

# Micromechanical Resonators With Near-Linear Response

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## abstract

We study the effect of bias voltage  $VDC$  on the effective nonlinearity of electrostatically clamped-clamped microbeam resonators. We identify three domains in the resonator response: hardening-type, softening-type, and near-linear behaviors. In the near linear domain we show that we can increase the power handling of the resonator without distorting its phase noise performance. We investigate the mixing of low frequency  $1/f$  noise into the input signal. This causes phase distortion of the output signal and is quantized as its phase noise. We find that the amplitude and phase responses of the resonator's displacement are coupled to each other through the effective non-linearity co-efficient ( $S$ ), which distorts its phase response in the nonlinear regime. Finally we also present closed form expressions for resonator displacement and current in both linear and non-linear regimes.

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