

## Spin and orbital magnetisation in the ferromagnetic superconductor UCoGe

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In UCoGe ferromagnetism and superconductivity co-exist. The superconducting phase occurs below  $T \sim 0.5$  K. It is considered to be a weak itinerant ferromagnet, with  $T_C \sim 2.4$  K and an ordered magnetic moment between  $0.07 \mu_B$  to  $0.18 \mu_B$ . Electronic structure calculations typically over-estimate this moment, and predict it to arise from the near-cancellation of large spin and orbital contributions. In order to ensure an accurate description of the properties of 5f systems, and to provide a critical test of the theoretical approaches, it is instructive to obtain experimental data for both the spin and orbital moments, rather than just the total magnetic moment. In this talk, we describe a study of the spin density and magnetic moments using magnetic Compton scattering in combination with XMCD and bulk magnetization measurements and electronic structure calculations.

Using magnetic Compton scattering, the experimentally observed total spin moment,  $M_s$ , was found to be  $-0.24 \pm 0.05 \mu_B$  at 5 T. By comparison with the total magnetic moment of  $0.16 \pm 0.01 \mu_B$ , the orbital moment,  $M_l$ , was determined to be  $0.40 \pm 0.05 \mu_B$ . The U and Co spin moments were determined to be antiparallel, and this was confirmed using XMCD measurements. We estimate that the U 5f electrons carry a spin moment of  $U_s \approx -0.30 \mu_B$  and that there is a Co spin moment of  $Co_s \approx 0.06 \mu_B$  induced via hybridization. These values are significantly less than the moments predicted by a variety of electronic structure calculations. The ratio  $U_l/U_s$ , of  $-1.3 \pm 0.3$ , shows the U moment to be itinerant.

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