

Folded-Flexure Suspension Variants

- Below: just a subset of the different versions
- All can be analyzed in a similar fashion

(a) Inner fold, continuous truss (b) Inner fold, discontinuous truss
 (c) Outer fold, continuous truss (d) Outer fold, discontinuous truss

[From Michael Judy, Ph.D. Thesis, EECS, UC Berkeley, 1994]

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Folded-Beam Stiffness Ratios

- In the x-direction: $k_x = \frac{24EI_z}{L^3}$
- In the z-direction: Same flexure and boundary conditions $k_z = \frac{24EI_x}{L^3}$
- In the y-direction: [See Senturia, §9.2] $k_y = \frac{8EWh}{L}$
- Thus: $\frac{k_y}{k_x} = 4\left(\frac{L}{W}\right)^2$ Much stiffer in y-direction!

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Folded-Beam Suspensions Permeate MEMS

Accelerometer [ADXL-05, Analog Devices] Gyroscope [Draper Labs.]
 Micromechanical Filter [K. Wang, Univ. of Michigan]

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Folded-Beam Suspensions Permeate MEMS

- Below: Micro-Oven Controlled Folded-Beam Resonator

Temperature Sensing Resistor Heating Resistor
 Support Struts Substrate Edge Micro-Platform

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