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Carbon Nanotube Field Effect Transistor based High Frequency Biosensors GIRISH KULKARNI, KAI BOON EE, ZHAOHUI ZHONG, University of Michigan, Ann Arbor — The sensitivity of transistor based biosensors suffers from the electrostatic screening due to mobile ions in solution. Here, we use carbon nanotube field effect transistor based high frequency biosensors for detection in high ionic strength solutions. Carbon nanotube transistors are configured as high frequency mixers and the changes in mixing current provides the sensing mechanism. At high frequencies, the ions are unable to follow the AC field and hence, electrostatic screening is minimized. In addition, the high transconductance of the transistor provides intrinsic gain for high frequency sensing. To prove this concept we demonstrate protein detection in $\sim 100\text{mM}$ buffer solution with high sensitivity. The technique will be evaluated against both, low frequency transistor based biosensors and conventional dielectric sensing technique relying on impedance measurement. The result will lead to novel biosensors for point-of-care applications, where electronic sensors functioning directly in physiologically relevant condition are required.

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