Supplementary Document

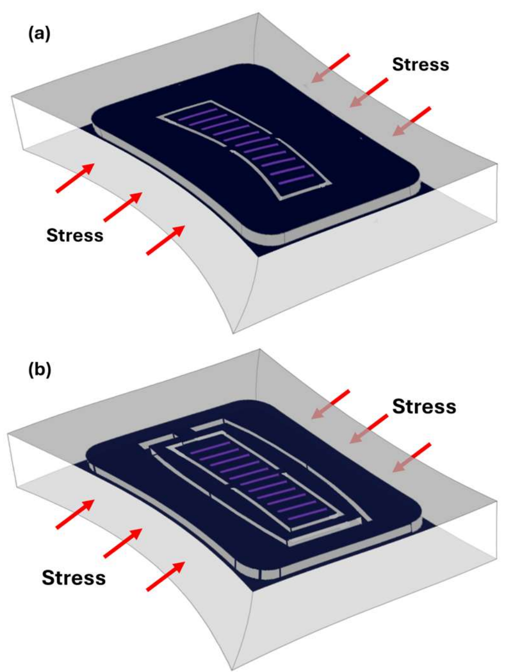

Figure 1. Illustration of packaged MEMS resonator, highlighting the impact of induced stress. (a) Baseline resonator; (b) Resonator with Isolation Frame.

Design and Fabrication

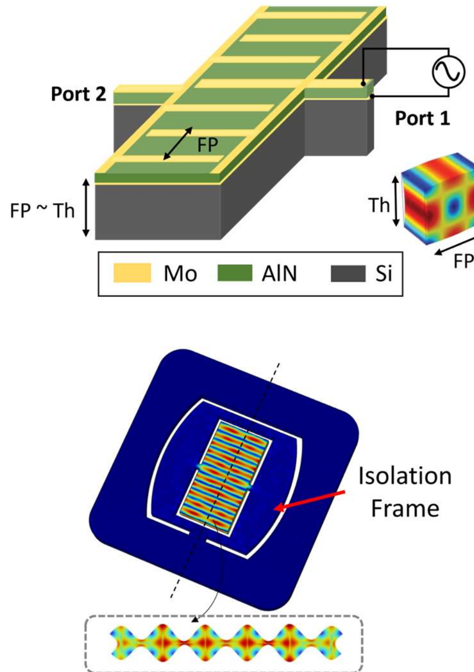

Figure 2. Conceptual schematic of a thickness-Lamé mode resonator (top) and its resonance mode shape (displacement) simulated by COMSOL (bottom).

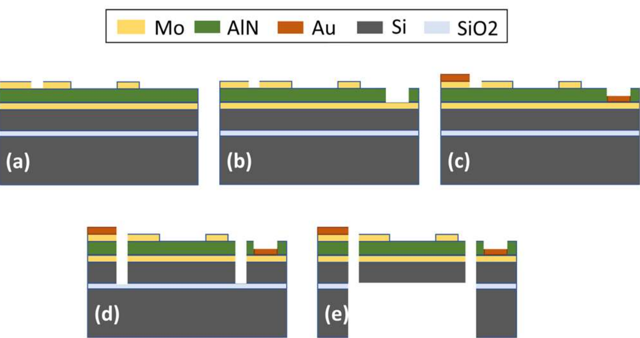

Figure 3. Simplified fabrication process flow of the TLM resonator.

Measurement

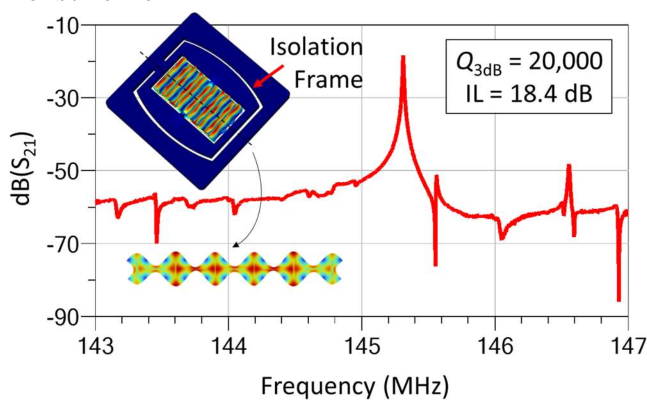

Figure 4. Measured frequency response of a typical thickness-lamé mode resonator with isolation frame. The Q is on average increased by a factor of 2.8.

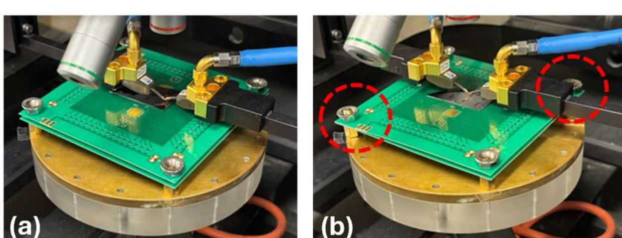

Figure 5. Stress inducing measurement set-up: (a) before bending; (b) after bending (applied stress points are highlighted).

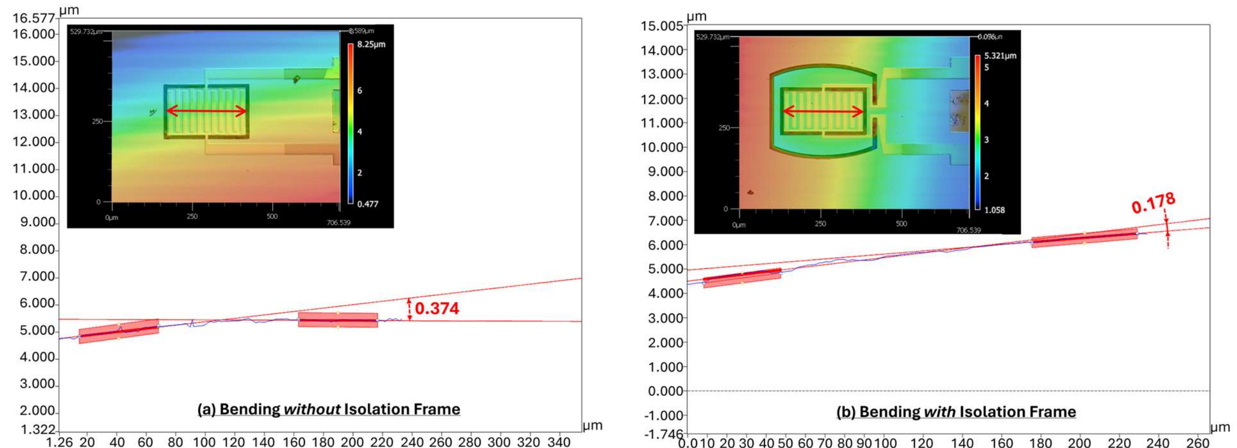

Figure 6. Measured bending angle/curvature of resonator under stress. Inset shows deviation of height from original position across resonators (as measured by optical profiler).

Table 1. Measured f.Q products, frequency shifts (ΔF), and curvatures (K) for different configurations of the devices under study.

Baseline	SEM			
	f.Q (THz)	1.2	0.9	0.8
	ΔF (ppm)	28.23	75.85	125.35
	K (degree)	0.374	0.395	0.249
Isolation Frame	SEM			
	f.Q (THz)	3.1	2.6	2.5
	ΔF (ppm)	4.58	10.97	7.79
	K (degree)	0.178	0.035	0.132