ACOUSTICS2008/1548
Broad-Band Vibration Attenuation in Plates With Periodic Arrays of Shunted Piezoelectric Patches

Massimo Ruzzene[a] and Luca Airoldi[b]
[a]Georgia Institute of Technology, School of Aerospace Engineering, 270 Ferst Drive, Atlanta, GA 30332-0150, USA
[b]Dipartimento di Ingegneria Aerospaziale, Via La Masa 34, 20156 Milano, Italy

Periodic arrays of shunted piezoelectric patches are employed for the control of waves propagating over the surface of plate structures. The shunted piezoelectric patches act as sources of impedance mismatch, which yield interference phenomena resulting from the interaction between incident, reflected and transmitted waves produced by the mismatch. The impedance mismatch corresponding to the shunted piezos can be tuned to achieve strong attenuation over frequency bands which are defined by the shunting circuit connected to the patches. Broad-band vibration attenuation can be achieved through the application of series and parallel of multiple resonant circuits, or through the implementation of negative capacitance configurations. The ability of plates with periodic shunted piezoelectric patches to attenuate vibrations over extended frequency bands is demonstrated numerically, through Finite Element models of the considered electromechanical structures. The effect of number of patches and of their periodic distributions is investigated together with the analysis and the comparison of performance achieved with various shunting strategies.