



Ion Fan Beam Radiation Therapy System with Partial Arc Motion

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WARF: P07284US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a radiation therapy system that uses an ion fan beam consisting of separately modulated beamlets that are rotated about the patient in a partial arc.

Overview

External beam radiation therapy is a tumor treatment technique that directs one or more high-energy radiation beams to the tumor. External beam radiation systems treat tumors with multiple X-ray fan beams that can be rotated around the patient. Each beam consists of individual “beamlets” that can be controlled to treat complex tumor shapes. An alternate beam radiation therapy technique involves the use of ions such as protons to treat tumors. This technique dramatically reduces the radiation dose to healthy tissue when compared with X-ray radiation therapy using photons.

The dose intensity from protons is not uniform along the beam path and rises to a “Bragg peak” near a point where the proton beam stops completely. Controlling the placement of the Bragg peak so it is located on the tumor reduces the amount of radiation delivered to the patient’s healthy tissue. Unlike X-ray radiation therapy, ions allow for separate control of the total dose of radiation (intensity) and distance the Bragg peak occurs (range).

Existing proton therapy techniques utilize different beam application methods. The spread out Bragg peak (SOBP) approach spreads the ion beam out into an “area beam” to cover the entire tumor in one exposure. This method is fast, but is less precise and requires a special compensator to adjust for the tumor shape. The magnetic spot scanning (MSS) approach uses the original ion “pencil beam,” but due to the multiple exposures the process is slow and results in missed “cold spots.” Recent development of a new technique (see WARF reference number P07282US) has led to the ability to convert the pencil beam into a fan shape that reduces neutron contamination and improves beam delivery efficiency.

The Invention

UW–Madison researchers have developed a radiation therapy system that uses an ion fan beam consisting of separately modulated beamlets that are rotated about the patient in a partial arc during modulation. This technique improves the dose conformity over SOBP while reducing cold spots and treatment time length when compared to MSS. Using the partial arc simplifies the treatment mechanism and the positioning of bulky neutron shields. The partial arc provides dose conformity that is nearly equal to a complete 360 degree arc while removing the dose to the distal side of the patient.

Applications

- External ion beam radiation therapy for the treatment of tumors

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- Provides benefits of 360 degree arcs without bulky treatment equipment



- Increases dose conformity
- Reduces cold spots
- Reduces treatment time

Additional Information

Related Technologies

- [WARF reference number P07282US describes a radiation treatment system that uses magnetic deflection to convert a pencil beam into a fan beam made up of individually controllable beamlets.](#)

Tech Fields

- [Radiation Therapy : External beam therapy.](#)

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