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Josephson nano-resonators. THOMAS MCDERMOTT, HAI-YAO DENG, University of Exeter, ANDREAS ISACSSON, Chalmers University of Technology, EROS MARIANI, University of Exeter — We study theoretically a suspended nano-electromechanical resonator coupled to superconducting contacts. The coupling between Josephson dynamics and mechanical oscillations is a subject that has had a small amount of theoretical studies (all in the voltage bias regime of difficult experimental realisability), but no experimental realisations so far. Here we show that by coupling the currents in the device to an in plane magnetic field, mechanical oscillations can be both activated and detected in suspended Josephson junctions under experimentally relevant DC current bias conditions. We show that the activation of mechanical oscillations has a dramatic effect on the IV characteristics of the junction, due to energy being converted from the Josephson system to mechanical oscillations, allowing a fully-DC measurement of both the resonant frequency and the mechanical quality factor of the suspended device.

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