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Séminaire du LVA

A methodology for including the effect of a damping treatment in the mid-frequency domain using SmEdA method

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An additive damping treatment is an effective tool to control the dynamic response of builtup structures, and it is widely utilized through industrial applications. By applying a viscoelastic layer on a given structure, the vibratory energy is dissipated through shear and in-plane motions at the layer interface. Modeling the effect of such a treatment in a complex mechanical system for the mid frequency domain is of interest. Statistical modal Energy distribution Analysis (SmEdA) has been developed as an alternative approach to Statistical Energy Analysis (SEA) for describing subsystems with low modal overlap. This technique is developed from the knowledge of the uncoupled subsystem modes. In this paper, one proposes to extend SmEdA by including the effect of a damping treatment. A damped subsystem consisting of a composite layer is modeled with the equivalent modulus of a single layer, which gives the same transverse displacement as a multilayered system. The modal loss factor of a partially damped structure is estimated by the Modal Strain Energy method (MSE), and the results are well agreed with the Complex Eigenvalue Method (CEM). Finally, energy transmission between the damped structure and a coupled cavity can be deduced from SmEdA modeling, knowing the modeshapes and modal loss factors of the equivalent single layer and of the cavity. This method is applied for modeling a rectangular plate partially damped with an unconstrained viscoleastic layer coupled to a small acoustic cavity.