical
characterization of the plates

Georges Nassar, Bassam Merheb, Alain Skaf, Fabrice Lefebvre and Bertrand Nongaillard
IEMN - DOAE, Université de Valenciennes, Le Mont - Houy, 59313 Valenciennes, France

A low-frequency acoustic method was implemented for the purpose of non-destructive control and evaluation of metal plates coating. In this method, a mechanical pulse (acoustic impact) is used to generate acoustic vibrations on a frequency band between 100 Hz to 20 kHz, and a compact acoustic sensor, constructed with by composite materials with an embedded ferroelectric disc, is used to receive the acoustic vibrations. The technique consists in setting in resonance the integrality of a reduced size mechanical structure. The modal frequencies of plates are calculated by two methods: analytically and by finite element method. Then, a numerical modelling of the acoustic behaviour of the sensor is presented. Finally, experimental trials are described and results showing the sensitivity of the method to evaluate coating of metal plates are analyzed.