



Nonlinear dynamics of M&NEMS resonant sensors

By Kacem, Najib

Condition: New. Publisher/Verlag: LAP Lambert Academic Publishing | Design strategies for performance enhancement | The mechanical transduction gain of nanoelectromechanical systems (NEMS) has been thoroughly studied, but the drive power has always been a priori limited to the onset of non-linearities. Besides, the smaller the structures, the sooner non-linearities occur, reducing their dynamic range and even making extremely difficult to detect their oscillation. In this thesis, this limitation is reconsidered, i.e. the non-linear dynamics of M&NEMS sensors is investigated. Several analytical design rules are provided in order to enhance the dynamic range of nanoresonators and the detection limit of NEMS-based resonant sensors. These rules essentially include hysteresis suppression by non-linearity cancellation as well as mixed behavior and pull-in retarding under superharmonic resonance and simultaneous resonances leading to the possibility of driving the resonator linearly at high oscillations compared to the critical amplitude. The experimental validation of the model has been performed in the case of resonant capacitive MEMS and M&NEMS accelerometers and gyroscopes as well as capacitive and piezoresistive gas/mass sensors. | Format: Paperback | Language/Sprache: english | 272 pp.



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