

Low Cost front-end readout electronic for instrumentation used in Neutron experiments.

ABSTRACT

In the field of material characterization, the neutron scattering technique is found to be useful in so many applications. This technique requires a position sensitive neutron detector (PSND) and their front-end readouts (FER) electronic to detect the position of neutron interactions. Normally, the PSND is designed for specific applications and has unique technical specifications. Therefore, it requires a customised electronic FER to match its specifications. Furthermore, a large active area requires a large number of FER electronic and, therefore, there is, also, an increased development cost. This paper presents a simple and low-cost design for FER electronic which consists of an eight channels preamplifier-shaper suitable for instrumentation used in neutron experiments. This FER was built entirely with low-noise FET-input operational amplifier (Op-amp) and passive components. The development cost is around U.S. \$50/channel. Results have shown that it is capable of accepting a wide dynamic range input charge (20 to 600 fC) with an excellent output linearity (nonlinearity < 1%). It has a good equivalent noise charge (ENC) with a performance average of 2113 e⁻ and is less sensitive to input capacitance variation (24 e⁻/pF).

Keyword: Low-cost; Front-end readout; Preamplifier; Shaper; Neutron experiments