Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Dielectric sensors for measuring membrane potential[1] KIMAL RAJAPAKSHE, ASANGA WIJESINGHE, JIE FANG, WILLIAM WIDGER, JOHN MILLER — Membrane potential in a biological cell depends on the ionic concentration difference between the extracellular and the intracellular medium. Ions close to the membrane show high polarizations under an electric field. Recent theoretical studies have related these polarizations to the alpha (α) dispersions in the impedance spectroscopy of a cell suspension. Therefore these dispersions can be used to measure the membrane potential of a single cell. Here we report the dielectric properties of phosphatidylcholine liposomes and its changes with the membrane potential. Liposomes have been prepared to have a higher concentration of potassium ions (K^+) inside the membrane compared to external medium. Under valinomycin (K^+ ionophores) these liposomes generate a negative membrane potential, as verified by fluorescent voltage sensitive dye measurements. Both dielectric and conductivity spectra display low frequency dispersions that are dependent on membrane potential. Possible future applications include noninvasive sensors for in vitro testing of new drugs and other applications.

[1]The authors acknowledge support by R21CA122153 from NHLBI & NCI, NIH, & from NSF, by the Welch Foundation (E-1221), and by TcSUH.

Kimal Rajapakshe
University of Houston

Date submitted: 21 Nov 2010 Electronic form version 1.4