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Simulation of Nonlinear Coupled Interdigitated Flexible Mems Resonators in Different Vibrating Modes

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Abstract: Nonlinear coupled system of microelectromechanical systems (MEMS) resonator is a laterally driven mechanical resonator, it can be activated by electrostatic force interaction.This study of the electrostatic forces which are generated between the interdigitated combs (IDC) by overlapping movable and fixed comb fingers to produce the force, and it stores the energy.This polymer MEMS resonator begins to exhibit hard and soft spring effect at excitation voltages of 5V and Young's modulus of 8.3GPa (PVDF)and 3.1GPa (polyimide).We discuss the device vibration on the various modes of the folded suspension beams and nonlinear effect arises from the mechanical structure domain. In addition the electrical and mechanical properties of the structure is studied. The key points of the hysteresis characteristics for upsweep and downsweep frequencies are calculated when the nonlinear response appears in device.Here, we calculated the resonance frequency in various modes with the high quality factor, capacitance and displacement. Therefore the nonlinear dynamic multiphysics model has been developed using finite element methods (FEM) technique.The capacitive comb drivedesign speculation is verified by the COMSOL multiphysics 4.4 simulation results.

Keywords: Polymers, MEMS resonator, Electrostatic actuation, Coupled nonlinear system andVibration modes.

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