

Arijit Saha

Research Summary:

[1] We study adiabatic charge pumping through a quantum dot placed at the junction of N quantum wires. We find out that the pumped charge in this case has a quantized value called *winding number contribution* and a non-integer part called the *dissipative part*. We explicitly map out the pattern of pumped charge as a function of the time-varying tunneling parameters coupling the wires to the dot and the phase between any two time varying parameters controlling the shape of the dot. We find that with $N - 2$ time-independent well-coupled leads, the maximum pumped charge in the remaining two leads is strongly suppressed with increasing N due to leakage through the other wires, leading to the possibility of tuning of the pumped charge, by modulating the coupling of the $N - 2$ leads.

[2] We study the effect of *dephasing* on adiabatic pumped charge through a dot at the junction of multiple quantum wires. We make the phase of one of the hopping parameters inside the dot random which acts like a random electric field. We find out that the pumped charge for $N = 2$ wires is almost robust to the dephasing effect, but surprisingly there is a gradual decrease of pumped charge for $N = 3$ wire case.

Publications:

1. Shamik Banerjee, Anamitra Mukherjee, Sumathi Rao and Arijit Saha, *Adiabatic charge pumping through a dot at the junction of N quantum wires*. Phys.Rev.B75, 153407, (2007).

Preprints:

1. Anamitra Mukherjee, Sumathi Rao and Arijit Saha, *Dephasing effect to transport through a quantum dot pump at the junction of multiple quantum wires*.

Conference/Workshops Attended:

1. *Physics near Mott Transition*, IISc(Bangalore), India, July, 24-28, 2006.
2. *Strongly correlated electron systems and nano materials*, IIT (Kharagpur), India, January, 16-18, 2007.

Visits to other Institutes:

1. Indian Institute of Science, Bangalore, India, July 14-28, 2006.

Other Activities:

1. Extension talk: *Adiabatic charge pumping through a quantum dot at Y junction*, April 27, 2006.
2. Cond-mat lunch talk: *Arbitrary ratio of pumped charge and spin current through a mesoscopic structure*, September, 2006.
3. Class room talk: *Graphene: Carbon in two dimensions*, February, 2007.
4. Tutor for *Advanced quantum mechanics course*, Jan-April, 2007.