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Phase Fluctuations in Strongly Coupled d-Wave Superconductors MATTHIAS MAYR, UT/Knoxville and Oak Ridge National Laboratory, GON-ZALO ALVAREZ, Oak Ridge National Laboratory, CENGIZ SEN, FSU/NHMFL, ELBIO DAGOTTO, UT/Knoxville and Oak Ridge National Laboratory — We present a numerically exact solution for the BCS Hamiltonian at any temperature, including the degrees of freedom associated with classical phase, as well as amplitude fluctuations via a Monte Carlo integration. This allows for an investigation over the whole range of couplings: from weak attraction, as in the well-known BCS limit, to the mainly unexplored strong-coupling regime of pronounced phase fluctuations. In the latter, two characteristic temperatures T^{*} and T_c, associated with short- and long-range ordering, respectively, can be identified in a mean-field-motivated Hamiltonian. T^{*} at the same time corresponds to the opening of a gap in the excitation spectrum. In addition to introducing a novel procedure to study strongly coupled *d*-wave superconductors, our results indicate that classical phase fluctuations are not sufficient to explain the pseudogap features of high-temperature superconductors.

Matthias Mayr UT/Knoxville and Oak Ridge National Laboratory

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