UT Austin Portugal | 2019 Strategic Research Projects

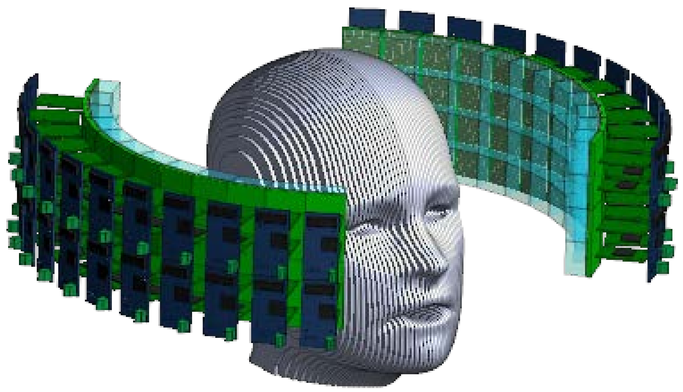
MEDICAL PHYSICS

TOF-PET for Proton Therapy (TPPT)

In-beam Time-of-Flight (TOF) Positron Emission Tomography (PET) for proton radiation therapy

The common gamma radiotherapy lacks accuracy when analyzing prostate, lung, head and neck, liver, esophagus and brain cancers. This project will show the benefits of using TOF-PET in Proton Therapy to increase the performance of Proton Therapy equipment in terms of an increased accurate radiation.

Keywords: Proton Therapy, TOF PET, Positron Emission Tomography, SiPM readout, TOFPET ASIC



Start Date: 01-JAN-2020 **Duration: 36 months** **Operation Code: 45904**

Main challenge/problem the project seeks to address

Proton therapy is the most advanced type of radiation treatment of prostate, lung, head and neck, liver, esophagus, and brain cancers. The reason is simple -- unlike in a common gamma radiotherapy, the proton energy destroying the tumor can be delivered with much better accuracy (by using the well-known 'Bragg peak' of the energy loss in matter) thus minimizing the damage to the surrounding healthy tissue.
Due to geometrical constraints, the in-beam PET scanning in proton radiation therapy is very difficult since it is impossible to fully surround the patient with a ring of detectors as is normally required in PET scanning.

Proposed solution

A novel diagnostic tool based on Positron Emission Tomography, or PET, that is suitable for radiation monitoring of the head and neck cancers. Once the PET scanner is built, the researchers will use phantom head models to ascertain and verify isotope production maps by a proton beam at MD Anderson. Computer simulations will predict the distribution of the positron annihilation events that should be observed. Any mismatch with the observation will provide feedback to adjust the beam.

Innovative Potential

The project will demonstrate the diagnostic value of the state-of-the-art PET scanner featuring excellent position resolution and Time-of-Flight (TOF) to register positron emitting radionuclides during and immediately after the proton irradiation. The project will allow testing the system with phantoms and small animals at the Proton Therapy Center at the M.D. Anderson Cancer Center. Patient studies are not part of the present application but will be part of a follow-up project after successful conclusion of the present project.

Target beneficiaries

The Proton Therapy Industry will be the target client.
People affected by cancer will benefit from getting a more accurate radiation in the tumor cells preserving the surrounding tissues.

Consortium

PORTUGAL

PETsys Electronics S.A. (PI: Stefaan Tavernier)(Lead Beneficiary)
LIP, Laboratório de Instrumentação e Física Experimental de Partículas (PI: Paulo Crespo)
ICNAS, Instituto de Ciências Nucleares Aplicadas à Saúde (PI: Antero Abrunhosa)
C2TN Centro de Ciências e Tecnologias Nucleares, Portugal (PI: António Paulo)

USA - UT'S PRINCIPAL INVESTIGATORS

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UT MD Anderson Cancer Center, Proton Therapy Center (PI: Narayan Sahoo)

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