Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Exploring Membrane Dynamics during Electric Pulse Exposure with Second Harmonic Generation ERICK MOEN, Univ of Southern California, BENNETT IBEY, HOPE BEIER, Air Force Research Lab, ANDREA ARMANI, Univ of Southern California — Optical second harmonic generation (SHG) is a powerful tool for investigating the nanostructure of symmetry-breaking materials and interfacial layers. Recently, we developed an imaging technique based on SHG for quantifying and localizing nanoporation in the plasma membrane of living cells. Nanosecond pulsed electric fields (nsPEF) were used to controllably disrupt the membrane, and the observed changes were validated against an extensible cell circuit model. In this talk, I will discuss the development of this method and its application to various cell types and stimuli, with a specific focus on bipolar (BP) nsPEF. BP nsPEF hold special interest as a cellular insult because they allow for a unique exposition of transmembrane potential and membrane charging/relaxation. Using this approach, we examine the structural response of the membrane as the temporal spacing between pulse phases was varied over several orders of magnitude and compare these results to the response when the cell is exposed to a monopolar (MP) nsPEF. Disagreement of the experimental results with the model demonstrates that biological processes may play a larger role than previously thought. These findings could lead to a greater understanding of the fundamental processes essential to all electroporation.

Erick Moen
Univ of Southern California

Date submitted: 09 Nov 2016 Electronic form version 1.4