9.7 cm

QUANTUM CRITICAL BEHAVIOR IN $CuGeO_3$

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High frequency ESR in the spin-Peierls compound $CuGeO_3$ doped with 1% Fe and 2% Co was studied. Experiments were carried out in the frequency/temperature/field domain 60-450 GHz/1.8-300 K/0-15 T. The use of the ESR spectroscopy have allowed to separate correctly effects of magnetism of Cu^{2+} chains modified by magnetic impurity from Fe or Co impurity paramagnetism and found magnetic susceptibility of Cu^{2+} chains $\chi(T)$, line widths and $g-$factors. It was found that doping of $CuGeO_3$ matrix by Fe and Co completely damps both spin-Peierls and antiferromagnetic transitions. For $T<$20K a divergent power asymptotic $\chi\propto 1/T^{\alpha}$ with the indexes α=0.35±0.03 ($CuGeO_3$:Fe) and α=0.69±0.04 ($CuGeO_3$:Co) was observed. Simultaneously for $CuGeO_3$:Fe magnetic contribution to specific heat for $T<$20 K acquires the form $C_m \propto T^{1-\alpha}$ with α=0.37±0.04. The observed anomalies suggest onset of the quantum critical behavior[1] in $CuGeO_3$ doped with magnetic impurities.

[1] Demishev S.V., et al. JETP Letters 73, 31 (2001)

13.4 cm

Subject category :

5. Phase Transitions and Critical Phenomena

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