ESRF	**Experiment title:** Spin-resolved Auger spectroscopy on paramagnetic and ferromagnetic 3d-metals using circularly polarized soft x-ray radiation	**Experiment number:** HE-141
Beamline: ID12B	**Date of experiment:** from: 3. April 1997 to: 19 April 1997	**Date of report:** 24.4.1997
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Rapid Preliminary Report:

Improvements at the beamline - made possible this time through the use of the second Helios I undulator with higher intensity - and of our apparaturs allowed us to perform systematic studies of the Auger processes following the 2 $p_{3/2} \rightarrow$ 3d excitation at Cr(l00). For the experiment we used a bulk clean Cr-crystal previously thoroughly processed within a photoemission experiment by F. Meier et al /1/. In Fig. 1 a spin resolved Cr- L_3VV spectrum measured at room temperature, i. e. below the Neel-temperature T_N = 308K /2/, is shown. I+ and I. represent the separation of the total intensity I_{tot} into partial intensities totally spin polarized parallel and antiparallel respectively, to the helicity of the radiation. All over the peak the partial intensity I. is preferred. As the primary excitation is a resonant p $\rightarrow$ d excitation resulting in a spin-polarization of the primary hole parallel to the helicity, the two valence electrons involved in the decay are found to be coupled to a singulett. The shoulder of the Auger peak at about 574eV is of interest. It is not present in a spin resolved L_3VV-Auger spectrum measured at Fe/Cu(100) (see Fig. 2) and (comparing with Cu-spectra) points to a more atomic-like behaviour of Cr. But the intensity of the shoulder may be influenced by surface contamination.

In addition to the L_3VV spectra Fig. 3 and Fig. 4 show the $L_3M_{23}M_{23}$- and $L_3M_{23}V$-spectra from Cr(100). The $L_3M_{23}M_{23}$ spectrum should be atomic-like. But comparing with the $L_3M_{23}M_{23}$ decay studied at free Ar atoms /3/ it is striking that in the $L_3M_{23}M_{23}$ spectrum only one pronounced peak, i.e. the ^3P-peak, is present. The $^1D_2$ peak is smeared out. With the $L_3M_{23}V$-spectrum it is of interest that I. is preferred as it is with the L_3VV spectra, pointing to a 3p-3d-coupling.

Finally it is worth noting that with all 3d-metals which we measured - Cu, Cr, Fe - the preferential spin direction in the main L_3VV peak is antiparallel to the helicity, i.e. the primary excitation is a p $\rightarrow$ d excitation also with Cu. This contradicts the preferential spin direction given in our previous experiment report.

The measurements on Cr were performed with our highly-esteemed, deceased friend Felix Meier, Zurich in mind. We thank Danilo Pescia for giving us access to the Cr(lOO) crystal.

/1/ F. Meier. D. Pescia, T. Schriber, Phys. Rev. Lett. 48, 645 (1982
/2/ Ch. Kittel "Introduction to Solid State Physics", 5th Edition, Wiley 1976
/3/ G. Snell, Dissertation, Univ. Bielefeld, 1997

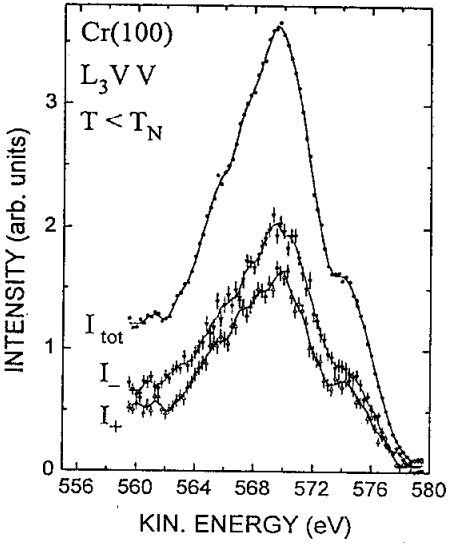

Fig. 1: Spin-resolved L_3VV-Auger spectrum from Cr(100) measured with excitation by circularly polarized radiation with energy $h\nu = 578eV \pm 1.9eV$ at room temperature The error bars give the statistical error only. (For I+, I. see text).

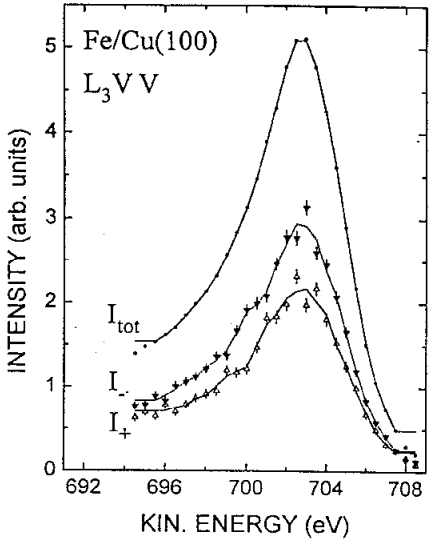

Fig. 2: Spin resolved L_3VV-Auger spectrum from Cr(100) measured at Fe/Cu(100) measured with excitation by circularly polarized radiation with energy $h\nu = 709eV \pm 2,8eV$.

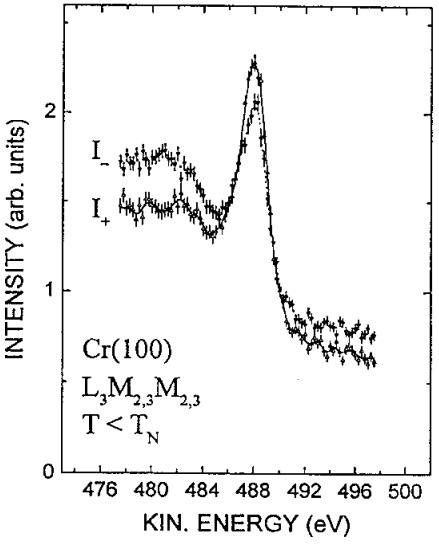

Fig. 3: Spin resolved $L_3M_{23}M_{23}$ Auger spectrum from Cr(l00) measured at room temperature (see also Fig. 1.)

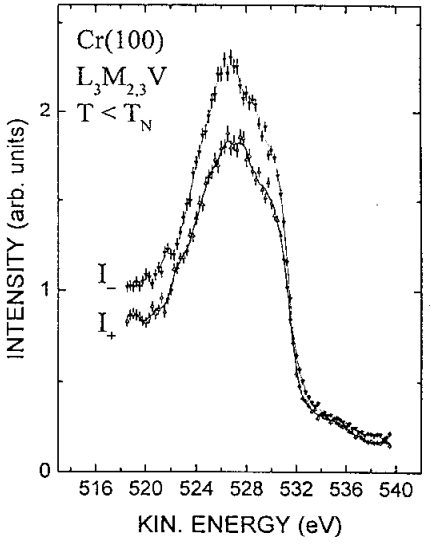

Fig. 4: Spin resolved $L_3M_{23}V$ Auger spectrum from Cr(100) measured at room temperature (see also Fig. 1.)