

Silicon NMR Radio-Frequency Biomolecular Sensor

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Technical Abstract:

Recent work will be presented that showcases how silicon radio-frequency (RF) chips can be used not only for wireless RF applications, but also for biomolecular sensing aimed at low-cost disease screening. The main function of the group's RF chip is to manipulate and monitor the dynamics of protons in water via nuclear magnetic resonance (NMR). Target biological objects such as cancer marker proteins alter the proton dynamics, which is the basis for the biosensing. The high sensitivity of our RF chip made possible our construction of an entire NMR system around the RF chip in a 100-g platform (the group's unpublished, newest system), which is 1200 times lighter, yet 150 times more spin-mass sensitive than a state-of-the-art commercial benchtop NMR system. The system can become a useful addition in pursuing disease detection in a low-cost, hand-held platform.