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**The effect of size distributions of magnetic nanoparticles on the AC magnetic susceptibility as Biomolecule Sensor** JOSEPH NUTTING, AMIT SHARMA, JIJI ANTONY, DANIEL MEYER, YOU QIANG, University of Idaho Physics Dept — Magnetic nanoparticles in a liquid have two relaxation times, Néel, $\tau_N$, and Brownian relaxation, $\tau_B$. For particles larger than 10-20nm, $\tau_N$ quickly becomes much larger than $\tau_B$ and can be ignored. $\tau_B$ is from rotation of the particle, and has a relaxation period from $10^{-1}$ to $10^{-5}$ seconds. This causes the imaginary part of the AC magnetic susceptibility, $\chi = \chi' + i\chi''$, to display a maximum at a frequency $f = 1/2\pi\tau_B$. $\tau_B$ is related to the particle's size and can be used to create a sensor capable of detecting molecules. Because this is based on particle size, a size distribution will broaden the curve and reduce the sensitivity. Several groups have reported theoretical and experimental research results using this kind of sensor to detect biomolecules but have not paid attention on the size effects of sensitivities. Our group has synthesized monodispersive nanoparticles with size distribution less than 5%, and calculated the effect of size distribution of magnetic nanoparticles on the AC susceptibility. E-Mail: ouqiang@uidaho.edu; Supported by NSF-EPSCoR, NIH-INBRE.

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