

ACOUSTICS2008/1424 Irregular sound absorbers work better

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The diffraction and absorption of waves by a system with both absorbing properties and irregular geometry is an open physical problem. In the same time, irregular absorbers have been shown to be extremely efficient (1). A more reachable and closely related goal is the understanding of wave oscillations in confined systems containing an absorbing material with an irregular shape. From the theoretical point of view, the difficulty lies in the fact that part of the propagation occurs in a lossy material for which the wave operator is non-hermitian. It is found here that, in resonators containing an irregular shaped absorbent material, there appears a new type of localization. This phenomenon, that we call “astride” localization, describes the fact that these modes exist in both the lossless and the lossy regions. They are then both lossy and well coupled to sources in the air. A numerical computation of the time decay of acoustic energy shows that indeed sound absorbing devices work better when presenting a very irregular shape and that this is directly linked due to the existence of astride localisation.

(1) Fractal Wall, product of Colas Inc., French patent N0-203404; U.S. patent 10/508,119.