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Large bandwidth measurements of break junctions for molecular electronics at microwave frequencies GABRIEL PUEBLA-HELLMANN, ANDREAS WALLRAFF, Quantum Device Lab, ETH Zurich — The controlled breaking of a thin gold wire, by mechanical stress or by electromigration, has not only been successfully employed to produce the nm-spaced electrodes necessary for creating single molecule devices, but has also attracted attention as the means to produce optical field enhancement for surface enhanced Raman scattering on the few to single molecule level. Although frequently employed, such break junctions usually have a low bandwidth when performing electrical transport measurements of single molecule devices. We investigate such junctions and single molecule devices by using microwave reflectrometry, where a break junction is integrated into a superconducting impedance matching circuit. This allows the impedance and thus the state of the junction to be deduced from the measured reflection coefficient with a bandwidth of 10-100 MHz. We electrically characterize such impedance matching circuits at microwave frequencies as well as gold break junctions at DC. We also show measurement results of the combined system, where the break junction is formed either by electromigration or by mechanical means. This setup will be used to study the transport properties of single molecule devices with a bandwidth larger than that of standard low frequency techniques.

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