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Bound excitons and optical absorption spectra of (10,10) metallic single-walled carbon nanotubes[1] JACK DESLIPPE, University of California at Berkeley, CATALIN SPATARU, STEVEN LOUIE, University of California at Berkeley and Lawrence Berkeley National Laboratory — Motivated by recent theoretical prediction of bound excitons [1] in small diameter metallic single-walled carbon nanotubes, we study the optical spectra of the larger diameter (10,10) metallic tube. We use an interacting-particle Greens function approach which includes calculations of the quasiparticle excitation spectrum (within the GW approximation for the electron self energy) and the electron-hole excitation spectrum (within the Bethe-Salpeter formalism). We show that the (10,10) tube has important excitonic effects despite being a metal, due to the quasi-one dimensional nature of the carbon nanotubes. A bound exciton with binding energy of 60 meV is found, and the location of the excitonic peak in the optical spectrum is at 1.8 eV. [1] C. D. Spataru, S. Ismail-Beigi, L. X. Benedict, and S. G. Louie, Phys. Rev. Lett. 92, 077402 (2004).

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Jack Deslippe
University of California at Berkeley

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