Defects in the spin-Peierls matrix. Impurity induced AFM ordering.

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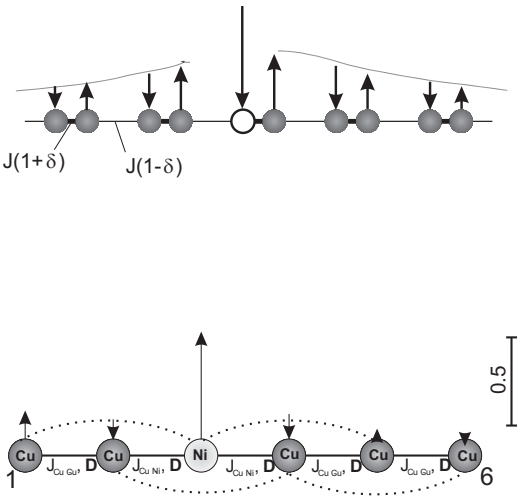

Figure 1: (top)Schematic representation of the local order parameter structure in the vicinity of the impurity ion. White circle — magnetic impurity, gray circles — magnetic native ions. (bottom)Average spin projections in the ground state of the finite-size cluster calculated by Hamiltonian exact diagonalization.

Introduction of the impurity to the spin-gap magnet leads to the local destruction of the singlet state and to the formation of the multi-spin magnetic defect with non-zero net magnetic momentum and antiferromagnetic correlations (Figure 1). Multi-spin nature of these defects manifests itself in the

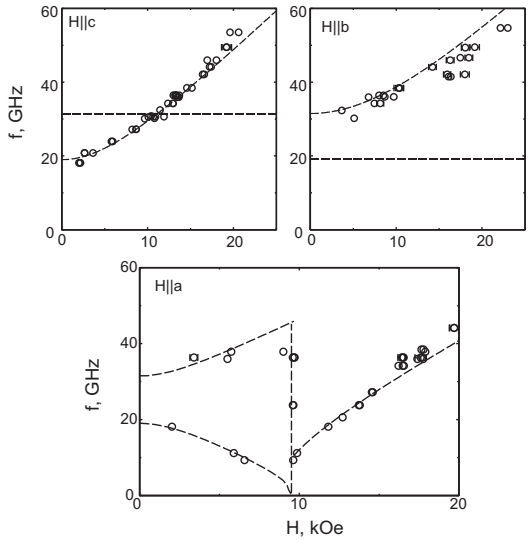

Figure 2: Frequency-field dependence of the antiferromagnetic resonance in the $Cu_{0.97}Ni_{0.03}GeO_3$ at 1.8K. Lines — molecular field theory.

ESR experiments on the Ni-diluted $CuGeO_3$ (Glazkov *et al.* JETP **93** 143 (2001), Glazkov *et al.* J.Phys.:Cond.Matt. **10** 7879 (1998)): Observation of the anomalous g-factor value (as low as 1.4) can be explained only assuming a multi-spin nature of the magnetic defect and a specific anisotropic interactions within this defect. Analysis of the defect's interaction with the gas of thermally activated triplets allows to determine size of the defect: it was found to contain about 30 Cu ions.

Revival of the local antiferromagnetic order in the impurity vicinity leads to the propagation of the antiferromagnetic correlations away from the impurity to the unperturbed mother compound matrix. The local order parameter decay exponentially in agreement with the finite correlation length of the spin-gap magnet. If the temperature is low enough, overlapping of these exponential "wings" leads to the establishment of the coherent long-rage antiferromagnetic order. The later can be detected in the ESR experiments by the transformation of the paramagnetic resonance absorption signal to the antiferromagnetic resonance absorption with the characteristic frequency-field dependence (Smirnov *et al.* JETP Letters **64** 305 (1996)) (Figure 2).