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Noise Analysis of Current Sensitive Preamplifiers and Influence on Energy Resolution of NaI:Tl Detector System

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Current Sensitive Preamplifiers (CSPs) are widely used in front-end electronics in DAQ (Data Acquisition System). The optimization of energy resolution requires front-end electronics with low noise and suitable gain, bandwidth, etc. We define the noise normalization factor containing noise, gain of CSPs and integrated gate of pulse. The linear model between energy resolution and noise normalization factor are set up. To verify the model, different CSPs with commercial Operational Amplifiers (OP AMPs) are designed and coupled with PhotoMultiplier Tubes (PMTs) in NaI:Tl detector. The experimental results show that the energy resolution and noise normalization factor are linearly conformable, and the goodness of fit R^2 is ~ 0.89 . The paper can provide reference for optimization on energy resolution by CSP design based on commercial OP AMPs.

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