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Development and First Parametric Characterization of High Fill-Factor Segmented LGADs with Trench Isolation.

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Low gain avalanche detectors (LGADs) are currently the state-of-the-art silicon detectors for timing application in HEP experiments. One limitation of the current technology is the relatively wide dead region present between pixels (40-60 μm), which reduces the effective fill-factor and the efficiency of the sensors and might limit some applications in which finely segmented detectors are required.

In this work, we will present the new trench-isolated LGAD sensors developed by FBK, in which the standard JTE and isolation structures are replaced by narrow trenches. This new technology has first been investigated by means of TCAD simulations, which enabled us to identify some promising solutions for the pixel border structures and showed that trench isolation could potentially reduce the width of the inter-pixel dead area to less than 10 μm .

Following the indications obtained by TCAD simulations, an R&D batch has recently been produced, in which a wide variety of structures and process splits were implemented. During the workshop, we will present a preliminary parametric characterization of the batch, which shows that the pixels are functional and have the expected gain behaviour.

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