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Clemson University Research Foundation

Precision Robotic Treatment Head for Safer, More Effective Stereotactic Radiosurgery (2016-023)

Unique Design Allows Neurosurgeons to Treat Patients with Tumors and Cancerous Abnormalities Quickly and Safely

Market Overview

This Cobalt-60 based treatment head for Stereotactic Radiosurgery eliminates the limiting factors of current heads currently used to fight cancer health disparities. Radiation therapy is a growing market, expected to reach $8 billion by 2019. Approximately 50 percent of all cancer patients will undergo radiation therapy as part of their treatment. Stereotactic Radiosurgery in particular uses many precisely focused radiation beams to treat cancerous tumors and other abnormalities in the brain, neck, and other parts of the body. There are currently three types of technologies used to deliver radiation during stereotactic radiosurgery: linear accelerator, gamma knife, and proton beam. Each of these approaches work in a similar manner, but they also pose treatment limitations. For example, patients must be enclosed in the treatment chamber, often causing psychological stress, and the technologies are bulky and heavy, weighing more than 40,000 lbs. Clemson University Researchers have developed a Precision Radiosurgery Treatment Head (PRTH) with a highly competitive design that will allow neurosurgeons to treat patients quicker, more safely and more precisely. The design eliminates the need for placing patients inside a Gantry and allows the possibility of automatic patient reposting, significantly decreasing treatment time and improving patient comfort.

Application

Radiation therapy; Cancer treatment

Stage of Development

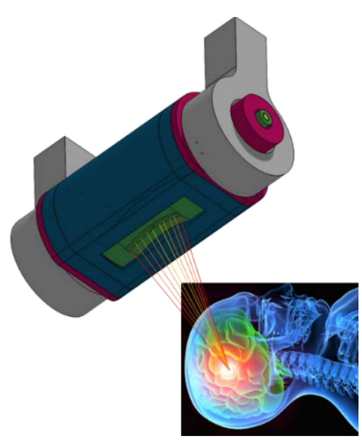
Preliminary Prototype

Advantages

- Utilizes a compact design, requiring less space and decreasing manufacturing costs
- Allows the entire treatment head to move easily around the patient, providing a wide range of entry points and minimizing the dose distribution in the surrounding healthy tissue
- Eliminates the need for patient placement inside a Gantry, significantly decreasing treatment time and providing an overall better experience for patients

Technical Summary

This PRTH adopts a new geometry sources arrangement. Rather than focusing beams inward the sources are arranged in one row along the hyperbolic arc of a source body, focusing beams outward to a spatial focal point. Collimators structure sleeves around the source body provide beam collimation and also first layer of shielding. The shielding body housing the collimator structure provides secondary shielding to the treatment head. The focal point is located outside the shielding body in an open spatial area. Because the sources are located in the very core of the total treatment head geometry arranged like a curve line, all the shielding around the cure line sources array is minimized physically in size and weight. The total weight can be less than 4,000 lbs. Since the focal point is located outside of the treatment head, there is then no limitation to expand the treatment to any part of the body.



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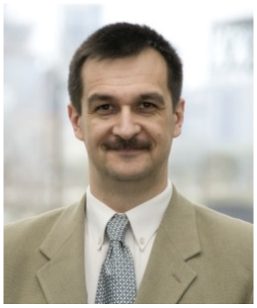
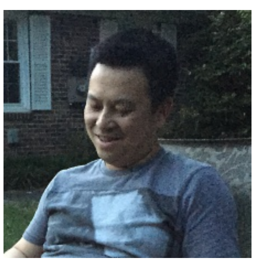
App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Provisional	United States	62/360,082	NA	2015-058	Ilya M Safro, Alexander Gutfraind

About the Inventors



Dr. Endre Takacs is an Associate Professor of Physics and Astronomy at Clemson University. He earned his M.S. and Ph.D. in Atomic Physics from the University of Debrecen, Hungary. Prior to joining Clemson's faculty, Dr. Takacs completed postdocs at Oxford University, NIST, and the University of Debrecen and held appointments at MIT-NIST, Harvard-SAO, Queens University, and Vanderbilt University. He is a member of the Hungarian, American, and European Physical Societies. His research interests focus on x-ray spectroscopy, highly charged ions, high energy radiation, and biomedical physics.

Dr. Mark Leising is a Professor and Chair of the Department of Physics and Astronomy at Clemson University. He earned his Ph.D. in space physics and astronomy from Rice University. Prior to his appointment at Clemson, Dr. Leising was an astrophysicist for the U.S. Naval Research Laboratory. While there, he and collaborators made the first detections of radioactive debris in a supernova explosion, produced the first map of electron-positron annihilation from the Milky Way, and predicted the detectability of supernova radioactivity in X-rays. His research interests focus on radioactivity from supernovae and classical novae, interstellar electron-positron annihilation, and X-ray and gamma-ray spectroscopy of radioactivity.



Xiao Ran Zheng is a Research Associate of Physics and Astronomy at Clemson University. He earned his B.S of Industrial Engineering in Beijing Institute of Fashion Technology. Prior to joining Clemson University, Mr. Zheng worked in medical industry for 20 years. He was the co-founder of two China based medical companies, ET Medical Group and Cancer Care International Ltd. Both companies are specialized in radiosurgery and oncology treatment devices. He holds 8 Chinese patents for multi-leaf collimators and radiosurgery device.

For More Information

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