

## Time-of-Flight PET for Proton Therapy

In-beam PET imaging could herald a new era of more accurate and efficient dose in proton beam treatments with the potential to greatly improve patient outcomes. Such advancements would be even more important in the not-yet-understood but highly promising ultra-high dose and dose rate (FLASH) modality. In this talk we present our efforts to demonstrate the benefits of in-beam PET imaging. Our Time-of-Flight PET for Proton Therapy (TPPT) project focuses on a novel PET scanner designed and built to provide feedback during proton therapy treatments (proton range verification). We discuss results of our in-beam tests and characterization of irradiations by both conventional and FLASH proton beams. In these exploratory PET imaging and dosimetry studies, we demonstrate the feasibility of image guidance in proton therapy by exploiting the short-lived positron-emitting isotopes produced during beam irradiations. We also present ongoing detector R&D aimed at improving overall PET detector performance. These findings are meant to enable new protocols for treatment planning which can bring in-beam PET into the established treatment modalities.

### Field

Detectors and electronics

**Primary author:** CESAR, John (The University of Texas at Austin)

**Co-authors:** KUO, Alex (The University of Texas at Austin); MOROZOV, Andrey (LIP); OJHA, Aryan (The University of Texas at Austin); JESUS, Bruno (University of Coimbra); LEONG, Carlos (PETsys Electronics); GROSSHANS, David (M.D. Anderson Cancer Center); POENISCH, Falk (M.D. Anderson Cancer Center); ABOUZAHAR, Firas (The University of Texas at Austin); CARAMELO, Francisco (University of Coimbra); SIMÕES, Hugo (LIP); DA SILVA, José Carlos (PETsys Electronics); SECO, João (LIP); VARELA, João (LIP); LANG, Karol (The University of Texas at Austin); KLEIN, Kyle (The University of Texas at Austin); FERRAMACHO, Luís (PETsys Electronics); PROGA, Marek (The University of Texas at Austin); SIMÕES, Margarida (LIP); GAJDA, Michael (The University of Texas at Austin); SILVEIRA, Miguel (PETsys Electronics); SAHOO, Narayan (M.D. Anderson Cancer Center); FERREIRA, Nuño (University of Coimbra); GONÇALVES, Patrícia (LIP); CRESPO, Paulo (LIP, University of Coimbra); BUGALHO, Ricardo (PETsys Electronics); FRANCISCO, Rui (PETsys Electronics); SILVA, Rui (LIP); TAVERNIER, Stefaan (PETsys Electronics, Vrije Universiteit Brussel); COUTINHO, Tiago (PETsys Electronics); VARELA, Vasco (PETsys Electronics)

**Presenter:** CESAR, John (The University of Texas at Austin)

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