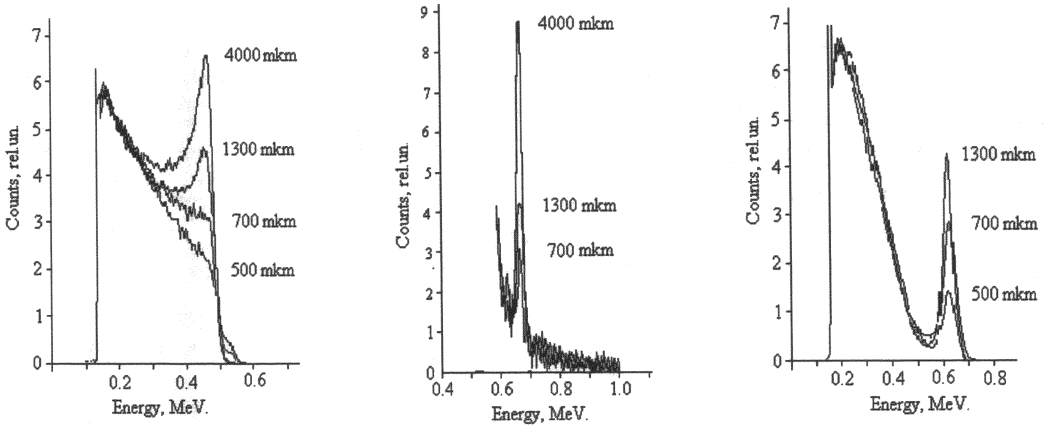
METHOD OF MEASURING THE THICKNESS OF THE MICONDUCTOR SILICON DETECTORS

S.V. ARTEMOV, G.A. RADYUK, A.A. KARAKHODZHAEV, YA.S. ABDULLAEVA, V.P. YAKUSHEV *INSTITUTE OF NUCLEAR PHYSICS, TASHKENT, UZBEKISTAN*

The barest necessity in measurement of the sensitive range thickness of the charge particles detectors exists especially for the in-beam ΔE - E - experiments with use the Li - drift Si – detectors, thickness of which can reduce with time.

The presented method is based on measurement of γ-quanta spectra and electrons from γ-source 137Cs, shapes of which depend on the thicknesses of detectors. The diapason of thicknesses of detectors which have been measured by this method makes ~50 - 6000 microns. Accuracy of the measurement changes from 20 % up to ~10 %, accordingly.

The height of the Compton peak (measurement made with the filter) at the energy ~0.5 MeV grows with thickness of the detector (irrespective of its size) respectively to the common character of a spectrum that is used for estimation of thickness of the detectors of full energy losses (fig. at the left). The intensity of the weak peak of full energy absorption on right side of a spectrum (fig. in the middle) also is proportional to thickness of the detector.



For measurement of the thickness of detectors less than ~1.5 mm there is convenient to use similarly the electron-positron spectra. The more thick detectors have higher conversion peak (fig. on the right). It should be noted that these methods of thickness measurement are relative, so it is necessary to have some basic detectors with known thickness for calibration.

At last, the transmission (totally depleted) detectors with the thicknesses less than 0.5 mm have been measured via the energy shift of the peak of the conversion electrons using the detector as a passive absorber.

Thus, the method allows one to measure the thicknesses of detectors in a wide range without necessity of beams of the accelerated charged particles.