



MASTER PROJECT

Broad-Range Pressure Sensors based on Nanomechanical Resonators



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Current state-of-the-art vacuum gauges suffer from narrow bandwidth or limited accuracy.

Nanomechanical resonators display pressure-dependent quality factors, which vary from atmospheric pressure to several orders of magnitude down, limited only by how large a mechanical quality factor achievable[1]. Devices based on strained silicon nitride have shown quality factors in excess of 1 million at room-temperature through dissipation dilution[2]. This effect is, however, not limited to silicon nitride, but can

be employed in other strained materials[3].

This project aims to investigate the pressure-dependent quality factor in high-Q mechanical resonators from rough vacuum down to ultrahigh vacuum. Possible implementation into an actual device could also be incorporated.

[1] S. Schmid and C. Hierold, *J. Appl. Phys.* **104** (2008), 093516.

[2] S. Schmid et al. *Phys. Rev. B* **84** (2011), 165307.

[3] G. D. Cole et al. *Appl. Phys. Lett.* **104** (2014), 201908.