

Master student project on the study of edgeless sensors

Introduction

The use of slim-edge silicon sensors to tile small units together in order to achieve a detector with a large active area with limited seams has always been an aim in the design of large detectors. Up till now, this was not possible due to the negative effects of dicing the silicon on the active area, which are usually countered with guard rings. With the advent of techniques to dice the sensor wafers with reduced damage, these guard rings might not be necessary anymore and we can make sensors with smaller inactive area around the active pixel matrix.

The project

In this project we have different types of silicon sensors to be tested both at Nikhef with various set-ups such as a laser set-up and X-ray set-up, and at test beam experiments e.g. at DESY. We need to obtain information about the performance of the edge pixels relative to the pixels in the centre of the matrix. Therefore we need to reconstruct the effective volume of the pixels and the electric field configuration.

Results from the measurements will be used to adapt the model of the sensor in a device simulation package (TCAD)

The material

The sensors we have available to test are bump-bonded to Timpix read-out chips and are of the following types; n-on-p, n-on-n and p-on-n and of various thicknesses; 100 μm , 200 μm , 300 μm and 500 μm , with different structures at the edge giving us the opportunity to map a large parameter space in options, which might be of interest for different applications like tracking in a vertex detector for future LHC experiments or for X-ray imaging detectors.