X—Y SILICON STRIP DETECTOR TRACKING STATION

V.V.Astashin, A.D.Avrutin*, N.F.Bondar, M.B.Ishmuhametov,
S.R.Novikov, V.V.Pogulyaev*, V.M.Suvorov

* SRI GIRICOND

The X—Y tracking station has been developed for the small angle scattering experiment proposed on UNK and for application in new tracking detector investigations. The compact tracking station reported is fabricated using silicon strip detector (SSD) developed for the X—Y coordinate measurements of the high energy particles with high spatial resolution of $\sigma \approx 15\,\mu m$. Fig.1 shows a photograph of the detector mounted on a connector unit. Two mutually perpendicular silicon wafers with strip pitch $50\,\mu m$ are fixed at the window of the aluminium oxide ceramic mother board back high voltage connector sides together. The two wafers have been carefully aligned under a microscope in order to minimize software correction in the analysis. Coordinate pair (X—Y) is ortogonal with accuracy $<5'$. Every detector is connected to one side of the double sided mother board. Convertion from the detector strip pitch $50\,\mu m$ to the standard amplifier input pitch $1.25\,mm$ on the amplifier printed circuit board has been implemented by the intermediate circuit consisting of the fine-lined mother board and flexible sixteen leading polymer microcables. The ceramic mother board was required because the density of leads from the detector, was sufficiently large to required lead pitch of $50\,\mu m$ which is possible only on ceramic substrates. The detector assembly is included in a light-tight and RFI shielded small cylindrical box. The amplifier PC board is designed to house 16 two channel hybrid chips of charge

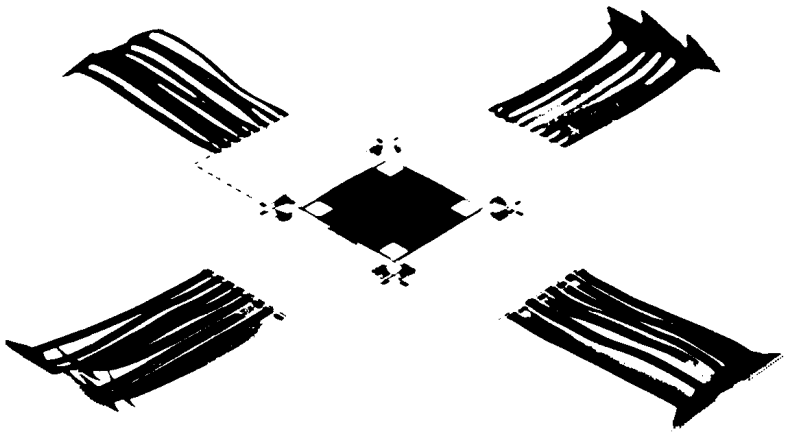

Fig.1. Photograph of detector with connector unit

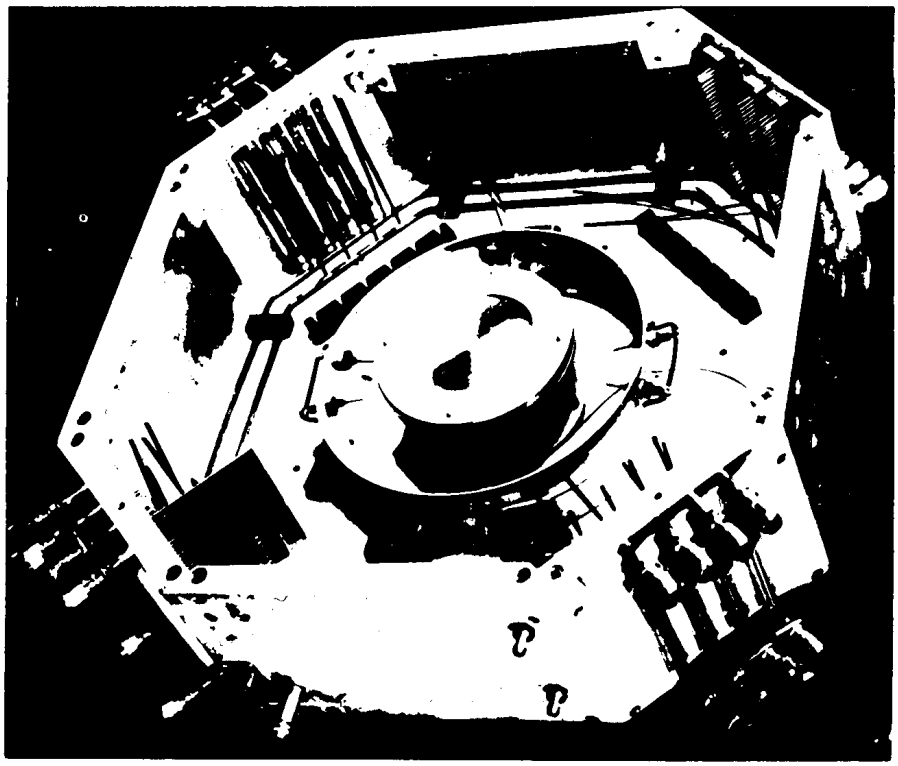

Fig.2. Photograph of station package

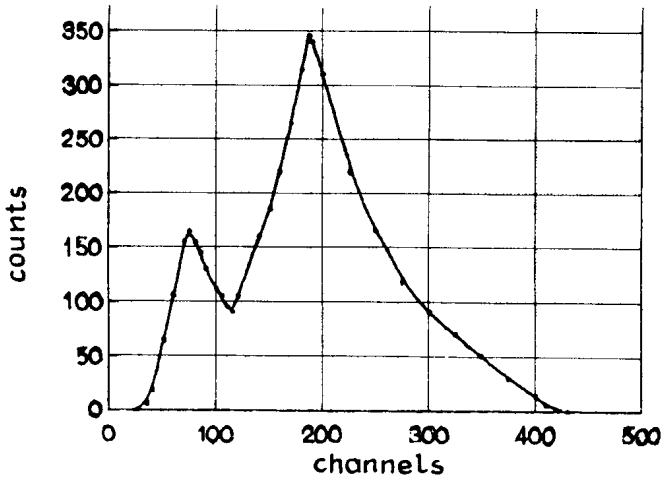

Fig.3. Single strip amplitude spectrum of ^{102}Ru

sensitive amplifiers. The mother board, microcables and PC boards maintain the power, control, calibration and output lines of the station.

The detector is housed in the center of a octogonal shape aluminium package having dimensions of $366 \times 366 \times 120\ mm^3$ (fig.2). The dimensions are limited by the output amplifier connectors. The amplifier PC boards are arranged around edges of the eight side walls of the package.

The possibility for blowing through the detector box volume noble gas is foreseen. The amplifiers are cooled by air. The design and manufacturing of the station adopted some new technical decisions. The modular construction of the station allows for the independent handling and servicing of the electronics and the SSDs.

A single strip test has been done using radiation of ^{102}Ru radiactive source. Fig.3 shows a single strip amplitude spectrum. A signal peak is clearly separated from pedestal.

Table below summarizes the basic properties of the station

1. Parameters of detector:	
— silicon	$\rho > 5\ K\Omega\ cm$;
— maximal dimension of silicon wafer	$(40 \times 40)\ mm^2$
— maximal numbers of channels	2×768;
2. Charge sensitive amplifier:	
— charge gain	$1300\ e/mV$;
— output signal width (on base)	$20\ ns$;
— equivalent input noise	$1300\ e$;
— output termination	$110 Ohm$;
— power consumption	$24\ mW/ch$;

References

1. Dvornikov B.D. at al. Preprint LNPI-1646. Leningrad. 1990. P.11.
2. Parhomenkov V.I. at al. Report of SRI, GIRIKOND, UDK 621.3.049.77. Leningrad. 1990.