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Experimental Analysis of Modal Interactions in the Non-Linear Vibrations of a Plate

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The geometrically non-linear vibrations of an aluminium fully clamped plate are experimentally investigated. The plate is excited transversely with harmonic excitations of constant amplitude and the frequency of the excitation is varied slowly from values below the first linear natural frequency to values above and vice-versa. The amplitudes of the first and higher harmonics of the response are analysed at different points of the plate, in order to detect the modes involved in the motions. It is demonstrated that internal resonances occur between the first and higher order modes, that is, that due to the non-linearity of the system, energy is transferred from the first to higher order modes, when the non-linear natural frequencies become related by integer numbers. The data obtained is compared with results from a finite element code.

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