



**Experiment title:**

**Fermi surface radius of  $\gamma$ -Sn**

**Experiment number:**

HC-582

**Beamline: Date of Experiment:**

ID15-BL25 from: 18-APR-96 7:00 to: 23-APR-96 23:00

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**Shifts: Local contact(s):**

15

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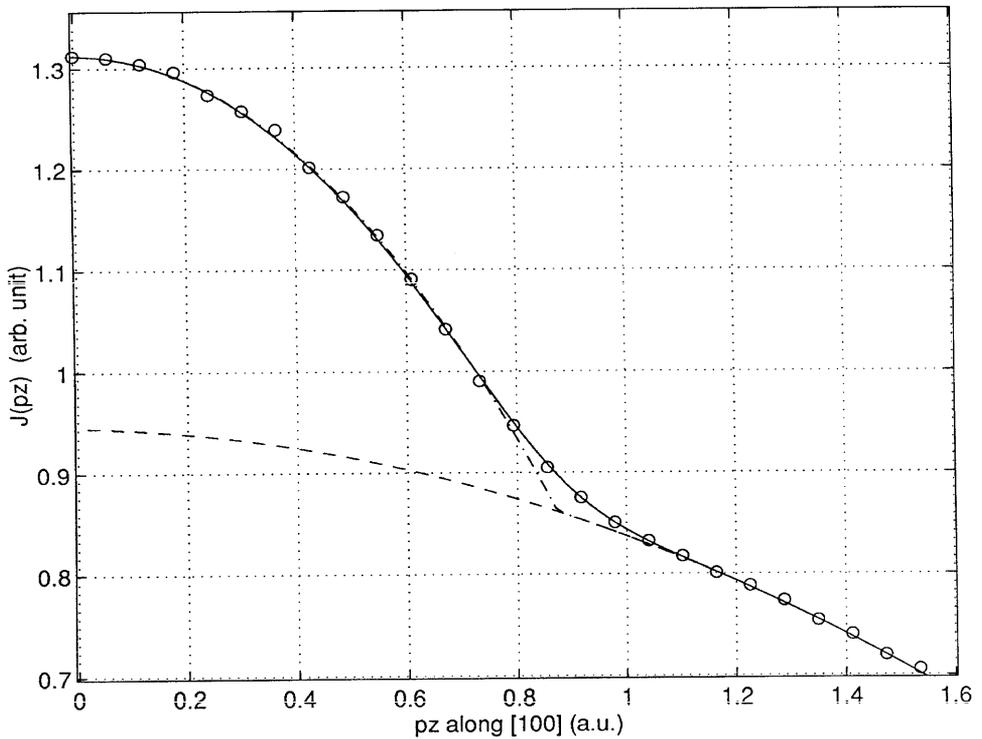
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## **Report:**

We have investigated [1] by Compton scattering the Fermi surface of  $\gamma$ -Sn, a random alloy with hexagonal structure. We have used the single crystal of  $\text{Sn}_{0.8}\text{In}_{0.2}$  previously employed for the study of the Fermi surface (FS) by positron annihilation and neutron scattering. We have measured, at room temperature, the Compton profiles in the (100) and (110) crystallographic directions with the scanning Compton spectrometer of ID15B, using a monochromatic beam of 57.8 keV. The result for (100) is shown in the figure 1.

We have extracted a precise value of the FS radius by fitting the contribution of the valence electrons with an inverted parabola describing a spherical FS. We have obtained a Fermi momentum  $p_F$  of  $0.867 \pm 0.01$  au. This value is in excellent agreement with the value of  $0.862 \pm 0.005$  au obtained by positron annihilation [2] and remove the doubt raised earlier by the value of  $0.834 \pm 0.008$  au. deduced from measurements of the Kohn anomaly in the dispersion curves measured with neutrons [3]. No significant change of  $p_F$  has been observed for the two



crystallographic direction measured.

We have carefully analyzed the smearing of the Fermi break. We find that it can be described by convolution with a gaussian function of 0.27 au. FWHM, a value significantly larger than 0.18 au., the experimental resolution of the spectrometer. We ascribe this effect to electron-electron correlations.

### References:

1. A. A. Manuel, D. Vasumathi, A. Shukla, P. Suortti, A. Yu. Rumiantsev and A. S. Ivanov, *Helvetica Phys. Acts*, to appear.
2. L. Hoffmann, B. Barbiellini, A. A. Manuel, M. Peter, A. Yu. Rurniantsev and A. S. Ivanov, *Physics B* 222,31 (1996).
3. A. S. Ivanov, A. Yu. Rumiantsev, B. Dorner, N. L. Mitrofanov and V. V. Pushkarev, *J. Phys. F* 17, 1925 (1987).