INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

MEMS-Based Single/dual Axis Confocal Endomicroscope

TECHNOLOGY NUMBERS: 7568, 7666

Accelerate Blue Foundry - 2025 (Life Sciences)

OVERVIEW

This miniature confocal endomicroscope brings “histology-like” imaging to the tip of a standard endoscope. Using a microelectromechanical systems (MEMS) mirror and custom micro-optics, the device scans tissue at sub-cellular resolution in real time to generate sections, and includes side and forward views to enable comprehensive “optical biopsies” during routine endoscopic procedures. The system is designed for minimally invasive use in hard-to-reach areas, such as the bile ducts, airway, pancreatic duct, and colon folds, where conventional tools struggle to visualize suspicious lesions. By delivering immediate, cellular-level detail at the point of care, this technology can reduce unnecessary physical biopsies, shorten diagnostic cycles, and support more precise interventions. The platform is compatible with standard clinical workflows and working channels for broad adoption across GI, pulmonary, and urologic procedures.

DESCRIPTION

This technology introduces an ultra-compact imaging instrument that fits inside the working channel of standard medical endoscopes, using a MEMS mirror and specialized lenses to scan and produce tissue images with high-details in real-time. Unlike existing fiber-based microscopes that are limited to views in just one direction and one dimension, this device can visualize tissues from the side, at an angle, and from the front to enable creation of detailed 3D tissue maps during actual medical exams. The system operates at sub-cellular resolution than previous miniature systems, can be easily manufactured at low cost, and is scalable for even smaller applications like biliary imaging. These breakthroughs allow clinicians to perform precise, real-time “optical biopsies” that reveal tissue structure and disease without taking physical samples, directly in the body and during procedures.

Technology ID

7568

Category

Medical Devices
Life Sciences
Engineering & Physical Sciences
Accelerate Blue Foundry - 2025/Life Sciences

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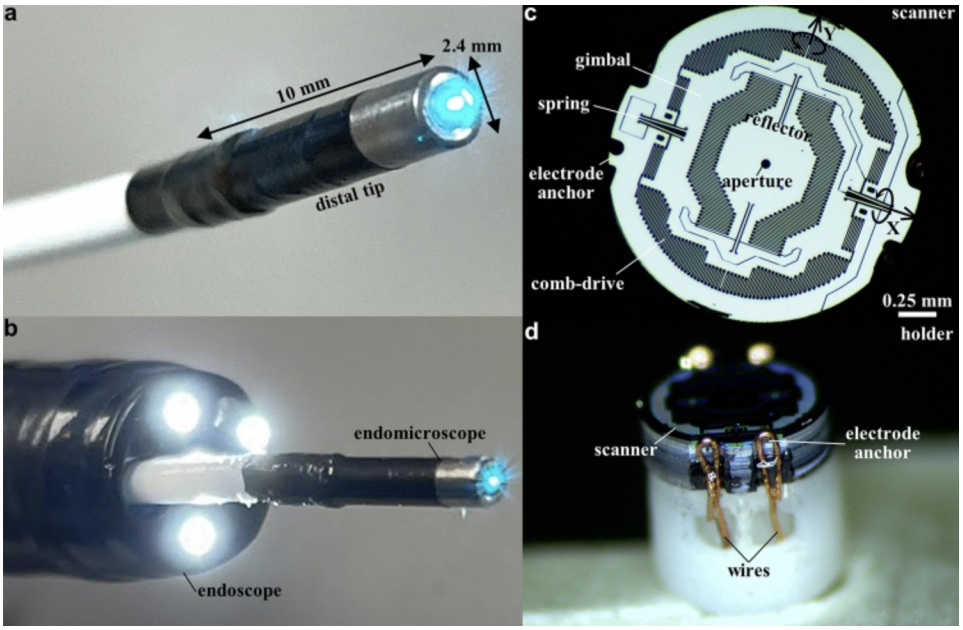
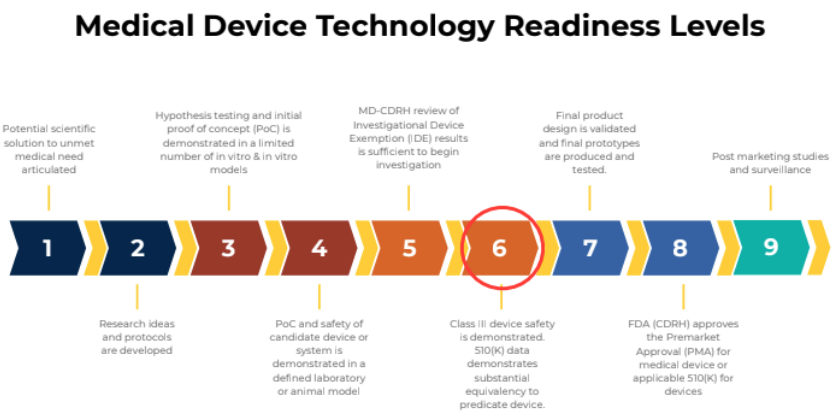


VALUE PROPOSITION

- **Comprehensive Imaging**: MEMS-based confocal endomicroscopes provide real-time, sub-cellular resolution images with “histology-like” quality to enable a more complete and accurate in vivo tissue assessment compared to conventional single-plane or fiber-bundle systems.
- **Broad & Scalable Use**: Compact, flexible, fiber-coupled probes fit seamlessly into the working channels of standard medical endoscopes. The design is reusable (up to 20 times), cost-efficient (<$100 per use), and scalable for multiple luminal organs (colon, biliary tree, airway, bladder) to support widespread adoption across diverse clinical specialties.
- **Superior Diagnostic Power**: First-in-human feasibility studies show strong concordance with pathology to demonstrate early cancer detection, accurate staging, and reduced reliance on physical biopsies. AI-powered software further enhances diagnostic confidence by providing automated, real-time interpretation at the point of care.
- **Clinical & Economic Impact**: By reducing procedure-related risks, eliminating pathology delays, and lowering per-procedure costs relative to conventional biopsy (>$500), this technology improves safety, accelerates clinical decision-making, and expands patient access.

TECHNOLOGY READINESS LEVEL



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INTELLECTUAL PROPERTY STATUS

ALL ISSUED PATENTS:

- US11819310
- CN111095074A
- US12259543
- CN113710142A
- EP3941329
- US10642027
- US9921406
- US9389184

Other patent applications pending.

MARKET OPPORTUNITY

There is a significant and growing demand for technologies that deliver real-time, sub-cellular resolution tissue characterization to enable earlier and more accurate diagnoses, in particular, for diseases such as colorectal cancer, inflammatory bowel disease, and precancerous conditions that are often difficult to evaluate with conventional tools. More than 25 million colonoscopies are performed annually in the U.S., with global procedure volumes projected to double by 2040. The limitations of physical biopsies, including perforation and bleeding risks, pathology costs averaging >$500 per specimen, and diagnostic delays of several days, create a clear need for safer, faster, and more cost-effective alternatives. This optical biopsy platform directly addresses these challenges by reducing unnecessary biopsies, improving targeting of suspicious lesions, and providing immediate histology-like images with AI-powered interpretation. Beyond gastroenterology, the compact, fiber-coupled design enables expansion into pulmonology, urology, and interventional radiology. Positioned within a $52 billion global endoscopy market and an estimated $3–4 billion advanced optical imaging market, this technology aligns with trends toward minimally invasive diagnostics, personalized medicine, and value-based healthcare, offering substantial clinical and commercial impact.

REFERENCES

- "Confocal laser endomicroscope with distal MEMS scanner for real-time histopathology"