

Folded-Flexure Suspension Variants

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

(a) Inner field, continuous truss
 (b) Inner field, discrete truss
 (c) Outer field, continuous truss
 (d) Outer field, discrete truss

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

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Folded-Beam Stiffness Ratios

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- 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

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Accelerometer [ADXL-05, Analog Devices] Gyroscope [Draper Labs.]

Micromechanical Filter [K. Wang, Univ. of Michigan]

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Folded-Beam Suspensions Permeate MEMS

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- Below: Micro-Oven Controlled Folded-Beam Resonator

Temperature Sensing Resistor Heating Resistor

Support Struts Substrate Edge Micro-Platform

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