

Title: The emergence of gapless quantum spin liquid near deconfined quantum critical point

Abstract: The deconfined quantum critical point (DQCP) between the Neel state and valence bond solid (VBS) state has been observed in various theoretical models, including the well-known J-Q model. In this presentation, I will explore the possibility of an emergent gapless quantum spin liquid (QSL) near the DQCP. Using advanced tensor network state techniques, particularly the finite projected entangled pair state (PEPS) algorithm, we investigate the global phase diagram of the spin-1/2 J_1 - J_2 and J_1 - J_2 - J_3 square antiferromagnetic Heisenberg models. Our research provides robust evidence that the intermediate nonmagnetic phase is indeed a gapless quantum spin liquid (QSL), characterized by power-law decay in both spin-spin and dimer-dimer correlations. Additionally, I will discuss the potential effective field theory for such a gapless QSL state.

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