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## SPECTRAL DOMAIN FUNCTIONAL OCT and ODT

Tech ID: 33534 / UC Case 2004-171-0

### BRIEF DESCRIPTION

This technology revolves around Optical Coherence Tomography (OCT), a noninvasive imaging method that provides detailed cross-sectional images of tissue microstructure and blood flow. OCT utilizes either time domain (TDOCT) or Fourier domain (FDOCT) approaches, with FDOCT offering superior sensitivity and speed. Doppler OCT combines Doppler principles with OCT to visualize tissue structure and blood flow concurrently. Additionally, polarization-sensitive OCT detects tissue birefringence. Advanced methods aim to enhance the speed and sensitivity of Doppler OCT, crucial for various clinical applications such as ocular diseases and cancer diagnosis. Swept source FDOCT systems further improve imaging capabilities by increasing range and sensitivity. Overall, this technology represents significant advancements in biomedical imaging, offering insights into both structural and functional aspects of tissue physiology.

### SUGGESTED USES

- 1.Ophthalmology:** OCT is extensively used in ophthalmology for imaging and diagnosing retinal diseases such as macular degeneration, diabetic retinopathy, and glaucoma. It provides detailed images of the retina, optic nerve head, and other ocular structures, aiding in early detection and monitoring of eye conditions.
- 2.Cardiology:** OCT can be used in cardiology to visualize coronary arteries and assess plaque composition and morphology. It helps cardiologists in diagnosing and treating cardiovascular diseases, including coronary artery disease and vulnerable plaque detection.
- 3.Dermatology:** OCT is increasingly being used in dermatology for imaging and diagnosing skin conditions such as skin cancer, melanoma, and psoriasis. It offers noninvasive visualization of skin layers and structures, aiding in early detection and treatment planning.
- 4.Neurology:** OCT has potential applications in neurology for imaging and diagnosing neurological disorders such as multiple sclerosis and Alzheimer's disease. It enables visualization of brain structures and changes in brain tissue, facilitating early detection and monitoring of neurodegenerative diseases.
- 5.Gastroenterology:** OCT can be used in gastroenterology for imaging and diagnosing gastrointestinal conditions such as Barrett's esophagus, inflammatory bowel disease, and colorectal cancer. It provides detailed images of the gastrointestinal tract, aiding in early detection and surveillance of diseases.
- 6.Endocrinology:** OCT may have applications in endocrinology for imaging and diagnosing endocrine disorders such as thyroid nodules and pituitary tumors. It offers noninvasive visualization of endocrine glands and structures, assisting in diagnosis and treatment planning.
- 7.Surgery:** OCT can be used intraoperatively to provide real-time imaging guidance during surgical procedures, particularly in ophthalmic surgery, cardiovascular surgery, and neurosurgery. It helps surgeons visualize tissue structures and assess surgical outcomes in real-time.
- 8.Dentistry:** OCT has potential applications in dentistry for imaging and diagnosing oral conditions such as dental caries, periodontal disease, and temporomandibular joint disorders. It offers noninvasive visualization of dental tissues and structures, aiding in treatment planning and monitoring.

### FEATURES/BENEFITS

### CONTACT

Alvin Viray  
aviray@uci.edu  
tel: 949-824-3104.



### INVENTORS

» Chen, Zhongping

### OTHER INFORMATION

### KEYWORDS

Optical coherence tomography (OCT), Doppler OCT, Spectral domain OCT, Functional OCT, Biomedical imaging, Blood flow imaging, Tissue microstructure, Imaging speed enhancement, Spectral signal acquisition, Polarization-sensitive OCT

### CATEGORIZED AS

» **Optics and Photonics**  
» All Optics and Photonics

1. **Noninvasiveness:** OCT is a noninvasive imaging technique that does not require the use of ionizing radiation or invasive procedures, minimizing patient discomfort and risk of complications.
  2. **High Resolution:** OCT provides high-resolution, cross-sectional images of tissue microstructure with micrometer-scale resolution, enabling detailed visualization of tissue morphology and pathology.
  3. **Real-time Imaging:** OCT allows for real-time, in situ visualization of tissue structures, providing immediate feedback to clinicians during diagnostic procedures or surgical interventions.
  4. **Depth Penetration:** OCT has the capability to penetrate deep into tissues, allowing visualization of subsurface structures such as blood vessels, nerves, and layers of the skin or retina.
  5. **Quantitative Measurements:** OCT can provide quantitative measurements of tissue characteristics such as thickness, volume, and blood flow velocity, aiding in diagnosis, monitoring disease progression, and evaluating treatment efficacy.
  6. **Functional Imaging:** Advanced OCT techniques, such as Doppler OCT and polarization-sensitive OCT, enable functional imaging of tissue physiology, including blood flow velocity, tissue birefringence, and vascular perfusion.
  7. **Wide Range of Applications:** OCT has diverse applications across various medical specialties, including ophthalmology, cardiology, dermatology, neurology, gastroenterology, dentistry, and surgery, making it a versatile tool for clinical diagnosis and research.
  8. **Early Detection and Diagnosis:** OCT facilitates early detection and diagnosis of various diseases and conditions, including retinal diseases, cardiovascular diseases, skin cancer, neurological disorders, gastrointestinal disorders, and dental abnormalities, leading to timely interventions and improved patient outcomes.
  9. **Guidance for Treatment Planning and Monitoring:** OCT provides valuable information for treatment planning and monitoring, guiding therapeutic interventions such as laser therapy, photodynamic therapy, intravascular interventions, and surgical procedures, and assessing treatment response over time.
- Overall, OCT technology offers numerous benefits in terms of its diagnostic capabilities, safety profile, versatility, and ability to improve patient care across a wide range of medical disciplines.

- » **Imaging**
- » Medical
- » Other
- » **Medical**
- » Devices
- » Diagnostics
- » Imaging
- » Screening

## RELATED CASES

2004-171-0

## FULL DESCRIPTION

Optical Coherence Tomography (OCT) is a non-invasive imaging technology that generates high-resolution, cross-sectional images of biological tissues. It operates on the principle of low-coherence interferometry, which involves splitting a beam of light into a sample arm directed at the tissue of interest and a reference arm with a mirror. Light reflected or backscattered from both arms is combined to create an interference pattern, which is analyzed to construct detailed images of tissue microstructure.

OCT utilizes either a time domain (TDOCT) or frequency domain (FDOCT) approach. TDOCT involves scanning the reference mirror to obtain depth-resolved information, while FDOCT measures the spectral interference pattern directly. FDOCT offers higher sensitivity and faster imaging speeds compared to TDOCT.

Various modalities of OCT exist, including Doppler OCT and polarization-sensitive OCT. Doppler OCT detects motion within tissues, such as blood flow, by analyzing changes in the frequency of backscattered light. Polarization-sensitive OCT measures the polarization state of light to provide additional information about tissue properties, such as birefringence.

OCT finds wide-ranging applications in medicine, including ophthalmology, cardiology, dermatology, neurology, gastroenterology, dentistry, and surgery. It enables clinicians to visualize tissue structures, assess pathology, monitor disease progression, guide interventions, and evaluate treatment efficacy. With its non-invasive nature, high resolution, and versatility, OCT has become an indispensable tool in medical imaging and research.

## STATE OF DEVELOPMENT

Prototype developed

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,359,062	04/15/2008	2004-171

**ADDITIONAL TECHNOLOGIES BY THESE INVENTORS**

▶ [Mapping Ciliary Activity Using Phase Resolved Spectrally Encoded Interferometric Microscopy](#)

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5270 California Avenue / Irvine, CA  
92697-7700 / Tel: 949.824.2683



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