## III.G2b. POSITION-SENSITIVE SILICON DETECTORS

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These detectors, which are in essence silicon MWPC's, are thin wafers of silicon on which are deposited a pattern of parallel metal strips. The technique has been shown to work[1] for a strip spacing of 300μ. A spectrometer (Fig. 1) for a hybrid emulsion experiment has been proposed[2] which demands that position resolution of ±20μ and track pair resolutions of 40μ be achievable, for the following reasons:

(1) Events must be tagged to ±20μ in emulsion for efficient finding.

(2) Detectors close to the emulsion target must resolve tracks 40μ apart to avoid serious reconstruction losses.

(3) Single-μ trigger demands a short decay path and hence a miniature spectrometer.

(4) Secondary vertices from $D^{\pm} \to \mu X$ will be reconstructed in the spectrometer as part of the event selection.

A schematic diagram of a detector is shown in Fig. 2. Prototype detectors having $(1\ \mathrm{cm})^2$ area and 40μ strip spacing (Fig. 3) are being built for Ohio State by the Semiconductor Group of the Research Services Division of Lawrence Berkeley Laboratory and should be ready for beam testing by January 1981.

It is clear that an electronic device with ±20μ resolution would have many applications beyond emulsion tagging, in improving momentum resolution of existing spectrometers, for example. One will also picture a "triple hybrid" system consisting of a small, erasable photographically-recorded vertex detector with resolution approximately a few microns, a conventional drift-chamber spectrometer with ~100μ resolution, and an interface of silicon detectors to select a clean sample of relatively long-lived charm decays electronically.

Finally, it should be emphasized that the ultimate resolution limit of the strip technique is not known, and that it has been suggested[3] that position resolutions ~1μ may eventually be obtained. Should this be the case, an active target using these electronically-recorded devices instsead of emulsion is an intriguing possibility.

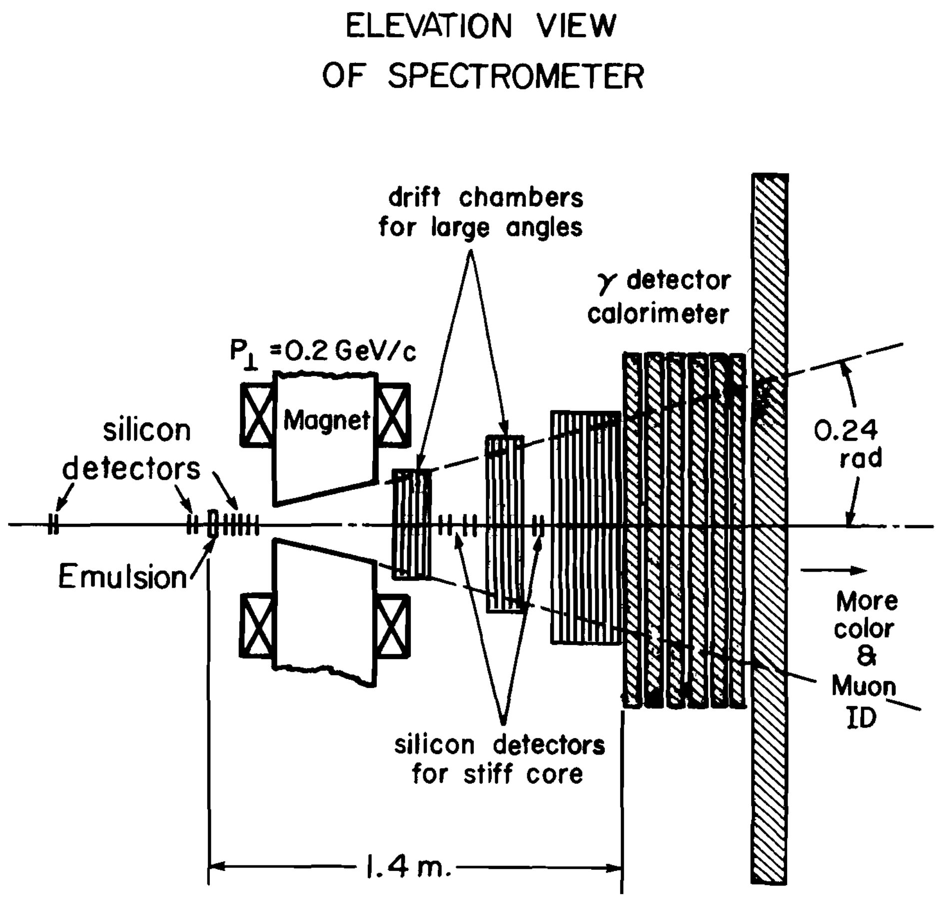


Fig. 1. Elevation View of Spectrometer.

Short (1.2 m to $\gamma$ detector)
Large aperture ($\pm$ 0.24 rad.)
High resolution (resolves tracks $\delta M/M \sim 1\ 1/2\%$)
Neutral detection (half of E-531 decays have $\pi^0$, an additional 1/3 have $K^0$, $\Lambda^0$)

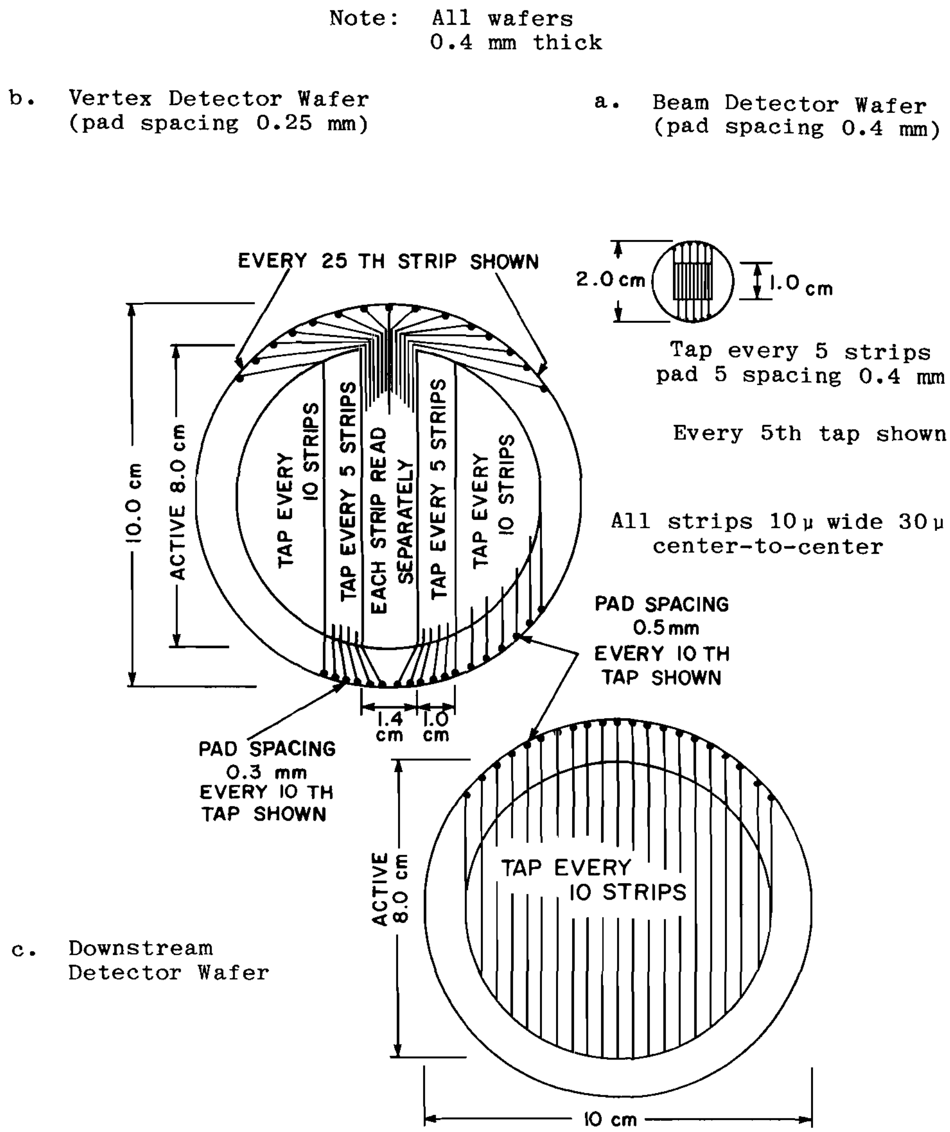


Fig. 2. Position-sensitive silicon detector.

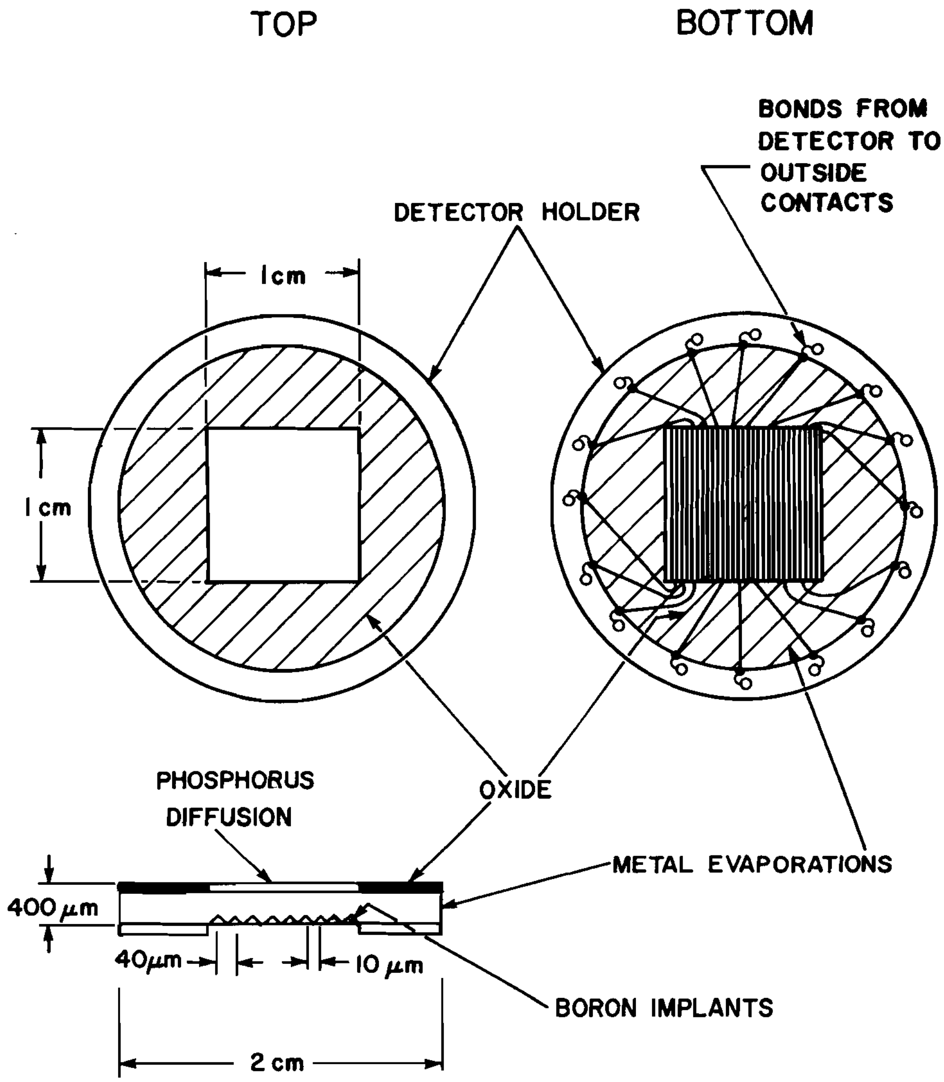


Fig. 3. Cross section of detector.

## References

1. S. R. Amendolia et al., A Multi-Electrode Silicon Detector for High Energy Physics Experiments, PISA 80-2, 1980.

2. N. Ushida et al., Fermi National Accelerator Laboratory Proposal 653, 1980.

3. V. Rodeka, Semiconductor Detectors in High Energy Physics, talk given at Brookhaven National Laboratory conference, December 1979.