

Interplay Magnetism-Superconductivity in UCoGe

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Recently, UCoGe has been shown to belong to the family of the ferromagnetic superconductors [1], exhibiting at ambient pressure weak ferromagnetism below $T_C = 3$ K and a superconducting state below ~ 0.8 K. The interplay between these ground states has been investigated using the zero-field μ SR technique. Below the Curie temperature, clear spontaneous oscillations of the muon polarization are observed in the μ SR signal reflecting the ordering of small magnetic moments ($m_0 = 0.03 \mu_B$). A comparison between the present data with those obtained on the doped sample URh_{0.4}Co_{0.6}Ge ($m_0 = 0.22 \mu_B$) shows that the ratio of the frequencies scales well with the ratio of the ordered moments. The amplitude of the oscillations in UCoGe unambiguously indicates that the whole muon ensemble senses spontaneous internal fields in the ferromagnetic phase, demonstrating that magnetism occurs in the whole sample volume. Upon cooling the sample below the superconducting transition, the μ SR data provide an unequivocal proof that ferromagnetism persists in the superconducting state. An indication for an interaction between magnetism and superconductivity is provided by a small decrease of the muon-precession frequency of the order of 2% in the superconducting state.

[1] N.T. Huy et al., Phys. Rev. Lett. 99 (2007) 067006.