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Doping dependence of quasi-particle gaps at low hole doping in the Hubbard model¹ MARKUS AICHHORN, University of Wurzburg, ENRICO ARRIGONI, University of Technology Graz, MICHAEL POTTHOFF, WERNER HANKE, University of Wurzburg — Using the variational cluster approach we investigate the doping dependence of the pseudogap and the superconducting gap in the t - t' - U Hubbard model at low hole doping and zero temperature. The self energy of the system is calculated on a well suitable reference system for the investigated doping range and provides well defined quasi particles in the nodal region. We show that the pseudogap in the paramagnetic regime decreases with increasing hole doping, whereas the superconducting gap in the superconducting solution shows the opposite doping dependence for low hole doping. Furthermore our calculations suggest that the superconducting pseudogap in the antinodal region can be seen as sort of superposition of the paramagnetic pseudogap and the superconducting gap as measured near the nodal region. Thus, we claim that the occurrence of two distinct energy gaps recently found in experiments can naturally be explained by the single-band Hubbard model.

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