Sumathi Rao

Research Summary:

We continued our investigations of junctions of quantum wire. This year we studied the effect of a Kondo spin at the junction of three or more wires. We also studied the patterns of time- dependent transport through a dot at the junction of quantum wires.

We are currently studying the problem of how the current through a mesoscopic conductor can be dephased by leakage of current through other wires attached to the junction.

We are also studying transport through a normal-superconductor-normal junction and in particular, we are studying the effect of electron-electron interactions on the Andreev reflection.

Finally, we have started working on graphene and in particular, the role of defects in graphene.

Publications:

1. Sourin Das, Sumathi Rao and Diptiman Sen, *Effects of interactions and junctions on conductances of quantum wires*, in *Special Issue on the International Conference on Nanoscience and Technology*, eds. M. K. Sanyal, A. K. Raychaudhuri and D. Chakravorty, International Journal of Nanoscience **4** 951 - 956, (2005).

2. Ravi Chandra, Sumathi Rao and Diptiman Sen, *A multi-channel fixed point for a Kondo spin coupled to a junction of Luttinger liquids,* Europhys. Lett. **75**, 797, (2006)

3. Ravi Chandra, Sumathi Rao and Diptiman Sen , *Renormalisation group study of the Kondo problem at a junction of several quantum wires* Phys. Rev. **B75**, 045435 (2007)

4. Shamik Banerjee, Anamitra Mukherji, 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 Mukherji, Sumathi Rao and Arijit Saha, *Transport through a quantum dot pump at a multiple wire junction,* (in preparation)

Conference/Workshops Attended:

1. *Physics near the Mott transition*, Bangalore, India, 20-25 July 2006
2. *Conference-cum-seminar on Emerging trends in physics*, S.G.T.B Khalsa college, New Delhi, India, Sept 20-23, 2006.
3. *National Conference on Convergence with physics*, Jamshedpur, India, 10-11 October, 2006
4. *K S Krishnan Discussion Meeting on Frontiers in Quantum Science*, Chennai, India, 13-14 December 2006
5. *Workshop on correlated systems and novel materials*, Kharagpur, India, Jan 16-18, 2007
6. *SERC Theoretical High Energy School*, Hyderabad, Jan 19-27, 2007.

Visits to other Institutes:

1. Indian Institute of Science, Bangalore, India, July, 2006
2. Indian Institute of Technology, Kanpur, September 2006

Invited Lectures/Seminars:

1. *Adiabatic charge pumping through dots and junctions*, Indian Institute of Science, Bangalore, July 17, 2006.
2. *Correlated electron transport through junctions of quantum wires*, Indian Institute of Technology, Kanpur, Sept 19, 2006.
3. *Novel phenomena in low dimensional physics*. Indian Institute of Technology, Kanpur, Sept 20, 2006.
4. *Science: A journey into new frontiers*, Convergence with Physics, Jamshedpur Women's college, Jamshedpur, October 2006.
5. *Women in Physics in India* Panel discussion on Nurturing women in physics, Convergence with Physics, Jamshedpur Women's college, Jamshedpur, October 2006.
6. *Novel phenomena in low dimensional physics* , Workshop on correlated systems and novel materials, Indian Institute of Technology, Kharagpur, Jan 2007.

7. *Tutored course on Anomalies*, SERC Theoretical High Energy School, Hyderabad, Jan 19-27, 2007.

8. *High energy physics at low energies*, HRI local symposium, March 20, 2007.

Other Activities:

1. Taught *advanced quantum mechanics* , Jan-May 2007

2. Convenor, Local works committee

3. Convenor, Women's grievance cell

4. Member, Faculty Advisory committee and Budget committee