Mott Transitions in Correlated Electron Systems: Geometrical and Orbital Frustration

N. Kawakami,[1] A. Koga,[1] K. Inaba,[1] T. Ohashi [2] and H. Tsunetsugu[3]

[1]*Department of Applied Physics, Osaka University, Suita, Osaka 565-0871, Japan.*
[2]*RIKEN, Wako, Saitama 351-0198, Japan*
[3]*Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto 606-8502, Japan.*

We investigate Mott transitions in a frustrated electron system by applying a cluster dynamical mean field theory to the Kagome lattice Hubbard model. The calculation of the double occupancy, the density of states, the static and dynamical spin correlation functions demonstrates that the system undergoes the first-order Mott transition at a critical Hubbard interaction *U*. In the metallic phase close to the Mott transition, we find the strong renormalization of three distinct bands, giving rise to the formation of heavy quasiparticles with strong frustration. It is elucidated that the quasiparticle states exhibit anomalous behavior at low temperatures: singlet pairing correlations are once enhanced and then suppressed, which clearly features the competition between itinerancy and frustration in correlated electrons near the Mott criticality.

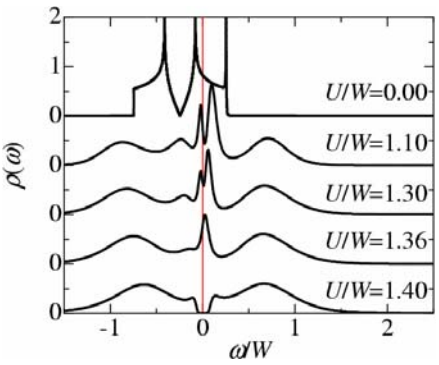

FIG.1: Density of states for Kagome lattice Hubbard model.

We believe that the above anomalous properties, which are newly found here, are inherent in frustrated electron systems near the Mott transition. It is further found that those properties are closely related to the anomalies found for the Mott transition in the multiorbital Hubbard model.