Reentrance behaviour of superfluidity in magnetic fields (part 2/2)

A. Krzywicka[1] and T.P. Polak[1]

[1] *Institute of Spintronics and Quantum Information, Faculty of Physics, Adam Mickiewicz University, Poznań, Poland*

We study quantum phase transitions in a system of bosons where the effects of single and pair tunnelling coexist. The pair condensation in the model stems from density induced tunnelling. The model is mapped onto the solvable quantum generalisation of the spherical model, improving accuracy over mean-field approximations. Lattice dependence and external magnetic fields are introduced via density of states functions. We show that the pair term has a dissipative effect on single particle superfluidity, however sufficiently large density induced tunnelling leads to the revival of the single superfluid. The impact of orbital magnetic field effects cannot be anticipated from typical assumptions.

References:

[1] A. Krzywicka, T.P. Polak, *Coexistence of two kinds of superfluidity at finite temperatures in optical lattices*, Annals of Physics 443 (2022) 168973, DOI: https://doi.org/10.1016/j.aop.2022.168973

[2] T.P. Polak, T.K. Kopeć, *Local dissipation effects in two-dimensional quantum Josephson junction arrays with a magnetic field*, Phys. Rev. B 72 (2005) 014509, DOI: https://doi.org/10.1103/PhysRevB.72.014509