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Radio-frequency Scanning Tunneling Microscopy (rf-STM)[1]
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— Scanning Tunneling Microscopy (STM) possesses unprecedented spatial resolution, extending down to sub-Angstroms. There is a serious obstacle, however, in front of realizing the full potential of the STM technique: insufficient temporal resolution. Electronic bandwidths in typical STM experiments extend only up to ∼10 kHz. Here, a novel approach to attain time resolution in STM is demonstrated. The impedance of the tip-sample tunnel junction in the MΩ range is matched close to 50 Ω by using a LC tank circuit, which allows for bandwidths up to 20 MHz. To demonstrate broadband rf-STM operation, several experiments have been performed. First, radio-frequency reflectometry has been used to image surfaces, resulting in spatial resolution comparable to that available in conventional STM. Second, shot noise in the tunnel current has been measured at high frequencies. Third, high frequency displacements of surfaces have been detected using the STM tip as a nanomechanical displacement detector.

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