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Optimizing the signal-to-noise ratio for biosensing with carbon nanotube transistors IDDO HELLER, JAAN MANNIK, SERGE G. LEMAY, CEES DEKKER, Delft University of Technology — The signal-to-noise ratio (SNR) for real-time biosensing with liquid-gated carbon nanotube transistors is crucial for exploring the limits of their sensitivity, but has not been studied thus far. We show that, surprisingly, the maximum SNR is obtained when the device is operated in the sub-threshold regime. In the ON-state, additional contributions to the noise lead to a reduction of the SNR by up to a factor of 5. For devices with passivated contact regions, the SNR in ON-state is even further reduced than for bare devices. Interestingly, a conventional back gate provides a handle to improve the SNR in ON-state by increasing the conductivity of the contact regions. The results presented here demonstrate that biosensing experiments can best be performed in the sub-threshold regime for optimal SNR.

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