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# Construction of Superconducting dome and Quantum Critical Region

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We investigate an extended model of holographic superconductor by a nonlinear electrodynamic interaction coupled to a complex scalar field. This non-linear interaction term can make a quantum phase transition at zero temperature with finite charge carrier density. By solving full equations of motion, we can construct various shapes of the superconducting phase in the phase diagram. With a specific choice of interaction coefficients, we can construct a phase diagram with a superconducting dome. Also, we find a new geometric solution inside the superconducting dome, which turns out to be a Lifshitz-type geometry. We develop our model using machine learning technique to find out the mass function of the scalar field. By using physics informed neural network method, we find mass function for the experimental data of the high Tc superconductors.

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