Ferromagnetism and superconductivity have long been thought to be mutually exclusive. Recently however it was found that the compounds UGe$_2$, URhGe and UIr belong to a class of materials in which ferromagnetism and superconductivity appear simultaneously. One characteristic property of these compounds is the existence of strong correlations between the magnetic moments of the uranium ions and the conduction electrons. These correlations lead to unusual magnetic properties at low temperatures. By applying external pressure the magnetic correlations can be varied. The fact that superconductivity in these materials is found only for those pressures, at which the magnetic correlations are strongest, indicates that the effective attracting force between the conduction electrons responsible for superconductivity has a magnetic origin.

In this research the magnetic correlations of the ferromagnetic superconductors are investigated in order to better understand the unusual coexistence of ferromagnetism and superconductivity. Besides the dilatometry, specific heat, magnetization, and three-dimensional neutron depolarization techniques, the muon spin relaxation (µSR) technique is frequently used in the study of the magnetic properties of the ferromagnetic superconductors. The muon experiments indicate that unusual excitations exist in these materials which are possibly responsible for the superconductivity.
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