

Integrated Photonics: A New Era for Sepsis Diagnosis

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The Sepsis Challenge and Photonic Solutions

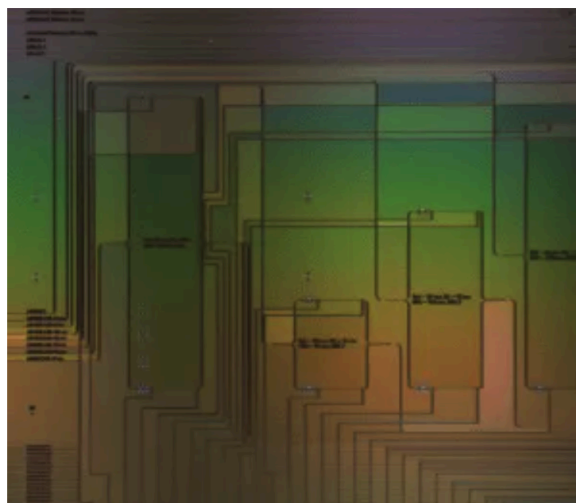
Sepsis remains one of healthcare's most pressing diagnostic challenges, with each hour of delayed treatment increasing mortality rates by 7-8%. Current methods often lack the speed and sensitivity required for early intervention. At this critical juncture, integrated photonics is a promising approach to address these limitations.

As part of the collaborative [AMBROSIA](#) initiative, we've explored how [silicon nitride photonic integrated circuits](#) can revolutionize point-of-care diagnostics for sepsis. The inherent advantages of photonic technology—high sensitivity, reliability, and integration capabilities—make it uniquely suited for detecting subtle biomarkers associated with early-stage sepsis.

Technical Insights: Complementary Sensing Approaches

Our research explores two distinct photonic sensor architectures with compelling results:

- **Bimodal Waveguide Configuration:**
This approach utilizes a single waveguide supporting multiple optical modes, with aluminum thin film sensing areas that enable detection sensitivities of 13.3×10^3 nm/RIU. The experimental results demonstrate remarkable alignment with theoretical predictions, validating the underlying physical principles.
- **Mach-Zehnder Interferometer Design:**
By comparing optical phase differences between sensing and reference paths, MZI sensors achieve sensitivities of 8.8×10^3 nm/RIU. These sensors maintain consistent performance parameters that closely match theoretical models. Our findings, recently



MZI plasmonic sensor

presented at CLEO2025, contribute to the growing evidence supporting photonic integration as a viable platform for next-generation medical diagnostics.

For those interested in the specifics of this sensor design, we invite you to read the full open-access publication. **Read the paper:** [Improving Limit-of-Detection in High-Sensitivity Plasmo-Photonic Mach-Zehnder Interferometer Refractive Index Sensors](#)

Beyond Technology: Healthcare Implications

The significance of these advances extends well beyond technical specifications. For clinicians and patients, photonic sensor technology represents the possibility of earlier sepsis detection and intervention, potentially transforming outcomes for a condition where time is critical. This work was supported by the [Swiss State Secretariat for Education, Research and Innovation](#) (SERI) under contract number 22.00511.

Collaborative Paths Forward

For those interested in exploring this emerging intersection of photonics and healthcare, we invite you to view the project presentation: [Integrated Photonics for Next-Generation Sepsis Diagnosis](#)

As we collectively work to expand the horizons of integrated photonics in healthcare, we anticipate significant advances in diagnostic capabilities—creating pathways to more effective, personalized, and accessible medicine.