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**Observation of atomically resolved HOPG and Au surfaces
in ambient conditions using the microwave channels of a hybrid
STM/microwave microscope based on a resonant microwave cavity¹**

JONGHEE LEE, CHRISTIAN J. LONG, University of Maryland, HAITAO YANG, Intematix Corporation, ICHIRO TAKEUCHI, University of Maryland — We report on the development of a hybrid STM/microwave microscope which combines the spatial resolution of STM with the high-frequency characterization capabilities of a resonant microwave cavity. The microwave cavity is integrated into the scanner head of the STM and electrically coupled to the sample through the STM tip. The resonator has a fundamental resonance frequency of 2.4 GHz and an unloaded quality factor of 600. While scanning over a sample surface, we can simultaneously monitor the DC tunneling current, the cavity resonance frequency, and cavity quality factor. We find that our hybrid STM is capable of atomic resolution imaging of HOPG and Au surfaces in ambient conditions. Atomic resolution can be obtained using only the microwave channels, only the STM topography, or both simultaneously. We discuss the detailed features of this state-of-the-art hybrid STM and future applications.

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