

DETECTORS

One-dimensional Microstrip Germanium Detector

The momentum resolution of the Cauchois-type spectrometer reaches 0.13 atomic units at the high-energy inelastic scattering beamline (BL08W) [1]. The spectrometer is equipped with a conventional Germanium detector with four slits in front to allow such observations as Fermi surface signatures of Sr_2RuO_4 . Now the spectrometer is to be equipped with a one-dimensional microstrip Germanium detector so as to establish a higher detection efficiency around the 80 keV X-ray region as well as a high background rejection capability [2].

There are one hundred twenty eight cathode strips that are photo-chemically formed on the Germanium crystal, the width, the interstrip, and the length of which are 300 μm , 50 μm , and 50 mm, respectively. When compared with the original system, the data-taking speed is expected to be 30 times faster in the new detector system. Owing to the high momentum resolution and the high detection efficiency, the spectrometer will yield a few dozen Compton profiles of, for example, heavy element metals or alloys, during a reasonable beamtime with a sufficient accuracy. Reconstructing the three-dimensional momentum densities from the multifold Compton profiles observed should significantly enrich knowledge about their Fermi surfaces.

The one-dimensional microstrip Germanium detector mentioned above was constructed during the second stage of the R&D program on the position-sensitive detector for the beamline. In order to handle the large number of the readout channels, four 32-parallel-input front-end hybrid-boards



Fig. 1. 128-channel microstrip Germanium detector with four 32-parallel-input front-end hybrid boards mounted.

(IDEAS, VA32c-TA32cg) were adopted as charge-sensitive pre-amplifiers and discriminators. These boards are currently controlled by a Windows-based PC data acquisition system (IDEAS, VADAQ). Because of its A/D conversion time of 30 μ sec, however, the data-taking speed achieved with the new detector system is still limited and is only four times faster than the original system. In order to improve the speed, a data acquisition system with flush ADC VME modules and a conversion time of 100 nsec maximum is currently under development.

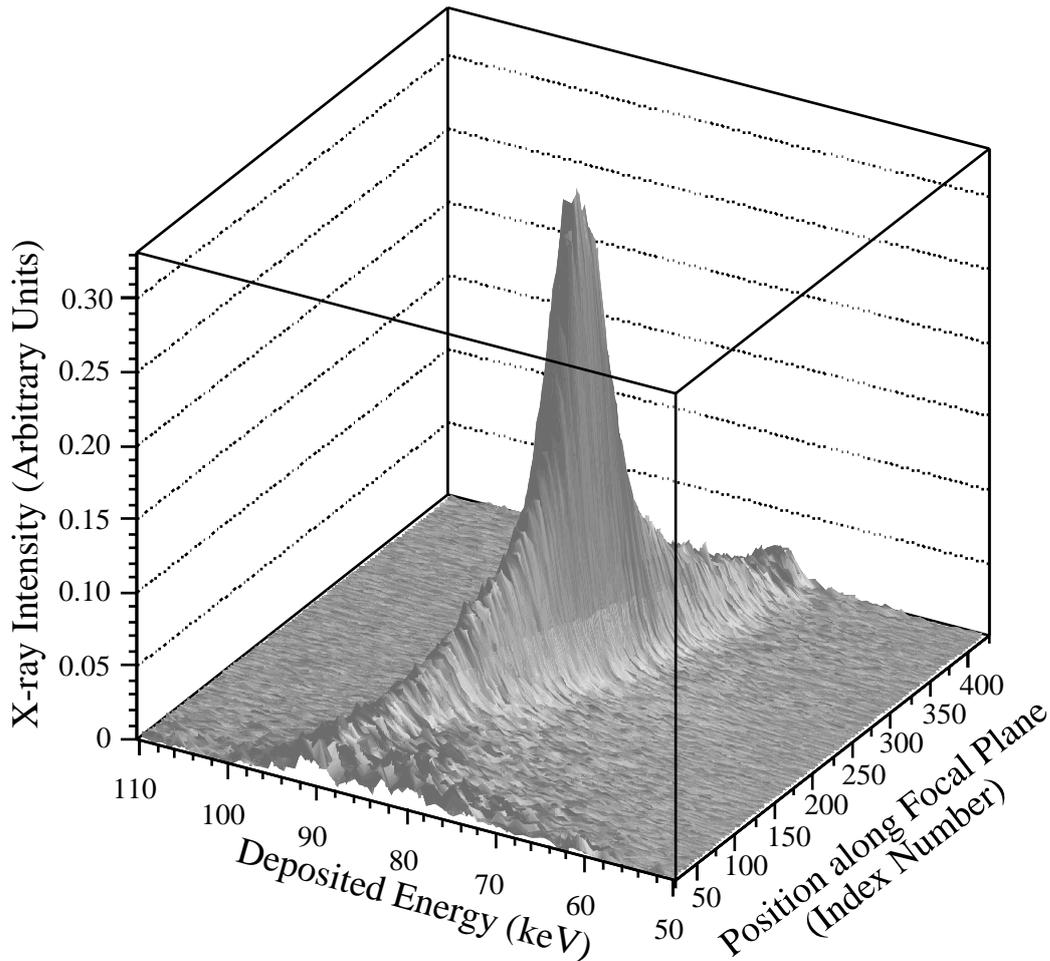


Fig. 2. X-ray energy spectra observed at focal plane with a sample of Nb in 2-D representation.

References

- [1] SPring-8 Research Frontiers 1998/1999, p. 77.
- [2] SPring-8 Research Frontiers 1998/1999, p. 98.

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