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## Characterization of an In-Beam PET prototype for Heavy-Ion Cancer Therapy Device

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Heavy-Ion Cancer Therapy Device (HICTD) developed by the Institute of Modern Physics of the Chinese Academy of Sciences has been equipped for clinical application. The positron emission tomography (PET) located on the beam line, called In-Beam PET, is a key detector in HICTD, which is employed for monitoring during heavy-ion therapy beta+ emitters like  $^{11}\text{C}$ ,  $^{15}\text{O}$ ,  $^{10}\text{C}$  are generated in irradiated tissues by nuclear reactions. The measurement of the time, energy and position information of this activity, immediately after patient irradiation, can lead to information on the effective delivered dose. The prototype is constructed with a Dual-Head Planar-Type detector consisting of 2 detection units. Each unit is made up of a position sensitive photomultiplier coupled to a square matrix of same size of LYSO scintillating crystals ( $2 \times 2 \times 15 \text{ mm}^3$  pixel dimensions). Four signals from each detector are acquired through a dedicated readout electronic system that performs signal amplification, shaping, A/D conversion and area calculation in digital signal processing domain. The In-Beam PET prototype has been characterized in the lab, energy and time resolutions were measured using a  $^{22}\text{Na}$  radioactive source. The validation of the prototype was performed using different energy ion-beam at the HICTD beam line of PMMA phantoms. A good correlation between the position of the activity distal edge and the thickness of the beam range shifter was found along the axial direction.

### Minioral

Yes

### IEEE Member

No

### Are you a student?

Yes

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