ESRF	**Experiment title:** Anomaly in c/a ratio of Zn under pressure : modification of the electronic density.	**Experiment number**: HE508
Beamline: ID30	**Date of experiment**: from: 05.11.98 to:08.11.98	**Date of report**: 28.02.99
Shifts: 9	**Local contact(s)**: **D. Hauserman**	*Received at ESRF:*

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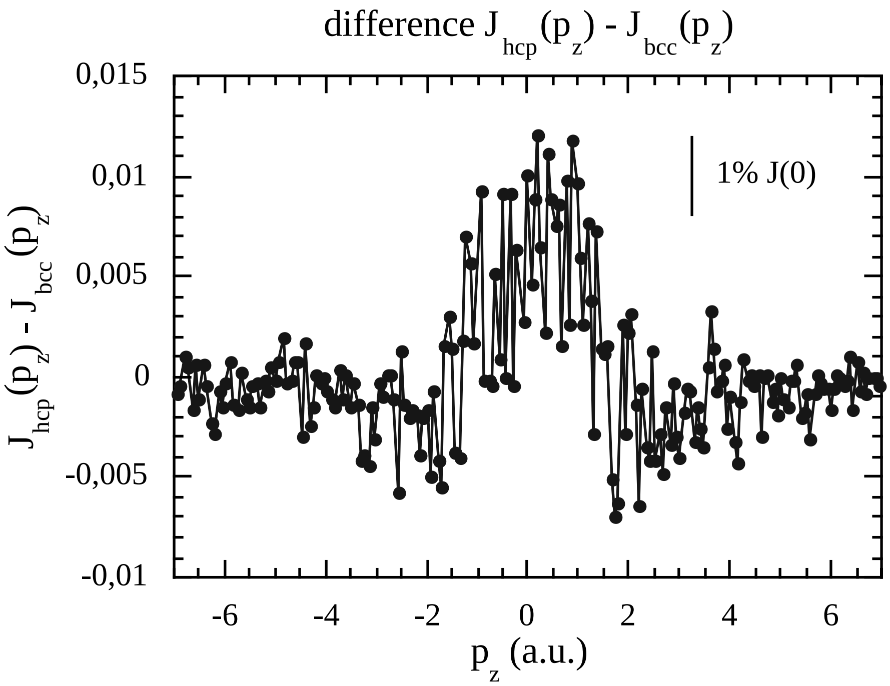
Report:

The experiment has been performed on iron and not on zinc. The reason of such a change is the following : a very recent paper [S.Klotz, M.Braden and J.M.Besson, Phys.Rev.B81, 1239, august 1998] was questionning the electronic topological transition of the Fermi surface in zinc. Since the number of shifts allocated did not allow to obtain the high statistics usually necessary for Compton scattering, we were needing a very clear electronic transition in order to follow the modification of electronic density in momentum space by Compton scattering. Zinc seemed no more to be abble to provide us such a clear modification of the electronic density.

Measurements have been performed within a collaboration with Guillaume Fiquet (ENS Lyon) whose domain of interest is focused on materials involved in earth science, such as iron which is a constituant of the earth-nucleus. Following the transition of iron under pressure from the point of view of the electronic density in momentum space, i.e. by inelastic scattering (information on the delocalized electrons : valence and conduction) can provide information usefull for the understanding of the composition of the earth nucleus.

The incident photons have been monochromatized in order to provide a 40.4 keV beam. The scattering angle was 160 degrees. Compton profiles have been measured on the backscattered photons and energy analyzed by the way of a germanium detector. We have checked the transition around 15 GPa by way of diffraction measurements : two Compton profiles, one for bcc iron and the other for hcp iron.The geometry of the experiment allowed us to shield very carefully the anvils in order to minimize the anvil contribution toinelastic scattering : photons scattered by the sample cross diamond before being detected and hence add to the iron Compton profile a profile due to inelatic scattering in diamond itself.We finally obtained that the contribution given to the Compton profile by the anvils is 50% of the total Compton profile detected. Nevertheless, if one make the difference of both profiles measured just below and above transition temperature, contribution of diamond electrons to the Compton profiles will cancel as well as experimental systematic errors.

On the figure just below is shown the difference J_{hcp} (p_z) - $J_{bcc}(p_z)$ between Compton profiles above and below the transition temperature :



First of all, one can observe that the signal difference is measurable, even with very low statistics : it is around 2% of J(0), J(0) being the value of the profile at p_z = 0 a.u.. We usually wait in such difference of profiles a signal around 1%J(0).

As a conclusion, at the step of the data analysis now reached, we can say the following :

- the fact that Compton profile is made of the contribution of every electron met by the incident photons on their path and the very small volume of sample make the very “clean” optics of the beamline ID30 and its accurate focalisation to a size of the beam around 30x40 μm^2 essential conditions for making such an experiment possible ;
- the shifts allocated have permitted to demonstrate the faisability of Compton scattering under pressure : the obtained signal is measurable, even if statistics is missing.