

Frustrated magnetism on the honeycomb lattice

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Frustrated magnetism gives rise to many body states with various levels of entanglement. Recently, a novel state consisting of entangled plaquettes has been proposed in the honeycomb lattice J_1 - J_2 model. We demonstrate the existence of this phase using DMRG calculations. To clarify the nature of this state, we use a plaquette-operator approach to obtain an effective description. The J_1 - J_2 model shows three phases as we vary J_2 , viz., Neel order, weak plaquette order and dimer order. Surprisingly, the phase transitions between these states appear to be continuous Landau-forbidden transitions. We discuss this exciting prospect of seeing deconfined criticality in a realistic Heisenberg model.