SAIP2013

Contribution ID : 169

High frequency Luttinger liquid excitations and ballistic transport in aligned CNTs range at room temperature

Wednesday 10 Jul 2013 at 14:10 (00h20')

Abstract :

Direct experimental observation of one dimensional (1D) Plasmon low energy excitations in CNTs using high frequency ac voltages in the Giga Hertz (GHz) range is reported. Evidenced by periodic oscillations in the complex ac impedance of a few aligned single walled (SWNTs) and doubled walled (DWNTs) carbon nanotubes best described by the Luttinger liquid theory we show that this observation is strongly influenced by the number of conduction channels available. Using on-wafer microwave probing up to 65 GHz on coplanar wave guides and an industrially accepted open-short de-embedding technique we further report of a crossover from diffusive transport to ballistic transport at approximately 13 GHz (resulting in a possible 15 ps momentum scattering time) in SWNTs and DWNTs at room temperature. The results are further complimented by the low bias IV characteristics that show quantized conductance in SWNTs and differential conductance characterised by dI/dV α V0.46 consistent with the LL theory. This work provides a direct experimental proof of the LL behaviour which had long been predicted theoretically and indirectly inferred from resonant tunnelling experiments.

Award :

Yes

Level :

PhD

Supervisor :

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Paper :

No

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