

Laboratory Measurements of Stitched Passive CMOS Strip Sensors

Tuesday 16 February 2021 10:55 (20 minutes)

Upgrades to existing particle physics detectors as well as future experiments in high-energy physics will continue to employ silicon sensors as central tracking elements, with an ever larger area covered by the silicon sensors. Already now, the sensors are a main cost driver. In addition, they are available from only a very small number of manufacturers in the quantities required. Therefore, detector technologies and designs that are cost-effective and can be realised through established commercial industrial production processes are becoming more and more relevant. One important group of candidates are sensors realised in CMOS technology. Typically, CMOS foundries are equipped for producing die sizes that are much smaller than the full size strip sensors in production e.g. for LHC experiments today. In order to obtain large sensors, several neighbouring reticles have to be connected in a process known as stitching.

For this contribution, passive strip sensors were designed and developed in a p-CMOS technology including stitching and produced by a European manufacturer. Following initial electrical characterisation on a probe station, the sensors were tested in the laboratory with Sr-90 sources and IR-lasers. The sensors comprise three different flavours of strip sensors fabricated on a 150 μm thick wafer with the passive p-CMOS 150 nm process. Our sensors have a strip length of up to 4 cm, formed by stitching of up to five individual reticles. One key area of results to be presented is position-dependent measurements to understand the performance of the sensors.

In this context, we also evaluate the impact of stitching on the functionality of the sensors. Based on our results, we are able to demonstrate that the stitching does not show any negative effect on the sensor performance, and, hence, the stitching can be considered successful.

Primary authors: PARZEFALL, Ulrich (Albert Ludwigs Universitaet Freiburg (DE)); BASELGA, Marta (KIT - Karlsruhe Institute of Technology (DE)); DIEHL, Leena (Albert-Ludwigs-Universitaet Freiburg (DE)); GREGOR, Ingrid-Maria (DESY & Bonn University); HEMPEREK, Tomasz (University of Bonn (DE)); HONIG, Jan Cedric (Albert Ludwigs Universitaet Freiburg (DE)); MÄGDEFESSEL, Sven (University Freiburg); RODRIGUEZ RODRIGUEZ, Arturo (Albert Ludwigs Universitaet Freiburg (DE)); SHARMA, Surabhi (Deutsches Elektronen-Synchrotron (DE)); SPERLICH, Dennis (Albert Ludwigs Universitaet Freiburg (DE)); WANG, Tianyang (University of Bonn (DE)); WIIK-FUCHS, Liv (Albert Ludwigs Universitaet Freiburg (DE))

Presenters: PARZEFALL, Ulrich (Albert Ludwigs Universitaet Freiburg (DE)); RODRIGUEZ RODRIGUEZ, Arturo (Albert Ludwigs Universitaet Freiburg (DE))

Session Classification: Session 2: Planar Sensors

Track Classification: Planar sensors