ESRF	**Experiment title:** Orbital Moment in Cr and its alloys	**Experiment number:** HE 312
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Report:

Chromium single crystals present interesting charge density wave (CDW) and spin density wave (SDW) phenomena [l-2]. Recent experiments with X rays have shown the potentiality of X ray magnetic scattering to probe new features of this system [3-5]. In particular non resonant X ray magnetic scattering has the unique capability to measure the orbital moment over the spin magnetic moment ratio. In the experiment HE 312 performed at the magnetic scattering beamline ID 20 at the ESRF, we have measured satellite peaks around the (001) reciprocal space position corresponding to the SDW magnetic peaks in a vertical scattering geometry and with incident linear polarisation. Using an PG 004 analyser we have performed the polarisation analysis at the (0 0 1±δ) SDW peaks obtaining the σ-σ and$\sigma\sigma$-π channels. The analysis was performed on a chromium single crystal of very good crystalline quality (FWHM of 18 arcsec) but containing small quantities of Cu impurities. Further chemical analysis are being performed to identify other possible contaminants. SDW peaks of 5000 counts/sec allowed the polarisation analysis of this sample at different energies and above and below the spin-flip temperature. A large L/S ratio of the order of -0.5 was found indicating an anti-parallel direction of the orbital moment to the spin magnetic moment.

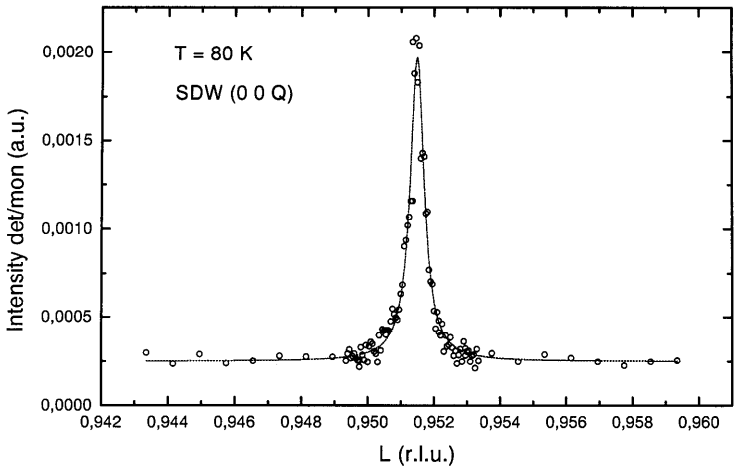

Fig. 1 σ-π polarisation analysis of the SDW 1-δ satellite peak of a Cr single crystal at 5.8 keV and 80 K.

These results have led us to measure the energy dependence of the σ-π channel through the K absorption edge of Cr, showing a large resonant enhancement (a factor of 15). This enhancement in the σ-π channel is compatible with an orbital contribution in agreement with theoretical calculations of the resonant scattering length for the K shell of 3d transition ions [6]. Further experiments on other samples containing different concentrations of impurities and even samples without impurities should confirm this large L moment predicted for the 3d transition metals.

References

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