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Characterization of AC-LGAD sensors with 120 GeV proton beam

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Introducción

Good spatial and temporal resolutions are desirable characteristics for new generation detectors. A single device capable of reaching simultaneously a position resolution on the order of a few microns and time in tens of picoseconds is a goal that will improve reconstruction of charged particle tracks and particle identification. Current detectors have reached this timing performance [2] but with imprecise spatial information. A sensor with both precise timing and precise position could be used in future detectors' upgrades such as the Electron Ion Collider (EIC) or the High-Luminosity LHC (HL-LHC), and could be of special interest in the study of minimum ionizing particles (MIPs), among others. A set of silicon detectors named AC-Low Gain Avalanche Detectors (AC-LGADs)[3] were developed by Brookhaven National Laboratory (BNL) and Hamamatsu Photonics K.K. (HPK) with different dimensions and using strips and pads for AC coupling, respectively. The samples were tested in the Fermilab Test Beam Facility (FTBF) with a 120 GeV proton beam. The promising results show simultaneous position resolution of around 12 μm and time resolution of 30 ps. Results will be presented for four BNL sensors and two HPK sensors to illustrate their qualities. These results and a description of special features such as the cross-talk and charge sharing effects are presented along with recommendations and comments for future samples in order to refine their production and achieve their best performance.

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