

Abstract Submitted  
for the NEF13 Meeting of  
The American Physical Society

**Frequency dependence property of photoelectric effect for introductory undergraduate lab course** CHANDRA YELLESWARAPU, Department of Physics, University of Massachusetts Boston — Three empirical laws defines photoelectric emission: a) for a given material there is a minimum (or threshold) frequency of the incident light below which no photoelectrons will be emitted; b) the maximum kinetic energy of the emitted electrons is proportional to the frequency of the incident light; and c) the number of electrons ejected from an illuminated surface per unit time, i.e., the photoelectric current, is proportional to the intensity of the incident light (given that the frequency is above the threshold). Since the 1960's, majority of the focus has vested in improving the sources – starting from a mercury arc lamp to employing light emitting diodes (LEDs) in more recent times. These developments made photoelectric effect experiment simple and has become standard in introductory undergraduate laboratory courses. However a different and equally important aspect of photoelectric effect is threshold frequency dependence. For a given material, there is a minimum frequency of incident light needed below which no photoelectrons are emitted even if the light source is very intense. This property of photoelectric effect is not easy to conceptualize for undergraduate students and is difficult to validate in an undergraduate physics laboratory. Here we demonstrate this property using red, green and blue ordinary light emitting diodes (LED) as sources as well as detectors. Furthermore this experiment is cost-effective as each LED costs less than 50 cents.

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Date submitted: 13 Sep 2013

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