QTC Trilayer Cantilever Probes

Silicon Nitride-Polymer AFM probes: for low temperature experiments

General description

The **Quantum Cryogenic Trilayer Cantilever (QTC)** is a custom device engineered for ultra-sensitive experiments in low-temperature environments. Built on the **trilayer technology pioneered at EPFL**, it combines **silicon nitride films with a polymer core**, providing increased thickness without excessive stiffness. This results in a **4× higher force sensitivity (µV/nN)** compared to standard single-crystalline silicon cantilevers.

A **triangular cantilever design with five platinum traces leading to the tip** ensures reliable electrical signal transfer. The traces are insulated from the integrated Wheatstone bridge, eliminating crosstalk and ensuring precise, stable measurements. Robust electrical insulation within the SiN/Polymer interface provides durability even under cryogenic conditions, making the QTC Cantilever a versatile tool for cutting-edge quantum research.

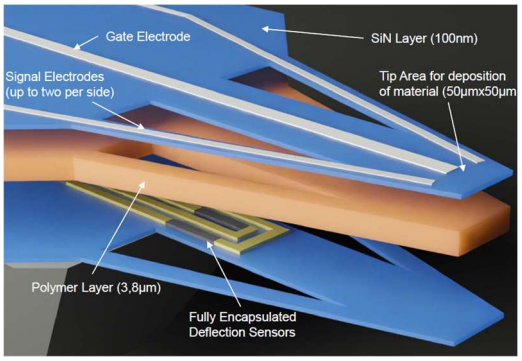

Figure 1: Schematic of the QCT cantilever

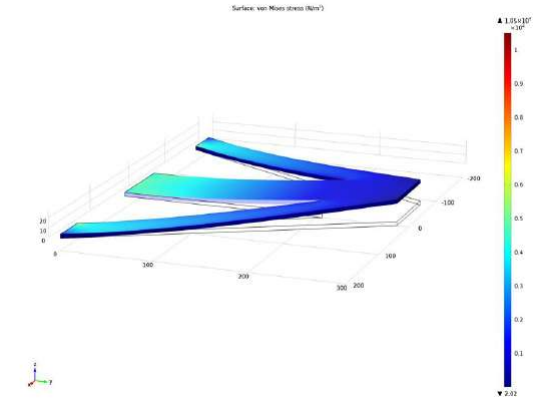

Figure 2: Simulation of bending behavior

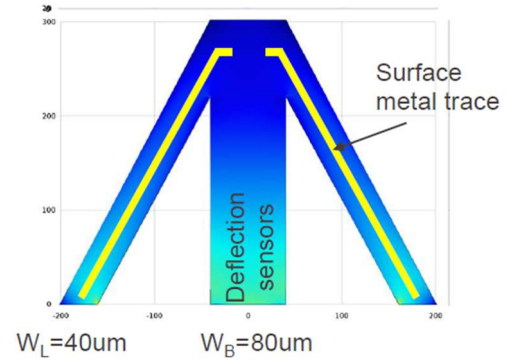

Figure 3: Schematic structure of Pt-traces (gate electrode not shown here)

Specifications			
Model	**QCT cantilevers**		
Material	SiN with a polymer core		
Tip material	-tipless-		
Pt metal coating	Up to 5 traces to the tip (thickness 70 nm)		
Modes	Low Temperature compatible		
Possible dimensions*	**Res. Freq.**	**Spring constant**	**Deflection sensitivity****
µm x µm x µm	**kHz**	**N/m**	**µV/nm**
300x80x4	45	4.5	1
Deflection sensing	on-chip piezoresistive bridge		
Actuator	external shaker		
Electrical connections	Unbonded		
** Dimensions of the main beam. Side beam width: 40µm* *** Nominal value. Not amplified, 1 V bridge supply.*			

Applications:

- Low Temperature-AFM / KPFM
- Probing quantum coherence, tunneling phenomena, and spin dynamics
- Sensitive force detection in cryogenic environments

What about your application? Contact us!

References: *Hosseini, N., Neuenschwander, M., Adams, J.D. et al. Nature Electronics DOI:*10.1038/s41928-024-01195-z

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