Abstract Submitted
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Charge Content In Nanometer Rings from Atomic Force Microscope (AFM) Traces[1] F. ZYPMAN, Yeshiva University, S. EPPELL, Case Western Reserve University, M. FEINSTEIN, Y. FRIED, D. LAZAREV, C. METZGER, Yeshiva University — The last few years have seen a growing interest in identifying charge content in small structures such as graphene ribbons and aromatic biorings. More generally it is believed that charge content in proteins holds the key to the ultimate understanding of biological self-assembly. Here we describe a model system, a charged ring inside liquid probed by an AFM tip, and show how the charge content and the relative size of the ring with respect to the tip affect the measured force. More importantly, we explain how to measure the charge from the AFM experimental data [1]. The process involves the modeling of the dynamics of the tip-cantilever sensor under the influence of the charged sample, but also of ambient hydrodynamic forces, electrostatic interactions that appear due to charge induction in the tip and electrolytic screening. Of particular relevance is the possibility of our approach to treat analytically the size of ions. This is relevant when the tip-sample distance becomes sub-nanometric, and the more common description via Poisson-Boltzmann equation breaks down. [1] Mehlman and F.R. Zypman, Scanning Probe Microscope Force Reconstruction Algorithm via Time-Domain Analysis of Cantilever Bending Motion, J. Adv. Microsc. Res. 9, 268-274 (2014).

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