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Delay-Line Readout Method Research

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Delay-Line readout method is suitable for GEM detector in low-rate environment. According to the electric circuit model of delay-line and the output signal of GEM detector, we construct a full simulation model of delay-line readout system, containing delay-line readout PCB, Amplifier, Constant-fraction discriminator and Time-Digital converter. Three kinds of delay-lines, with the per cell time delay of 300ps, 600ps and 800ps in ideal condition, are selected. The corresponding test results are 360.8ps/cell, 458.6ps/cell and 654.7ps/cell in real case. The difference between experiments and design show that the affection of parasitical parameters of PCB route must be considered. By using the software of 2D Extractor (Ansoft Corporation), the time delay of the PCB route is calculated and a new electric circuit model of our delay-line PCB is developed. The simulation results of the new model are 353.1ps/cell, 454.9ps/cell and 656.8ps/cell, which are in good agreement with experiment. A GEM detector with 150um width readout stripes in 400um pitch, coupled with the Delay-line readout PCB (360.8ps/cell), is tested with an 8keV X-ray source. The position resolution of 240um is obtained.

Author:Dr ZHOU, YiPresenter:Dr ZHOU, YiSession Classification:Poster Session 2 - PPE & Nuclear

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