Docket #: S21-067

GENERATION OF A NEEDLESHAPED BEAM FOR EXTENDED DEPTH OF FOCUS OPTICAL COHERENCE TOMOGRAPHY

Technology Reference
CZ Biohub ref. no. CZB-204S-PC
Stanford ref. no. S21-067

Researchers at Stanford have developed an innovation that will enhance the depth of the imaging capabilities for optical coherence tomography (OCT) imaging.

Optical coherence tomography is a technique for visualizing various medias that was originally developed in the 1990s for the imaging of ocular measurements. This technique is of clinical significance due to its ability to image tissue morphology at a much higher resolution than other clinical imaging techniques such as MRI. OCT provides what are effectively 'optical ultrasound' images by directing an optical beam at a tissue of interest. A fraction of this light will then be reflected from sub-surface features of the tissue and subsequently recorded to create a digital reconstruction of the sub-surface tissue morphology. The key advantage of this technique is its high resolution and lack of ionizing radiation due to its use of light as a reflective source rather than sound or radio frequency. Despite advancements in the field of OCT imaging, improved methods to extend the depth of focus in these systems represents a major unmet medical need.

Stage of Development
Research-

in vivo

Stage of Research

The inventors have developed new methods of creating needle-shaped beams to extend the depth of focus in OCT imaging systems. Briefly, a diffractive optical element with a predetermined phase profile is used to create a single beam with multiple foci along the axial direction of propagation. This then produces a beam that has both a large depth of focus and a narrow diameter. This needle shaped beam can then be used in a myriad of optical imaging and analysis systems. While other OCT systems utilize multiple beams, they fail to achieve the same extended depth that the inventor's system does without considerable draw backs. The inventor's system provides the capability to extend the depth of focus of imaging in an OCT system while maintaining lateral resolution along the depth of the image, allowing for an increased depth of focus without sacrificing a wide field of view.

Applications

- Increased depth of focus imaging for clinical applications such as ocular imaging
- Increased depth of focus imaging for preclinical applications such as improved depth of imaging in animal models that require non-invasive imaging techniques.

Advantages

- Maintains OCT systems' non-invasive imaging method
- Extends the depth of focus of current OCT systems without sacrificing on lateral field of view.

Patents

- Published Application: WO2022187646
- Published Application: 20230384609

Innovators

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