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Accessing nanomechanical resonators via a fast microwave circuit

MIKA SILLANPAA, JAAKKO SULKKO, JAYANTA SARKAR, JUHA MUHONEN, PERTTI HAKONEN, Helsinki University of Technology, Finland — We demonstrate how to fully electrically detect the vibrations of conductive nanomechanical resonators up to the microwave regime. We use the electrically actuated vibrations to modulate an LC tank circuit which blocks the stray capacitance, and detect the created sideband voltage by a microwave analyzer. We show the novel technique up to mechanical frequencies of 200 MHz and femto-meter displacement sensitivities. Finally, we estimate how one could approach the quantum limit of mechanical systems.

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