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Anomalous behaviour of the mixed phase of superconducting $\text{LaFeAsO}_{1-x}\text{F}_x$

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The Fe-based superconductors have been extensively investigated in view of the intimate interplay of the magnetic and superconducting phases developing therein. Here, we show an anomalous behaviour of the mixed phase in the family of superconducting compounds $\text{LaFeAsO}_{1-x}\text{F}_x$ as detected by transverse-field muon spin rotation. This technique is the best tool to probe both the flux line lattice distribution and any additional source of magnetism through both the muon depolarization rate and the local magnetic field at the muon site B_μ . Although the typical shielding behaviour is expected to saturate to a constant value well below the superconducting transition T_c , our results for $\text{LaFeAsO}_{1-x}\text{F}_x$ show that B_μ is enhanced in the low-temperature regime (see figure). We discuss an extensive investigation of this phenomenon as a function of F doping, external magnetic field and temperature alongside different interpretations for the observed phenomenology, including a spontaneous magnetic re-entrance and a possible change of the flux line lattice distribution [1].

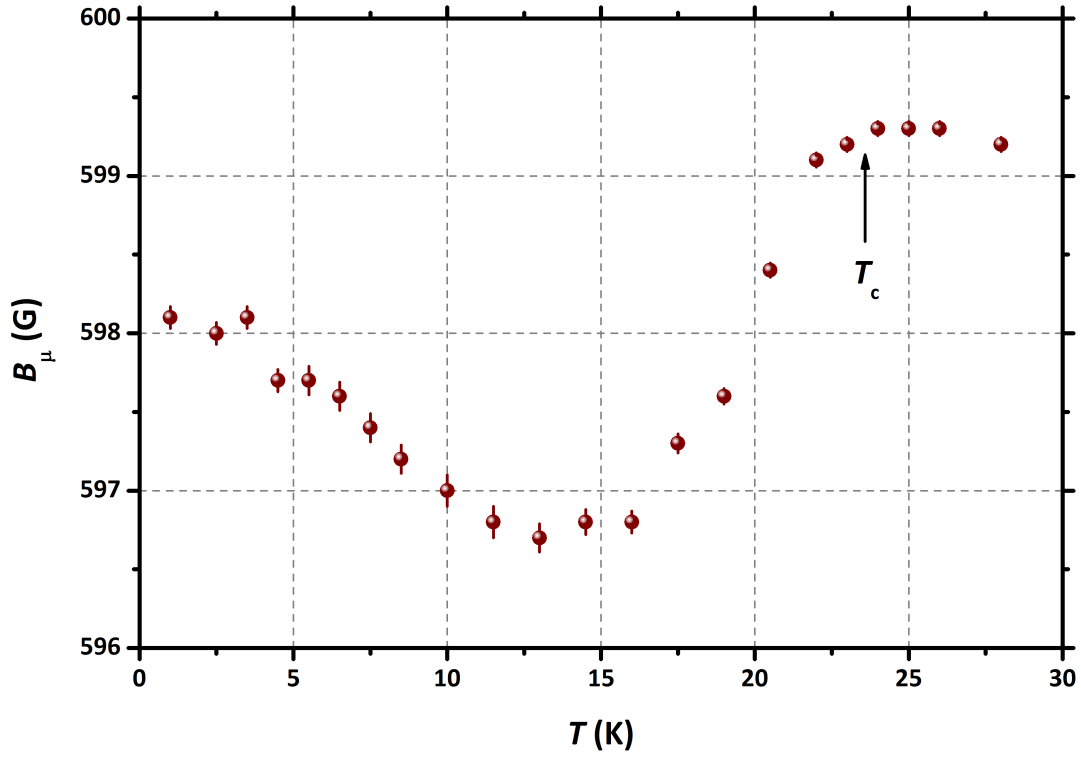


Figure 1: Temperature dependence of the internal magnetic field at the muon site for $\text{LaFeAsO}_{1-x}\text{F}_x$ ($x = 0.1$) field cooled in a transverse external field $B_{ext} \simeq 600$ G. An anomalous enhancement is observed in the low temperature regime.

[1] Manuscript in preparation (2022).

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