Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Inexpensive, pocket-sized LED-based fluorometer for undergraduate teaching laboratories and in-the-field chemical detection GAGE TIBER, PARTHA BASU, THEODORE A. CORCOVILOS, Duquesne University — Fluorometry is a standard experimental technique for the detection of chemical compounds in solution. Excitation light is absorbed by a sample and then longer-wavelength light is emitted. Typical laboratory fluorometers are large and expensive, making them poorly suited for field work and teaching laboratories. We present a simple battery-powered fluorometer built with off-the-shelf components and a 3D-printed body. The light sources are user-replaceable light emitting diodes (LEDs). Two independent light sources of different wavelengths allow ratiometric measurements of the sample. The detectors are photodiodes with interchangeable dielectric Fabry-Perot stack spectral filters. The light gathering optics are designed using non-imaging optics principles to maximize the amount of detected fluorescence light. We present the design of the device and demonstrate the sensitivity using a molecular detector[1] of Pb^{2+} ions in solution. The absorption and emission wavelengths of the detector molecule change from 415 nm and 465 nm, resp., in the absence of Pb^{2+} to 389 nm and 423 nm, resp., in the presence of Pb^{2+}. The estimated sensitivity of the fluorometer with this molecular detector is a few p.p.b.

[1]Marbella, L., et al. Angew. Chem. 121, 4056 (2009).

Theodore Corcovilos
Duquesne University

Date submitted: 30 Jan 2015 Electronic form version 1.4