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Single and Multi-Channel Carbon-based Quantum Dragons[1]
GODFRED INKOOM, Mississippi State University, OMADILLO ABDURAZAKOV, NCSU , MARK NOVOTNY, Mississippi State University — In the coherent regime for electrical conductance measurements, two semi-infinite leads are connected to a finite nanostructure, and the nano-device conductance is calculated using the Landauer formula. Any channel k that has transmission for electrons with energy E, $\mathcal{T}_k(E)$=1 contributes the conductance quantum G_0=$2e^2/h$. Any nano-device with at least one $\mathcal{T}_k(E)$=1 is called a quantum dragon [1]. The transmission probability $\mathcal{T}_k(E)$ can be obtained from the solution of the time-independent Schrödinger equation. Uniform leads connected to armchair single-walled carbon nanotubes (SWCNTs) have $\mathcal{T}(E)$=1, while when connected to zigzag SWCNT the $\mathcal{T}(E)$ is less than unity. Appropriately dimerized leads connected to zigzag SWCNTs are quantum dragons, while when connected to armchair SWCNTs $\mathcal{T}(E)$ is less than unity [1]. We have generalized the matrix method and mapping methods of [1] in order to investigate SWCNTs that can be multi-channel quantum dragons. For example, one can use armchair SWCNT leads to connect to an armchair SWCNT to try to produce a multi-channel quantum dragon.
[1] M.A. Novotny, Phys. Rev. B **90**, 165103 [14 pages] (2014).

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