

Spin orbit in quantum dots in the low filling factor regime

During the visit, the influence of the Dresselhaus term in the spin-orbit interaction has been added to our former model of quantum dots[1]. One of the most dramatic consequence of this coupling is that the quantum numbers that were defined in the presence of the Rashba interaction only are not conserved anymore; at this point, the problem becomes essentially numerical, and we solved it by exact diagonalization.

During the stay, we also worked on a recent paper [2] claiming that spin excitations ("merons") constitute the lowest lying states of the quantum dots (without spin-orbit). This would modify the inner nature of the dot, which would not be a Fermi liquid anymore. Consequently, we also calculated the spin-spin correlation function in these quantum dots, in order to check the validity of this claim. We found a similar spin texture and we are currently investigating if these new results are worth a publication.

Finally, additional work has been carried out on experimental data collected by Prof. F. Tafuri, on mesoscopic grain boundaries in high critical temperature superconductors. We filtered these data to retrieve universal conductance fluctuations in these systems. We hope this study can be a basis for future publication/collaboration with the different partners.

[1] P. Lucignano, B. Jouault, A. Tagliacozzo, Phys. Rev. **B 75**, 153310 (2007).

[2] A. Petkovic *et al.*, Phys. Rev. Lett. **98**, 066808 (2007).