

Strip defect recognition in electrical tests of silicon microstrip sensors

This contribution describes the measurement procedures and data analysis of AC-coupled double-sided silicon microstrip sensors with polysilicon resistor biasing.

The most thorough test of a strip sensor is an electrical measurement of all strips of the sensor; the measured observables include e.g. the strip's current and the capacitance. These measurements are performed to find defective strips, e.g. broken capacitors (pinholes) or implant shorts between two adjacent strips.

When a strip has a defect, its observables will show a deviation from the "typical value". To recognize and quantify certain defects, it is necessary to determine these typical values, i.e. the values the observables would have without the defect. Piecewise least-median-of-squares (LMS) linear fits are applied to determine these "would-be" values of the observables. An LMS fit is robust against outliers, i.e. it ignores the observable values of defective strips. Knowing the typical values allows to recognize, distinguish and quantify a whole range of strip defects.

This contribution explains how the various defects appear in the data, how to distinguish them from similar defect signatures, how to resolve correlations between signatures, and in which order the defects can be recognized.

The analysis has been used to find strip defects on 37 double-sided trapezoidal microstrip sensors for the Belle II Silicon Vertex Detector, which have been measured at the Institute of High Energy Physics Vienna.

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