Contribution ID: **173**   Type: **Oral Presentation**

MicroPEPT: A step towards hybrid PEPT detectors

Thursday, 7 July 2022 15:15 (15 minutes)

Positron Emission Particle Tracking (PEPT) measures the trajectory of a freely moving radioactive tracer particle, and enables the non-invasive study of dynamic systems from engineering to medicine. PEPT performance is limited by the activity achievable in radiolabelling a suitable tracer particle, and the fixed geometry of conventional detector systems. In investigating phenomena on micro-scales, recent development of advanced instrumentation has been required to offset these limitations.

A modular bismuth germanate oxide (BGO) scintillator array, with detection modules derived from CTI/Siemens PET scanners, has been constructed and coupled to a recently developed data acquisition system. This array consists of 1024 detector elements (512 pixels of 6.75 x 6.25 x 30 mm and 512 pixels of 4.1 x 4.0 x 30 mm) giving a field of view of 150 mm x 196 mm x 101 mm. Detector efficiency, spatial resolution, timing resolution, and deadtime parameters for this system were determined, informing on the overall system performance and compatibility of different detection modules. Sensitivity profiles were measured and compared to numerical model validation demonstrating reasonable agreement. These results indicate the applicability of modular BGO scintillator arrays in addressing small scale flow phenomena, and lead the direction of future work in combining the BGO system with a pair of high resolution pixelated semiconductor detectors for the first time.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

Msc

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Session Classification: Applied Physics

Track Classification: Track F - Applied Physics