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PAIRING TRANSITION IN INTERACTING ELECTRONIC DOUBLE LAYERS

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In a system of two parallel two-dimensional layers we study the pairing transition caused by interlayer Coulomb interaction. Depending on the charge carriers, which can be electrons or holes, the interaction is either repulsive for two electron layers or attractive for an electron and a hole layer. In the latter case the paired state consists of excitons [1] while in the former case we get electron pairs [2]. It is important that these two pairing states are related by a duality transformation. The pairing transition depends on the density of states and requires a critical interaction strength in the case of a honeycomb lattice, where the density of states vanishes at the Fermi energy (**Figure 1 left**). The paired states have a characteristic behavior in terms of the optical conductivity, which reflects the Coulomb drag effect (**Figure 1 right**).

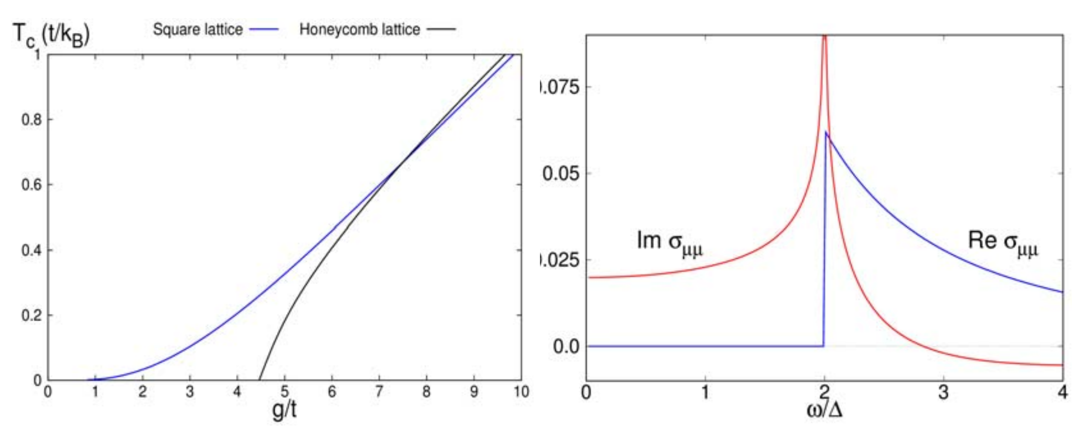

Figure 1. Left panel: critical temperatures for a square lattice and a honeycomb lattice as a function of the interaction strength g. Right panel: Optical conductivity of frequency ω describes the Coulomb drag.

References

[1] O. Berman, R. Kezerashvili, Y. Lozovik and K. Ziegler, Phys. Rev. B 100, 134514 (2019).
[2] A. Sinner, Y. Lozovik and K. Ziegler, arXiv: 1912.13257.