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A phototype Readout ASIC for the MTPC detector at CSNS Back-n

High-precision energy measurement is required in the readout systems for the Multi-purpose Time Projection Chambers (MTPC) at China Spallation Neutron Source (CSNS) back-streaming white neutron source (Back-n). Considering the size and power consumption limitation of the readout electronics, a new prototype front-end ASIC was designed. The prototype ASIC integrates 16 readout channels, each comprising a Charge Sensitive Amplifier (CSA), a Pole-Zero Cancellation (PZC), two bridged-T filters, a baseline holder (BLH), and a fully differential output buffer. The BLH circuit is added to assure stabilization of the output baseline with temperature drift and reduce the potential noise or crosstalk from the reference path. It provides selectable dynamic ranges of 2 pC and 10 pC, programmable peaking time from 110 ns to 1000 ns, and an adjustable output common-mode voltage from 0.7 V to 1.25 V. The ASIC has already been tested and all the results meet the requirements. In the case of 100 pF input capacitance, 10 pC dynamic range, and 1000 ns peaking time, it features a maximum integral non-linearity (INL) of 0.91% and an Equivalent Noise Charge (ENC) of 3.1 fC. Besides, the dead time of this ASIC is less than 5 μ s.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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