Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Active Dynamic Frictional Probes JOSHUA STEIMEL, JUAN ARAGONES, ALFREDO ALEXANDER-KATZ, Massachusetts Inst of Tech-MIT — In biological systems there are a myriad of interactions occurring instantaneously and these interactions can vary drastically in the strength of the interaction, the speed at which this interaction occurs, and the duration of the interaction. When multiple interactions occur any of these factors can determine which particular interaction is dominant. However, currently it is extremely difficult to measure binding affinity, K_{on}, and K_{off} rates in a relatively high throughput manner. Here we propose a novel and versatile system that will be able to detect differences in binding affinity of wide range of transient interactions and will be able to extract the relevant time scales of these interactions. Our system will utilize ferromagnetic particles that can be easily functionalized with a receptor of interest and the substrate will be coated in the corresponding ligand. A rotating magnetic field will cause particles, henceforth referred to as rollers, to rotate and this rotational motion will be converted into translational motion via the effective frictional force induced by interaction that is being probed. By measuring the translation of the rollers to a baseline, where only hydrodynamic friction occurs, we can measure the relative strength of the interactions. We can also potentially measure kinetic information by changing the frequency at which the magnetic field rotates, since changing the frequency at which the bead rotates is akin to changing the time allowed for bond formation. We will measure a wide range of interaction including ionic, metal-ion coordination, IgG-Protein A complex, and biotin-streptavidin complex.

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Date submitted: 14 Nov 2014 Electronic form version 1.4