

**Lecture Outline**

- Reading: Senturia, Chpt. 10: §10.5, Chpt. 19
- Lecture Topics:
  - ↳ Estimating Resonance Frequency
  - ↳ Lumped Mass-Spring Approximation
  - ↳ ADXL-50 Resonance Frequency
  - ↳ Distributed Mass & Stiffness
  - ↳ Folded-Beam Resonator

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**Estimating Resonance Frequency**

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**Clamped-Clamped Beam  $\mu$ Resonator**

Resonator Beam  
 $W_r$ ,  $L_r$ ,  $h$

Electrode  
 $v_i$

Sinusoidal Excitation  
 $v_i = V_i \cos[\omega_0 t] \rightarrow f_i = F_i \cos[\omega_0 t]$

Voltage-to-Force Capacitive Transducer  
 $V_P$

Sinusoidal Forcing Function  
 $f_i = F_i \cos[\omega_0 t]$

$i_o$

$Q \sim 10,000$

$\omega_0$ ,  $\omega$

- $\omega \neq \omega_0$ : small amplitude
- $\omega = \omega_0$ : maximum amplitude  $\rightarrow$  beam reaches its maximum potential and kinetic energies

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