

Session G32 - Scanning Probes II.

*MIXED session, Tuesday morning, March 21
213A, MCC*

**[G32.003] Single-Crystal Silicon Multiple Torsional
Micro-Oscillators for Use in Magnetic Resonance Force
Microscopy¹**

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Micro-oscillators have been fabricated for use in a nuclear magnetic resonance force microscope (NMRFM). Various designs include double and triple torsional oscillators which have high Q's at room temperature ($\approx 10,000$) when operating in the antisymmetric cantilever and torsional modes. Depending on design and dimensions, the resonant frequencies vary from tens to hundreds of kHz. Typical dimensions of the oscillators are $(200 \times 150) \mu\text{m}^2 \times 200 \text{ nm}$ thick. To fabricate these devices, microlithographic techniques are employed. A Si (100) wafer is patterned, etched, and boron-implanted at a dose of $4.2 \times 10^{16} \text{ cm}^{-2}$ and an energy of 134 keV. A post-implant anneal is then performed at 1000°C , followed by a KOH wet-etch which leaves the free-standing boron-doped oscillators. Resonant frequencies and Q's have been characterized using a fiber-optic interferometer with a motion sensitivity of $0.001 \text{ nm} \sqrt{\text{Hz}}$. The optimal oscillators to date exhibit a minimum detectable force of $1.5 \times 10^{-16} \text{ N} \sqrt{\text{Hz}}$ at room temperature. An overview will be given outlining the recent progress and implementation of these oscillators in the NMRFM experiment.