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Silicon Strip Detectors in Physics: From Nuclear Physics to Space Applications

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Semiconductor detectors are a popular choice in many areas of physics because of their flexibility. One possible technology of semiconductor detectors is silicon strip detectors (SSDs): by means of segmenting readout electrodes in the form of thin, long strips, it is possible to measure several properties of charged particles, keeping under control the number of channels.

The ability to finely tune the parameters of the silicon construction, such as its area, thickness, and number/width of strips, in combination with the use of low noise, high dynamic range readout electronics, allows for easy adaptability to different situations. The resulting detectors can achieve very high spatial resolutions, ranging from tens of micrometers down to less than 5 micrometers, with good charge resolution.

In this work, we provide an overview of the results that can be achieved with strip segmented detectors in a wide range of applications. These include tracking low energy charged particles for nuclear fragmentation momentum reconstruction and tracking and particle identification for space applications. Both applications have in common the need to measure the Z charge of the impinging particle with great accuracy, with the addition of a strictly limited power consumption, especially for space applications. Results are based on test performed with different particles (p, ions) and different energies in the range from few tens of MeV up to hundreds GeV.

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