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Prompt Gamma Imaging System for Proton Range Verification using a Compton Camera

Key Investigator
Jerimy Polf, PhD

Fields
Radiation Oncology
Medical Imaging
Theranostics
Radio-isotope monitoring/imaging

Technology
Prompt Gamma Imaging System

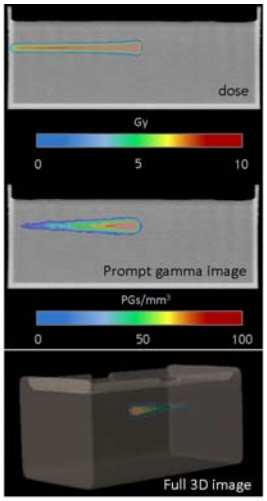
Status
Available for licensing

Patent Status
PCT Pending
(PCT/US2016/039256)
Other Patents Pending

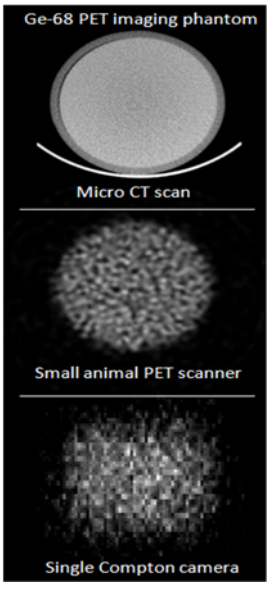
UMB Docket Reference
JP-2017-058
JP-2016-088
JP-2015-137

External Reference
Imaging of prompt gamma rays emitted during delivery of clinical proton beams with a Compton camera: feasibility studies for range verification. *Phys Med Biol.* (2015) Sep 21;60(18):7085-99.

Technology Summary



Range uncertainty in the exact position of the distal dose gradient of a proton beam delivered within a patient during radiotherapy (RT) can lead to underdosing of the tumor or to excessive dosing to adjacent healthy tissues or critical organs at risk. The unwanted side effects and complications due this uncertainty is currently one of the key limitations to proton RT. UMB research is directed specifically to overcome this limitation by developing a system for measuring prompt gamma emissions from the treated tissue during proton delivery as a method to verify the *in vivo* beam range. This system uses a Compton camera approach with reconstruction algorithms to determine the initial energy and directional information about an incident radiation (photon or particle) to produce a 3D image. Moreover, investigators have demonstrated that this system can produce images with high spatial and energy resolution without requiring complete energy absorption of the incident radiation within the Compton camera detector. This design provides a feasible path for an on board clinical imaging system to support emission guided RT that has yet to be resolved by other existing technologies, and would improve our ability to fully realize the advantages of proton RT and patient outcomes.



A second, emerging application of this technology is as a compact, portable imaging system for nuclear medicine applications such as PET and SPECT imaging. Feasibility studies have shown its potential as a portable PET scanner and initial design studies are now underway.

Key Features
- Dose delivery verification solution
- Real-time monitoring of exposure areas
- Compatible with current treatment delivery systems
- Personalizes treatment regimens
- Compact design

Stage of Development
- Clinical camera prototype testing
- Proton therapy delivery systems integration testing
- Range verification software development

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