

Report on the Visit to Gothenburg University  
4-10 June 2007

Host: Henrik Johannesson

We have discussed various topics with the intent of starting collaboration.

1- We have discussed recent work on the finite energy properties of integrable systems such as the one-dimensional Hubbard model. The theory of the calculation of the spectral function and dynamical structure factor was discussed in detail and the comparison with experimental results for TTF-TCNQ and the possible outcome of future experiments on cold atoms in optical lattices was discussed. These discussions took part between Henrik Johannesson, Jose Carmelo and myself. Recent work on this topic was presented in a seminar by Jose Carmelo during the visit.

Relevant work on this topic is presented in the references:

- J.M.P. Carmelo, J.M. Roman and K. Penc, Nuclear Physics B 683, 387 (2004)
- J.M.P. Carmelo, K. Penc and D. Bozi, Nuclear Physics B 725, 421 (2005)
- J.M.P. Carmelo and K. Penc, European Physics Journal B 51, 477 (2006)
- J.M.P. Carmelo, L.M. Martelo and K. Penc, Nuclear Physics B 737, 237 (2006)
- M. Sing et al. Physical Review B 68, 125111 (2003)
- J.M.P. Carmelo et al. Europhysics Letters 67, 233 (2004)
- J.M.P. Carmelo, K. Penc, P.D. Sacramento, M. Sing and R. Claessen, Journal of Physics Condensed Matter 18, 5191 (2006)

2- We have started a collaboration on the problem of persistent currents in mesoscopic rings coupled to a quantum dot, with particular focus on the effect of the Kondo coupling on the persistent current. This work will attempt to unearth the mechanism by which integrability "protects" a persistent current from being influenced by a quantum impurity (J. Nilsson, H.-P. Eckerle, and H. Johannesson, cond-mat/0612267), and will also try to shed further light on the conflicting results obtained by H.-P. Eckerle, H. Johannesson and C.A. Stafford Physical Review Letters 87, 016602 (2001) and I. Affleck and P. Simon Physical Review Letters 86, 2854 (2001).

3- Also, we discussed the general field of the effect of magnetic impurities in superconductors and in particular the quantum phase transitions induced in the case of conventional superconductors. In this context, we discussed the various entanglement signatures of these quantum phase transitions which originate discontinuities in various quantities like the von Neumann entropy, the mutual information, the negativity, the generalized global entanglement and the fidelity. Recent work on this topic was presented in a seminar by myself during the visit. We have discussed the relation between the information contained in the density matrices and its relation to correlation functions such as discussed in  
D. Larsson and H. Johannesson, *Physical Review Letters* 95, 196406 (2005)  
P.D. Sacramento, P. Nogueira, V.R. Vieira and V.K. Dugaev, cond-mat/0706.1476

P.D. Sacramento