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Ultra-short single-wall carbon nanotube NEMS transistors ANDREW C. MCRAE, JOSHUA O. ISLAND, VAHID TAYARI, SERAP YIĞEN, A.R. CHAMPAGNE, Department of Physics, Concordia University, Montreal, Canada — We study electron transport in clean suspended single-wall carbon nanotube (SWCNT) transistors hosting a single quantum dot (QD) ranging in length from a few tens of nm down to $\approx$ 3 nm. To fabricate these ultra-short QD transistors, we align narrow gold bow-tie junctions on top of individual SWCNTs and suspend the devices. We then use a feedback-controlled electromigration to break the gold junctions and expose nm-sized sections of the SWCNTs. We measure electron transport in these devices at low temperature and show that they form clean and tunable quantum dot transistors. We observe QD excited states which correspond to both the stretching and flexural vibronic modes. The out-of-plane vibron resonances approach the THz range, and show that these ultra-short suspended transistors are promising candidates to develop highly sensitive NEMS and explore the strong electron-vibron coupling regime.

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