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Entanglement properties of the antiferromagnetic-singlet transition in the two dimensional Hubbard model[1] RICHARD T. SCALETTAR, CHIA-CHEN CHANG, RAJIV R.P. SINGH, Univ of California - Davis — Entanglement entropy is a manifestation of quantum coherence. In a many body system, it can provide distinct signatures of quantum criticality and topological order. Measurements of entanglement entropy typically require knowledge of the many body wave functions. Due to their non-local nature, it is difficult to evaluate entanglement properties of correlated systems using numerical methods that rely on local operators. Here we present a study of Renyi entanglement entropy (EE) for fermonic bilayer Hubbard model at half-filling using a recently proposed formalism [1] within the determinantal quantum Monte Carlo framework. We obtain temperature dependence of the Renyi EE. At low temperatures, a sharp signal in the EE is observed as the system undergoes the singlet-antiferromagnetism transition. Scaling properties of the Renyi EE resulting from different bipartite divisions of the bilayer are explored. In the non-interacting limit, the results of the simulations are compared with those obtained with the correlation matrix method.

[1] T. Grover, Phys. Rev. Lett. **111**, 130402 (2013).

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