Open Talk

24th December, 2018 **3:00 PM** **Fermion**

SPEAKER

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TITLE OF THE TALK

Mesoscopic Physics: Quantum Electronic Transport in Quasi-1D Systems

ABSTRACT

Electronic transport in quasi-one dimensional (1-D) systems are mainly studied in quantum point contact (QPC) and quantum wire devices. It was first reported in QPCs of high electron mobility devices of GaAs/GaAlAs heterostructure, where steps of differential conductance (G normalized to a quantum value G0 = 2e2/h) was observed as a function of gate voltage. Since 1988 a number of other 1-D systems from Si metal-oxide field effect transistors, GaAs type other hetero-structures and constricted graphenes etc. exhibited the quantized steps. Apart from quantized steps of universal nature (having its occurrence at integral values n= 1, 2. 3 etc. for G/G0 = n) there seems to be anomalies observed in many of the above systems at the nonintegral values. It has been argued that this (0.7 anomaly) is an intrinsic property caused by many-body effect, which appears to arise independent of the materials system. Although 0.7 anomaly has been discussed abundantly in the literature, a careful observation of conductance features in all the 1D conductors would reveal anomalies at various conductance values apart from at 0.7. They occur clearly at some elevated temperature and at nonzero magnetic fields. (ii) Another anomaly has been identified in the nonlinear transport regime at low temperatures as zero-bias peak in the differential conductance while sweeping the drain bias. It is called "zero-bias anomaly" (ZBA). (iii) A third anomaly seen at higher bias where the quantized step exceeds Landauer limit.

We analyse the experimental findings and present various theoretical methods to explain the observed anomalies (1-2).

(1) M. P. Das and F. Green, Conductance anomalies in quantum point contacts and 1D wires, Adv. Nat. Sc.: Nanosci. Nanotechnol. 8 023001 (2017).

(2) F. Green and M. P. Das, Anomalous conductance quantization in the inter-band gap of a one dimensional channel, J. Phys.:Condens Matter 30 385304 (2018)

HOST FACULTY

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