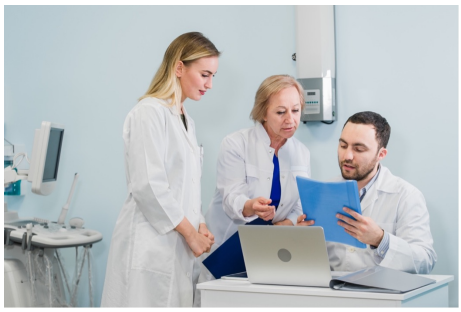
An optical scanning system that reduces the planning cost associated with 3D dosimetry planning techniques

Unmet Need

Radiation therapy is an essential element of cancer treatment that has been estimated to be potentially beneficial to 4 million diagnosed patients every year. Since the turn of the millennium, the sophistication, precision, and capabilities of these treatments has increased dramatically. This includes the ability to deliver complex three-dimensional distributions of dose that conform to even irregularly shaped lesions in the patent. However, despite radiation therapy being one of the most cost-effective cancer treatment modalities, these improvements have increased the associated cost and required labor intensive procedures. These comprehensive 3D dosimetry techniques require expensive optical scanning tools like the Duke Large field of view Optical Scanner (DLOS) to complete the required verification and quality assurance steps during radiation treatment planning. There is a need to reduce the costs and inconveniences associated with 3D radiation treatment planning in order to make them more accessible and improve patient outcomes.

Technology

Duke inventors have reported an optical scanning system that reduces the cost associated with 3D dosimetry techniques like those that use the PRESAGE® dosimeter. Over 60% of the total cost of previous optical scanner systems like DLOS can be contributed to the telecentric lenses and fluid tank. In this technology, a small amount of refractively matched fluid is used with a novel curved sided tank made from transparent materials. Specifically, the system uses a solid, economical light-collimating tank with one or more light surfaces shaped to focus or collimate light. In



Duke File (IDF) Number

IDF #:T-004806

Patent Information

Patent #: 10,670,874
Patent Title: LIGHT-COLLIMATING TANK FOR USE WITH AN OPTICAL COMPUTED TOMOGRAPHY SYSTEM
Country United States of America

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Radiation Oncology

Publication(s)

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External Link(s)

• From the lab of Dr. Mark Oldham

this manner, the system can function without the need for expensive telecentric lenses and with only a small amount of refractive index fluid when compared to previous designs. A 3D-printed prototype has been developed and demonstrated accurate dosimeter readout. The inventors have found that optimal results occur when the refractive index of the dosimeter and tank is the same, in which case the fluid will have the same refractive index. See Figure 1 in the inventors' 2015 Medical Physics publication for a top-down view of this invention compared to previous systems.

Advantages

- Dramatically reduces the costs associated with fluid-based optical scanning systems for 3D radiation therapy planning
- Produces better results than free space scanning systems
- Easier to use and maintain than fluid-based systems by mitigating the need for large quantities of high refractive index fluid