The 116th MANA Special Seminar

15:30-16:15 Prof. Somnath Bhattacharyya

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Quantum transport in low-dimensional disordered carbon films

Chair: Dr. Dr. Kazushi Miki (NanoArchitecture Group)

Developing high-speed device and low power non-volatile memory by using low-dimensional semiconductor super-structures has recently been encouraged and we show a possible route using some novel carbon nanostructures. In the low-dimensional carbon due to modification of the electronic structure, novel transport properties such as n-type conductivity of nanocrystalline diamond films, a dimensionality crossover in conductivity, and enhanced correlation length & carrier mobility can be seen. Similar studies have been made in artificially-grown multi-layers of low-dimensional diamond-like amorphous carbon films where resonant tunneling with negative differential resistance and quantum conductance has been demonstrated. These carbon structures are able to show switching of complex impedance in the range 100 GHz controlled by applying bias and a transition from diffusive to ballistic conduction regime. We elaborate on how to tune the characteristic (scattering) time of carriers in low-dimensional carbon through magnetic field dependent electron transport. Based on these experimental results a conductivity model showing an enhancement of spectral conductivity in the delocalized π-states of low-dimensional disordered carbon is developed, which also explains the microscopic origin of the high n-type conductivity of nanocrystalline diamond films with a diffusive mobility and the non-dispersive transport in carbon having a high coherence length and resonant tunneling in these weakly localized systems.

Venue: **4F Seminar Room #431, MANA Bldg.**

Date: **Dec 14th Monday** ***Time:*** **15:30-16:15**

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