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**A New Electrometer based on Quantum Capacitance** C.M. WILSON, T. DUTY, D. GUNNARSSON, K. BLADH, P. DELSING, Chalmers University — We propose a new kind of electrometer that exploits the parametric quantum capacitance ($C_Q$) of a single cooper-pair box (SCB). The $C_Q$ is the curvature of the ground-state energy band. Near the charge degeneracy point, the curvature arises from the avoided level crossing induced by the Josephson coupling. The $C_Q$ depends strongly on gate charge and can be larger than the geometric capacitance. The designs embeds a SCB in a resonant circuit and detects changes in the $C_Q$ as changes in the phase of a reflected microwave signal. The device is similar to an RF-SET, but has potential advantages. (Our group has recently measured the $C_Q$ of an RF-SET.) In the standard RF-SET, a dissipative bias current must be passed from source to drain. This current is the source of significant backaction at the mesoscopic scale. The $C_Q$ electrometer has no bias current nor intrinsic dissipation. Therefore, its noise temperature should approach the standard quantum limit. Semiclassical calculations confirm this and predict the charge sensitivity should be comparable to the RF-SET. This approach is dual to recent proposals exploiting the Josephson inductance.

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