

NON-LINEAR VIBRATIONS OF LAMINATED AND SANDWICH RECTANGULAR PLATES WITH FREE EDGES, PART II: EXPERIMENTS & COMPARISONS

Farbod Alijani¹, Marco Amabili¹, Giovanni Ferrari¹, Vincenzo D'Alessandro²

¹Department of Mechanical Engineering, McGill University, 817 Sherbrooke Street West, Montréal, Canada H3A 0C3

²Department of Industrial Engineering, Aerospace Section, University of Naples "Federico II", Via Claudio 21, Napoli 80125, Italy

ABSTRACT

Large-amplitude (geometrically nonlinear) forced vibrations of completely free sandwich rectangular plates are investigated experimentally. Harmonic excitation is applied by using an electro-dynamic exciter and the plate vibration is measured by using laser Doppler vibrometers. A scanning laser Doppler vibrometer is used for experimental modal analysis since it provides non-contact vibration measurements with very high spatial resolution. The large-amplitude vibration experiments are carried out by using a single point laser Doppler vibrometer and a stepped-sine testing procedure. The nonlinear frequency response curves are obtained by increasing and decreasing the excitation frequency in very small steps at specific force amplitudes controlled in a closed-loop. The experimental results are compared to numerical simulations obtained by reduced-order models and show very good agreement. The nonlinear damping is experimentally obtained as a function of the vibration amplitude.

Keywords

Nonlinear vibrations; Sandwich plate; Experiments; Free edges