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Diamond Particle Detectors

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Resolution Studies of Single-Crystal Diamond Pixel Detectors

Diamond Pixel Detectors

PSI46 Pixel Readout Chip

The PSI46 chip consists of an array of 52 x 80 pixels with a pitch of 150 µm x 100 µm. Each pixel features individual pixel threshold/mask settings, full analog readout of the pixel hit address and charge deposit, as well as a column-multiplicity signal (known as the Fast-OR), which indicates the number of double columns that had pixels over threshold in each bunch crossing. Fast-OR signals are read at the full bunch-crossing rate of 40 MHz clock, while the full pixel information, consisting of the row and column addresses and the pulse heights of all pixels over threshold, is read out at a lower rate of a few kHz.

Single-Crystal CVD Diamond

- Ideal for detectors which are exposed to high radiation environments, such as those found in modern high energy physics experiments.
- Preferred sensor material rather than polycrystalline diamond since the pulse height distribution of single crystal diamond is large and well separated from zero, ensuring that any efficiency changes due to threshold drifts will be small.

Spatial Resolution

The spatial resolution was measured using a silicon microstrip telescope provided by the University of Zurich, which was inserted into a 10 GeV/c proton beam at the CERN PS. The x and y residuals for 2-hit clusters. The x and y residuals for 2-hit clusters. The x and y residuals for 2-hit clusters. The x and y residuals for 2-hit clusters. The x and y residuals for 2-hit clusters.

CMS Pixel Luminosity Telescope (PLT)

The PLT is a dedicated luminosity monitor for CMS based on single-crystal diamond pixel sensors. It consists of two arrays of eight small-angle telescopes situated one on each end of the CMS experiment at CERN.