Protoacoustic Imaging for Real-Time Proton Therapy Guidance

Tech ID: 34246 / UC Case 2021-964-0

BRIEF DESCRIPTION

A novel protoacoustic imaging method and apparatus providing affordable, real-time verification of proton range and quantification of radiation dose during proton therapy to improve treatment precision and patient outcomes.

FULL DESCRIPTION

This technology utilizes the protoacoustic effect—acoustic emissions generated by pulsed proton beams—to produce in vivo, real-time imaging of the Bragg peak during proton radiotherapy. By integrating an ultrasound transducer array with proprietary tracking and reconstruction algorithms, it enables precise localization of proton dose deposition with sub-millimeter accuracy. This capability significantly reduces proton beam range uncertainties, allowing for targeted cancer treatment with minimized damage to healthy tissues. The system is adaptable to clinical proton therapy machines without vendor dependencies and includes hardware and software optimized for acquiring, processing, and reconstructing protoacoustic signals into 3D dose maps.

SUGGESTED USES

- Medical devices and medical imaging for proton radiotherapy
- Improved patient outcomes in oncology clinics
- Research institutions focused on advanced imaging and radiation dosimetry

ADVANTAGES

- Real-time, in vivo verification of proton beam range and dose deposition
- Sub-millimeter accuracy in localizing the Bragg peak
- Non-invasive and affordable integration using ultrasound transducer arrays
- Reduces uncertainties associated with proton therapy dose delivery
- Compatible with existing clinical proton therapy machines, vendor-independent
- Improves tumor dose conformity and spares surrounding healthy tissue
- Enables smaller treatment margins to allow for maximum dose delivery to the tumor

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Reference for National Filings	WO 2023/278627	01/25/2023	2021-964

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OTHER INFORMATION

KEYWORDS

Proton Therapy, Medical Device, Protoacoustic Imaging, Proton Induced Acoustic Imaging, In Vivo Dosimetry, 4D Dosimetry, Bragg Peak Localization, Radiation Oncology

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Devices
  - Disease: Cancer
  - Imaging

RELATED CASES

Patent Pending

RELATED MATERIALS

» Wang, S., et al. Xiang, L. (2024). Real-time tracking of the Bragg peak during proton therapy via 3D protoacoustic imaging in a clinical scenario. npj Imaging, 2. - 09/17/2024

» Samant, P., et al. Xiang, L. (2022). 3-D protoacoustic imaging through a planar ultrasound array: a simulation workflow. IEEE TRPMS. 7 (1). - 05/26/2022

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