

Interplay of Hidden Order, Quantum Criticality and Superconductivity in the Physics of 2D Heavy, Ultracold Atomic and Sulfur Hydride Fermions.

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Abstract.

In the presentation of talk, we will discuss about the possible single boson nature of hidden order, quantum criticality and superconductivity in the physics of 2D heavy, ultracold atomic and sulfur hydride fermions. First, we demonstrate that this nature displays in experiments on heavy fermion compounds and then introduce model, which results may be consistent with experimental ones. We predict the single boson physics for ultracold atomic and sulfur hydride fermion materials.

Anyon bosonized fermion mechanism of 2D superconductors

1. Screening of electron spin with anyon magnetic field leads to formation of single boson.
2. High temperature SC of listed in title compounds is a result of BEC of single bosons (no pairs!).
3. Spin of each boson fluctuate. Spin fluctuating single bosons are HO. Experiments on HO in cuprates together with STM probe in HF metals justify this model of HO.
4. Lambda critical point of HF metals is a result of BEC of HO single bosons.

Instead of conclusion, predictions

1. For cuprates, in analogy with HF metals, we predict existence of the second SC dome in the phase diagram temperature-doping for dopings above second critical doping.
2. For 2D ³He system, we predict existence of a superfluid phase transition critical point from single bosons.
3. Magnetically strongly correlated 2D ultracold atomic fermion gases and sulfur hydride must display the same physics as HF metals.
4. As in cuprates, HO of all listed in title compounds must display the spin fluctuation in the experiment.