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Recent results of the carbonated USTC-IME LGADs and fabrication of the AC-LGADs at USTC NRFC

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The Low-Gain Avalanche Detector (LGAD) with timing resolution better than 35(70) ps before (after) irradiation is the key technology that has been studied by many RD50 institutes and is going to be used in the ATLAS HGTD upgrade. The University of Science and Technology of China (USTC) has been developing LGAD sensors with the Institute of Microelectronics of the Chinese Academy of Sciences (IME) and the Nano Research and Fabrication Center (NRFC) of USTC. The prototypes of DC and AC coupled LGADs have been produced. The recent development focused on carbon diffusion and large array fabrication. The prototypes have been tested by several methods including IV/CV, beta-scope, laser-TCT as well as the electron/hadron beam test. The irradiation hardness is tested with the samples irradiated by reactor neutrons at the JSI. The c -factors are extracted and compared. The uniformity is characterized both by the on-wafer test and 5x5/15x15 array probe-card test. The latest results have shown that the prototypes can provide enough charge ($>4fC$) and good timing resolution ($<70ps$) after $2.5E15$ neq/cm² and meet the specification of the HGTD upgrade. The novel structure LGADs fabricated by the NRFC LGADs show good performance with a yield at an acceptable level.

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