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The BO Approximation Breakdown - Raman Spectroscopy of Suspended Single-Walled Carbon Nanotubes under Gate Voltages. ADAM W. BUSHMAKER, University of Southern California, VIKRAM V. DESHPANDE, SCOTT HSIEH, MARC W. BOCKRATH, Caltech, STEPHEN B. CRONIN, University of Southern California — Since the creation of the field effect transistor, gate voltage response has been central to solid state devices. Typically, changing the Fermi energy in a metal with a gate voltage does not substantially change any of its properties. We present Raman spectra of pristine, suspended, metallic single walled carbon nanotubes observed under gate voltages, in which the LO mode of the G band downshifts, and then upshifts, giving the predicted "W" shaped gate voltage response. The data give interesting insight into the electron-phonon coupling through the Kohn anomalies in carbon nanotubes, and for the first time, confirm the predicted Born-Oppenheimer approximation breakdown in metallic nanotubes. We also report on Raman intensity variations in metallic nanotubes in response to gate voltages. Understanding these effects in pristine systems is crucial for the future development of low-dimensional devices based on metallic nanotubes.

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