

基于双端读出探测器的磁兼容小动物 PET 系统

Tuesday, 16 October 2018 10:30 (15 minutes)

A MRI compatible small animal PET insert with high spatial resolution, high sensitivity and long axial field of view is being developed with depth encoding detectors by using dual-ended readout of pixelated LYSO arrays with SiPM arrays. The scanner consists of 4 detector ring and with 12 detector modules per ring. The ring diameter of the scanner is 111 mm and the axial field of view is 106 mm. The LYSO arrays have 23×23 elements and with a crystal size of $1.0 \times 1.0 \times 20$ mm³. The outer dimension of each LYSO array is $24.6 \times 24.6 \times 20$ mm³. The LYSO arrays are read out by two 8×8 Hamamatsu SiPM arrays placed at opposite ends. The size of each SiPM pixel is 3×3 mm² and the gap between pixels is 0.2 mm. The active area of each SiPM array is 25.4×25.4 mm². The 64 pixels of a SiPM array are read out with a resistance network circuit to reduce the number of signals from 64 to 4. The signal processing electronics consists of 12 singles processing units (SPU) with each processing 32 channel signals, a coincidence processing unit (CPU), a system clock and a synchronizing board and power supply boards. The performance of one detector module is measured by using NIM electronics. All except the edge crystals can be resolved from the flood histogram. A DOI resolution of 2.36 mm was obtained for events of $E > 350$ keV if a crystal based DOI calibration is used. The energy resolution of the detector is 18.9%. The detectors was also measured by using the SPU and similar flood histogram was obtained. In the next step we will assemble the scanner, commence system debugging and perform imaging studies.

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Session Classification: 第一分会场 (2)

Track Classification: 核探测器及其应用的研究成果