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Development of an electrical nanopore device towards the control of the translocation of DNA with single base resolution[1] HONGBO PENG, BINQUAN LUAN, STANISLAV POLONSKY, STEPHEN ROSSNAGEL, GUSTAVO STOLOVITZKY, IBM Research at Thomas J. Watson Research Center
— Recently, application of nanopores to low-cost DNA sequencing has attracted great interest as there is great need to reduce the cost of sequencing a whole human genome to $1000. A key issue in the field of nanopore DNA sequencing is to control the DNA translocation. Here we will report the development of what we call a "DNA transistor": a nanopore-based electrical device for controlling the translocation of DNA with single base resolution. The key part of this device is a free standing membrane, within which multiple layers of electrically addressable metal electrodes separated by dielectric layers are embedded. A 1-5 nanometer size pore is made through the membrane. We demonstrated that such a device is electrically viable for the electrode layer or the spacing dielectric layer as thin as 3 nm in 1 mM KCl solution. Induced electrical signals on the nano-electrodes by the translocating DNA, as well as the modulation of DNA translocation speed by the voltage bias applied on the nanoelectrodes are also observed. Our ongoing experiments test if the modulated electrical field can trap or translocate DNA at a single base resolution.

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