

Development of Low Gain Avalanche Detectors at Teledyne e2v

Thursday 3 March 2022 11:50 (20 minutes)

Low Gain Avalanche Detectors (LGADs) are a novel silicon sensor technology being developed to design full 4D trackers able to measure precisely both spatial and temporal coordinates. The first deployment of this technology will be in the ATLAS and CMS timing layers at the High Luminosity LHC where, by adding fast timing information to each crossing track, they will allow to better separate overlapping events.

Further developments of this technology will be pursued in anticipation of their use at future collider experiments where 4D tracking detector systems will be needed to cope with an unprecedented number of pile-up and beam background events through the addition of precise timing information to each point along the track. In this context, the University of Birmingham, University of Oxford, Rutherford Appleton Laboratory and Open University are working with the UK foundry Teledyne e2v to establish their processing line for LGAD production. The addition of Te2v to the currently established LGAD manufacturers will significantly increase LGAD production volume capabilities.

This talk will present updates on the ongoing characterisation of the first batch of LGAD sensors produced by Te2v, designed to match the specifications of the ATLAS and CMS timing layers. IV and CV measurements have been completed on a set of wafers that allows to compare the performance of the devices for different energy and dose of the gain layer implant. Diced structures from one of the wafers have undergone full characterisation including gain and timing measurements. We will present results from a set of un-irradiated devices and possibly first results after irradiation. Studies are also ongoing to evaluate the jitter component of the timing resolution. Finally, we will present plans for the design of the structures for the second batch of LGAD production at Te2v.

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Session Classification: LGAD

Track Classification: LGAD