Contribution ID: **256**   Type: **Invited talk**

Development of Large-Area Imaging Spectrometer Systems for Future Clinical Spectral SPECT Imaging Applications

Monday 1 July 2024 09:30 (30 minutes)

In recent years, there have been tremendous progress in novel theragnostic applications, in which one combines traditional diagnosis procedures and therapeutic/surgical interventions for treating cancer, cardiovascular diseases and brain disorders. These procedures would benefit from the next generation of clinical imaging techniques that would allow simultaneous multifaceted assessment of the diseases, following the delivery of the therapeutics, and staging the response to the interventions.

To facilitate these clinical needs, we have developed a generic platform for large-area, high-performance gamma-ray imaging spectrometers based on CZT(CdZnTe) detector material and the HEXIECT ASIC developed at the STFC, UK, and modular readout electronics. As we will experimentally demonstrate, these detectors could offer sub-200 μm spatial resolution, sub-2.5 keV energy resolution, a reasonable count rate capability, over large detection areas of above 4000 cm^2. These detectors would not only offer an exquisite imaging performance, but also allow us to differentiate the gamma-ray emissions from most used radioisotopes for diagnostic (e.g., Tl-209, Tc-99m, In-111, I-123) and therapeutic (e.g., Lu-177, Ac-225 and Ra-223) purposes.

Based on the HEXITEC/CZT detector platform, we have developed a series of high-performance preclinical SPECT system and clinical SPECT systems, including the Alpha-SPECT-mini and whole-body clinical Alpha-SPECT systems for imaging alpha-Radiopharmaceutical (α-RPT) therapeutic alpha-emitters, and the Neuro-Scope system for multi-function microscopic study of brain functions.

In this presentation, we will present the status on our development of the HEXIECT/CZT detector platform, the pre-clinical and clinical imaging systems, and initial experimental results on in-vivo imaging of α-RPT, in which we can follow the re-distribution of Ac-225 and its daughters in mice.

Authors: YANG, Can (Department of Nuclear, Plasma, and Radiological Engineering); ZANNONI, Elena (Department of Nuclear, Plasma, and Radiological Engineering, & Department of Mechanical Engineering, University of Taxes, Austin); MENG, Ling-Jian (University of Illinois at Urbana-Champaign); VERHOEVEN, Marcus (Aspect Systems GmbH, Dresden, Germany); WILSON, Matt (Science and Technology Facility Council (STFC), UK); MANDOT, Shubham (Department of Nuclear, Plasma, and Radiological Engineering)

Presenter: ZANNONI, Elena (Department of Nuclear, Plasma, and Radiological Engineering, & Department of Mechanical Engineering, University of Taxes, Austin)

Session Classification: Detector Systems