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## Simulation of small pixel LGAD's, PixeLGADs.

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Low Gain Avalanche Detectors (LGAD) are part of family of Avalanche Photodiodes but have only small gain of an order of magnitude. LGAD's have been shown to have a very fast response time, order of picoseconds, which can make them useful in many applications, including concurrent excellent time and position resolution tracking for particle physics and synchrotron applications.

In this work we present results of TCAD detector simulations. Synopsis TCAD software was employed to perform fabrication process simulations, electrical properties modelling, detector response to incident radiation and influence of pixel size on the effective fill factor. Effective fill factor is the fraction of pixel which shows gain. Several devices with differing pixel periphery's were studied to look at the effective fill factor as a function of pixel size. The effective fill factor was shown to have a large dependence on pixel periphery and size.

LGAD's have been fabricated at Micron Semiconductor for variety of pixel size, down to 55um. Limited results show this same dependence on pixel size and periphery design.

Maximising the effective fill factor is essential for devices with a pitch of 55um, such as those used with the Timepix3 chip. First results of the electrical performance of such devices are presented.

This work is done in collaboration with the University of Manchester, and AGH in Krakow working towards the new Velopix chip for the LHCb upgrade.

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