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Nonlinear modal interactions in a microcantilever[1] HIDDE WESTRA, HERRE VAN DER ZANT, WARNER VENSTRA, Kavli Institute of Nanoscience, Delft University of Technology — We study the nonlinear interactions between vibrational modes in a microcantilever. The flexural-flexural, torsional-torsional and torsional-flexural modal interactions are investigated theoretically and experimentally. In a cantilever, the nonlinearity arising from geometrical and inertial effects couples the different modes. The motion of one mode influences the resonance frequency of the other modes. We show that depending on the amplitude of one mode, both frequency stiffening and weakening of the other mode occurs. The modal interactions in clamped-clamped beam resonators is recently studied, and several applications have been proposed. Microcantilevers are frequently used in instrumentation, and the modal interactions presented here enable such schemes, including Q-factor tuning and self-detection.

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