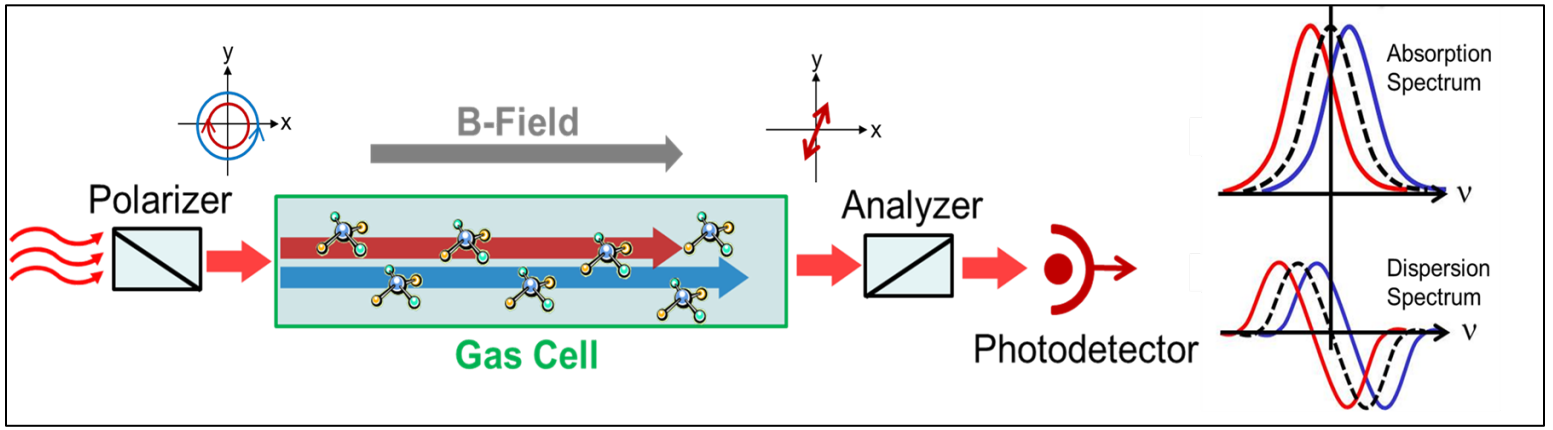
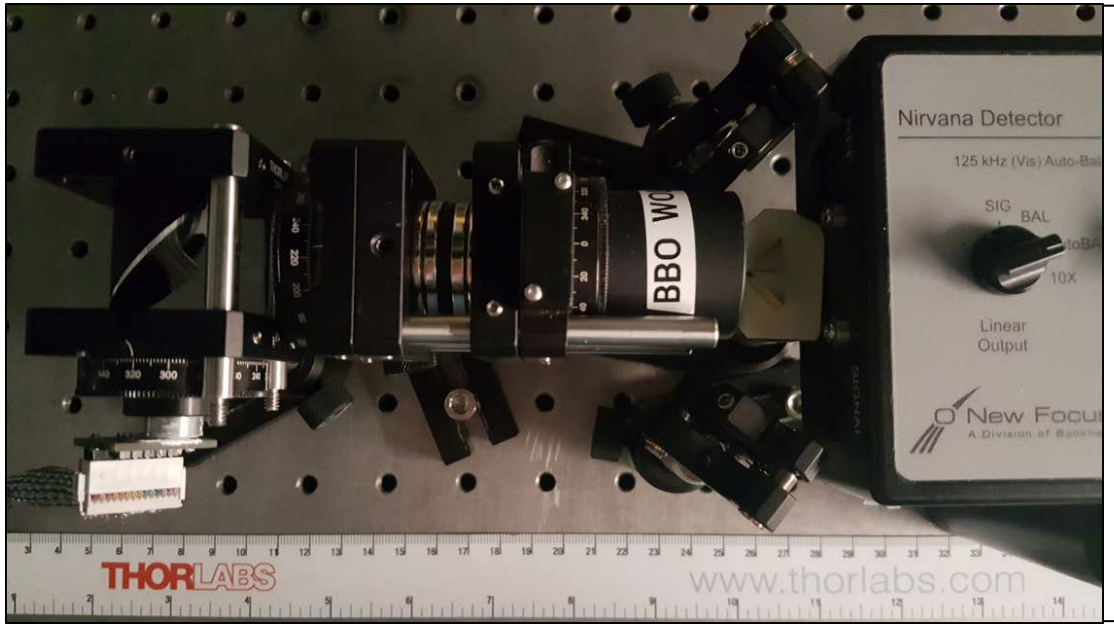
Faraday Rotation Spectroscopy

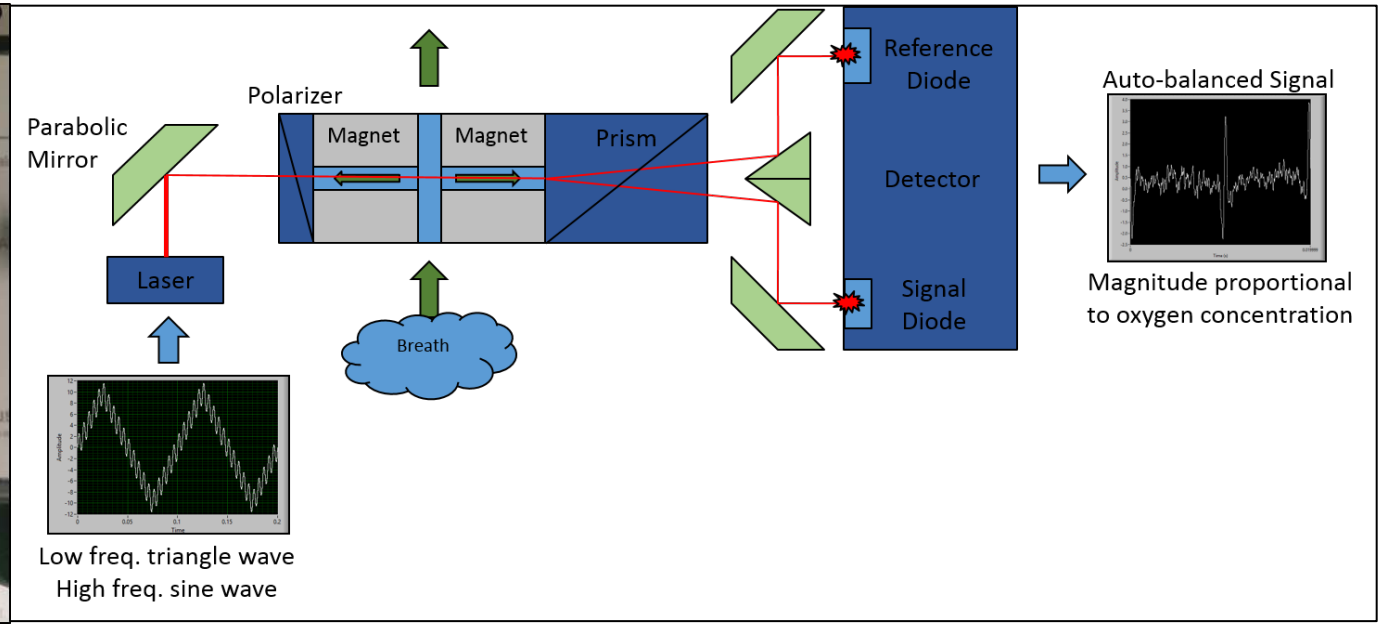


- Oxygen level in exhaled air is a clinically significant measurement that demands a low-power, light-weight, and compact device that can deliver a sub one percent minimum detection level with 1 s time resolution.
- Faraday Rotation Spectroscopy (FRS) is a laser based technique for the detection of paramagnetic gases like oxygen.
- FRS is 2-3 orders of magnitude more sensitive than direct absorption spectroscopy

Figure courtesy of Eric Zhang

Optical Benchtop Prototype





- Our optical benchtop prototype has a 28 mm path length, uses less than 0.1 kg of magnets, and is based on a low power VCSEL laser

Performance

- Using laser wavelength modulation FRS and a balanced detection scheme, an FRS spectrum of oxygen can be selectively acquired
- We have achieved a bandwidth normalized a minimum detection level (1σ) of **0.12%** of oxygen gas in air by volume at a one second integration time, which exceeds the sensitivity required for the biomedical sensing of oxygen in human breath

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Faraday Rotation Spectroscopy for Biomedical Oxygen Sensing

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