Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Demonstration and analysis of the harmonic dithering technique for a high-sensitivity silicon waveguide biosensor
KANGBAEK KIM, ROBERT M. PAFCHECK, THOMAS L. KOCH, Lehigh University — A label-free biosensor readout technique is demonstrated based on a silicon-on-insulator ring resonators and a harmonic dithering technique using a distributed feedback (DFB) laser and a lock-in amplifier. The 400 μm ring resonator is integrated with a microfluidic sample delivery channel formed with Polydimethylsiloxane (PDMS). Dithering the frequency of the DFB laser across the Lorentzian lineshape of the drop port at high frequency eliminates 1/f noise, and broadband noise is reduced by narrow-band detection with the lock-in amplifier. Biosensor system noise is analyzed and compared with more conventional readout methods, and in our case is dominated by thermal noise of the receiver, shot noise, and relative intensity noise (RIN) of the DFB laser. Because the readout automatically latches onto the drop port and does not require a complex scanning process, this methodology may provide a pathway for high-sensitivity, real-time, and low-cost biosensing.

Kangbaek Kim
Lehigh University

Date submitted: 13 Nov 2011 Electronic form version 1.4