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Vacancies in a 3D-Kitaev model on hyper-honeycomb lattice G J SREEJITH, Max Planck Institute for Physics of Complex Systems, Dresden, SUBHRO BHATTACHARJEE, International Centre for Theoretical Sciences, Bangalore, RODERICH MOESSNER, Max Planck Institute for Physics of Complex Systems, Dresden — We study the properties of isolated single and pairs of vacancies in an exactly solvable Kitaev model on a three dimensional hyper-honeycomb lattice. We show that each vacancy in the lattice is associated with a low energy spin like degree of freedom, similar to the case of previously studied honeycomb model. We calculate the contribution from these vacancy spin-moments to the low field magnetization response to a z-directed field. Isolated vacancies in the gapped phase act as free spins. In the gapless phase, these spins interact with the surrounding spin-liquid suppressing the low-field magnetization to $\frac{1}{\sqrt{\ln[1/h_z]}}$. Pair of vacancies have a sublattice-dependent, anisotropic, spin-liquid mediated interaction with each other. In the gapless phase, interaction between vacancies in the same (opposite) sublattice enhances (suppresses) the low-field magnetization, indicating a ferromagnetic (anti-ferromagnetic) nature. We also show that, unlike vacancies in the honeycomb lattice, the vacancies here do not bind a flux at low-energies.

Sreejith Ganesh Jaya
Max Planck Inst

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