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Evaluation of the Performance of a "Tube-Scanner" Type STM
XIAO QIU BAO, CRAIG HOWALD, Marietta College — The performance of a tube-scanner type scanning tunneling microscope (STM) is evaluated. Since tunneling current noise is a basic limitation for the performance of a STM, it is important to eliminate it as far as possible. The dominant noise in tunneling current is the noise in tip-to-sample distance because tunneling current is exponentially dependent on this distance. Minimizing this vibrational noise is achieved by raising the lowest mechanical frequency of the STM. To facilitate this, various dependencies of the lowest resonant frequency are calculated using three simplified models. Resonant frequencies are also measured using both the piezo-electric effect in the tube scanner and the tunneling current. Comparison of the measurements and calculations of the mechanical response of the STM allows us to identify useful improvements in STM designs.

Dennis Kuhl
Marietta College

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