Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Optical detection of cellular activation by optical stimulation SARMISHTHA SATPATHY, University of Texas at Arlington, SUBRATA BATBYAL, University of Texas System, YOUNG-TAE KIM, SAMARENDRA MOHANTY, University of Texas at Arlington — Despite the many advantages of patch clamp recordings, there have been efforts to find alternative methods for measuring action potentials in neurons as electrode methodologies have limited spatial resolution, rely on mechanical stability, and are hence cumbersome to use. Here, we report use of optical methods that allow detection of cells with increased spatial information. We demonstrate use of calcium dyes or genetic voltage/ion indicators for optical detection of influx of Ca^{2+}ions as a measure of optical stimulation. We also show that phase information of light transmitted or reflected from the activated-cell can be used to non-invasively measure changes in optical path length of the cells during optical activation. Further, we report use of polarized light for wide-field detection of optogenetically-stimulated activity in cells, requiring no exogenous labeling, making it possible to detect cellular activity with high spatial and temporal resolution by wide-field polarimetric/phase imaging. With optical detection of neural activities, the whole process of identification, activation and detection can be made non-invasive added with the advantages of high throughput and least requirement of mechanical stability and contamination.

Subrata Batbyal
University of Texas at Arlington

Date submitted: 14 Nov 2014 Electronic form version 1.4