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(UG) TIIGR: A Therapeutic Isotope Imager with Gamma Rays

Wednesday 29 May 2024 14:45 (15 minutes)

Targeted Alpha Therapy (TAT) is a mode of cancer treatment in which alpha-emitting radionuclides attached to selective delivery molecules are injected into patients to preferentially kill cancer cells, a promising candidate radionuclide is actinium-225. Due to the relatively low radio-activities used (MBq's) in this treatment and the absence of positron emissions in actinium-225's decay chain, well established methods such as SPECT or PET are not suitable for imaging in-vivo dose distributions. To address this issue, we are investigating the use of a cylindrical single volume Compton camera for imaging patients undergoing targeted alpha therapy. Using the kinematics of Compton scattering, Compton cameras can determine the energies and directions of incident gamma rays without mechanical collimation. This allows the detector to have a relatively high sensitivity so that more of the scarce gamma emissions from a TAT radiopharmaceutical can be captured. By performing Monte Carlo simulations with Geant4 and using our implementation of a List-Mode Ordered Subset Expectation Maximisation (LM-OSEM) algorithm for image reconstruction, we present the assessment of different scintillator materials and geometries to demonstrate the feasibility of such a device.

Keyword-1

Targeted radiation therapy

Keyword-2

Nuclear imaging

Keyword-3

Author: MACKAY, Logan (TRIUMF / University of Edinburgh)

Co-authors: Dr SHER, Aleksey (TRIUMF); HOEHR, Cornelia; RETIERE, Fabrice; RADCHENKO, Valery (TRIUMF); FEDORKO, Wojtek (TRIUMF)

Presenter: MACKAY, Logan (TRIUMF / University of Edinburgh)

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