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Development of silicon strip sensors for future HEP applications on 8-inch wafers

Silicon sensors are widely used in HEP and for medical applications like for imaging techniques in hadron therapy. At the moment there is only one high volume industrial producer. In view of widening the market, we are working to establish a second high-quality and high-throughput European vendor.

We are developing silicon strip sensors with the European semiconductor company Infineon Technologies capable of supplying sensors in a high volume production and industrial environment. The sensors are AC-coupled and produced on high resistive 200 μm thick 8-inch wafers with p-type base material.

Two batches have been produced where several process variations have been established in order to find the optimal process parameters. An extensive and comprehensive sensor characterization campaign has been carried out. The electrical properties of the sensors were investigated providing insights into the overall quality. Issues observed for sensors of the first batch could be determined by the electrical characterization and were communicated to the manufacturer. This resulted in an improved production for sensors of the second batch where several process parameters have been optimized. Furthermore, measurements of standard but also new types of test structures were performed giving insights into the process quality. Proton as well as neutron irradiation studies to fluences of up to 1E16 neq cm^-2 were conducted and the sensors properties after irradiation investigated. Finally, a beam test was carried out at DESY to investigate the performance of the sensors in an electron beam using an ALiBaVa-based read out.

Results of the described characterization campaign will be presented.

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