A Disposable Photonics Approach to Multiplex Diagnostics

Benjamin L. Miller, University of Rochester, Rochester, NY, USA

Abstract
Over the past few decades, research by many academic and industrial groups has driven the development of numerous innovative photonic sensors able to detect biomedically relevant target molecules with high sensitivity and specificity. For integrated photonic sensors to achieve relevance in medical diagnostics, however, they must compete with existing methods not only in performance, but also in cost and usability. To address this need, a collaborative team from several academic institutions, industry, and government laboratories has work with AIM Photonics to develop a simple and inexpensive photonic sensor system for medical diagnostics. The system incorporates several features: (1) a small (1 x 4 mm) ring resonator photonic integrated circuit (PIC) optically addressed via focused grating couplers and incorporating up to 18 rings for multiplex sensing; (2) a disposable card enabling pump-less/instrument-free delivery of human samples to the sensor via passive microfluidics; (3) a compact photonic reader system providing rapid, automated optical alignment to the sensor and fully automated data acquisition.

This talk will describe the development of the “disposable photonics” system, and its application to three diagnostic areas: (1) detection of anti-viral antibodies in human serum in the context of infectious disease monitoring and evaluation of vaccine efficacy; (2) simultaneous detection of enzyme concentration and activity; (3) multiplex evaluation of bleeding disorders.