Use of Piezo Buzzers as Actuators in a Fabry Perot Etalon.

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Piezoelectric elements, frequently referred to as PZTs (Lead Zirconate Titanate), are often used in the construction of moving mirror Fabry Perot interferometers (FPI). PZTs have a linear voltage to displacement relation that makes them an excellent actuator choice. In an effort to follow the MIRTHE goal of developing low cost sensors, we explore employing inexpensive piezo buzzer elements as a means of mirror actuation in an FPI setup.

The FPI is constructed using two highly reflective silicon substrate mirrors which are partially transmissive to light in the mid-IR range. One mirror is fixed, while the moving mirror is attached to three equally spaced piezo elements, leaving a central path for light to pass through the fixed mirror (see figure 1). The advantage of this three actuator setup is that one may compensate for any errors in mirror alignment by adjusting the voltage to each piezo element. Utilizing the linear properties of PZTs, one may use this voltage as an offset in order to ensure that the two mirrors remain parallel while sweeping the optical path.

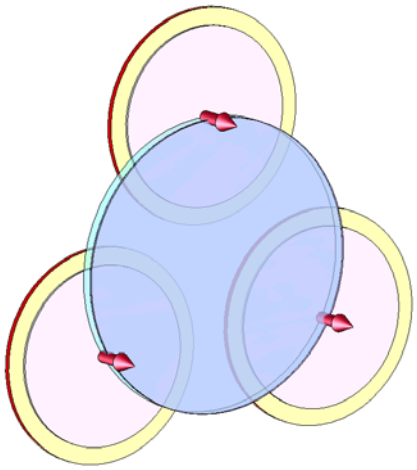

***Figure 1** Illustration depicting the moving mirror and 3 piezo buzzer actuators used in the FPI setup. Arrows indicate the direction of motion.*

The complete setup utilizes a wideband mid-IR LED as a low cost light source, and a thermo electrically cooled photodetector for measurement. The output current from the photodetector is run through a transimpedence amplifying circuit to produce a voltage that will be measured. A PC running LabView software is used to control both the excitation and offset voltages sent to the piezos in the sweeping FPI setup. Labview is also used to sample voltage output from the aforementioned circuit and to process it in order to produce the background and sample spectrums.

This system is still under development at the time of this publication, and results will be included in the flash presentation during the August MIRTHE conference.