Interferometric Near Infrared Spectroscopy and Fluorescence Lifetime Imaging

Tech ID: 34796 / UC Case 2026-386-0

ABSTRACT

Researchers at the University of California, Davis have developed a hybrid system combining Fluorescence Lifetime Imaging (FLIM) and Interferometric Near-Infrared Spectroscopy (iNIRS) within a single optical probe for advanced, multimodal tissue analysis.

FULL DESCRIPTION

This technology integrates FLIM and iNIRS techniques into a hybrid optical measurement system.. By utilizing optical fibers such as double-clad, multimode, and single-mode fibers, the system measures both FLIM and iNIRS signals simultaneously through a unified imaging probe. This approach enables simultaneous acquisition of structural, biochemical, metabolic, and hemodynamic information from biological or non-biological samples, facilitating minimally invasive, in vivo measurements across various clinical settings. The imaging probe can be incorporated into handheld devices, catheters, endoscopes, and other medical instruments, allowing versatile deployment in constrained environments.

APPLICATIONS

- In vivo clinical diagnostics and monitoring of biological tissues.
- Minimally invasive imaging of gastrointestinal tract, oral cavity, lungs, trachea, and other organs.
- Detection and assessment of burns, melanoma, atherosclerosis, and other medical conditions.
- Research tools for studying tissue morphology, blood flow, metabolism, and biochemical states.
- Integration into handheld medical devices, catheters, endoscopes, and compatible scanners.
- Advanced surgical guidance and therapeutic monitoring.

FEATURES/BENEFITS

- Integrates FLIM and iNIRS into a single compact probe to simplify multimodal imaging.
- Beams for FLIM and iNIRS can be focused separately.
- Adapts to varied use cases by supporting multiple fiber configurations (double-clad, multimode, single-mode).
- Enables minimally invasive deployment by supporting endoscopic and catheter-based procedures.
- Captures structural, metabolic, and hemodynamic tissue features in one measurement, allowing real-time clinical assessment.
- Replaces bulky multi-probe systems with a single integrated optical platform.
- Eliminates alignment/calibration challenges inherent to separate FLIM and iNIRS instruments.
- Prevents mis-correlation from measurements made at different times.
- Enables access to tissue in space-constrained clinical settings.
- Improves diagnostic consistency by reducing sampling-location mismatch and motion-related artifacts.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

absorption, catheter, dual-modality imaging, fluorescence lifetime imaging, gastrointestinal tract, interferometric near infrared spectroscopy, minimally invasive, optical fibers, tissue morphology, vascular imaging

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Communications**
  - Other
- **Imaging**
  - Medical
- **Medical**
  - Devices
  - Imaging
- **Sensors & Instrumentation**
  - Medical

RELATED CASES

2026-386-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Fabrication Method for Side Viewing Miniature Optical Elements with Free-Form Surface Geometry
- Real-Time Fluorescence Lifetime Tracking
- Volumetric Optical Coherence Tomography using a Passively Scanned Probe
- Motor Drive Unit for Combined Optical Coherence Tomography and Fluorescence Lifetime Imaging of Intraluminal Structures
- Broadband Optical Rotary Junction with High Return Loss for Analysis of Plaques

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