Abstract Submitted
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One-dimensional quantum transport in hybrid metal-semiconductor nanotube systems.[1] MAXIM GELIN, Munich Technical University, IGOR BONDAREV, North Carolina Central University — We study the inter-play between the intrinsic 1D conductance of metallic atomic wires (AWs) and plasmon mediated near-field effects for semiconducting single wall carbon nanotubes (CNs) that encapsulate AWs of finite length. We use the matrix Green's functions formalism to develop an electron transfer theory for such a hybrid quasi-1D metal-semiconductor nanotube system. The theory predicts Fano resonances in electron transmission through the system. That is the AW-CN near-field interaction blocks some of the pristine AW transmission band channels to open up new coherent channels in the CN forbidden gap outside the pristine AW transmission band. This makes the entire hybrid system transparent in the energy domain where neither of the individual pristine constituents, neither AW nor CN, are transparent. The effect can be used to control electron charge transfer in semiconducting CN based devices for nanoscale energy conversion, separation and storage [1-3]. – [1]S.Nanot, et al., Sci. Rep. 3, 1335 (2013); [2]M.Barkelid and V.Zwiller, Nature Photo 8, 47 (2014); [3]A.Sharma, et al., Nature Nano DOI:10.1038/nnano.2015.220.

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