

Supporting information for

Electro-osmotic trapping and compression of single DNA molecules while passing through a nanopore

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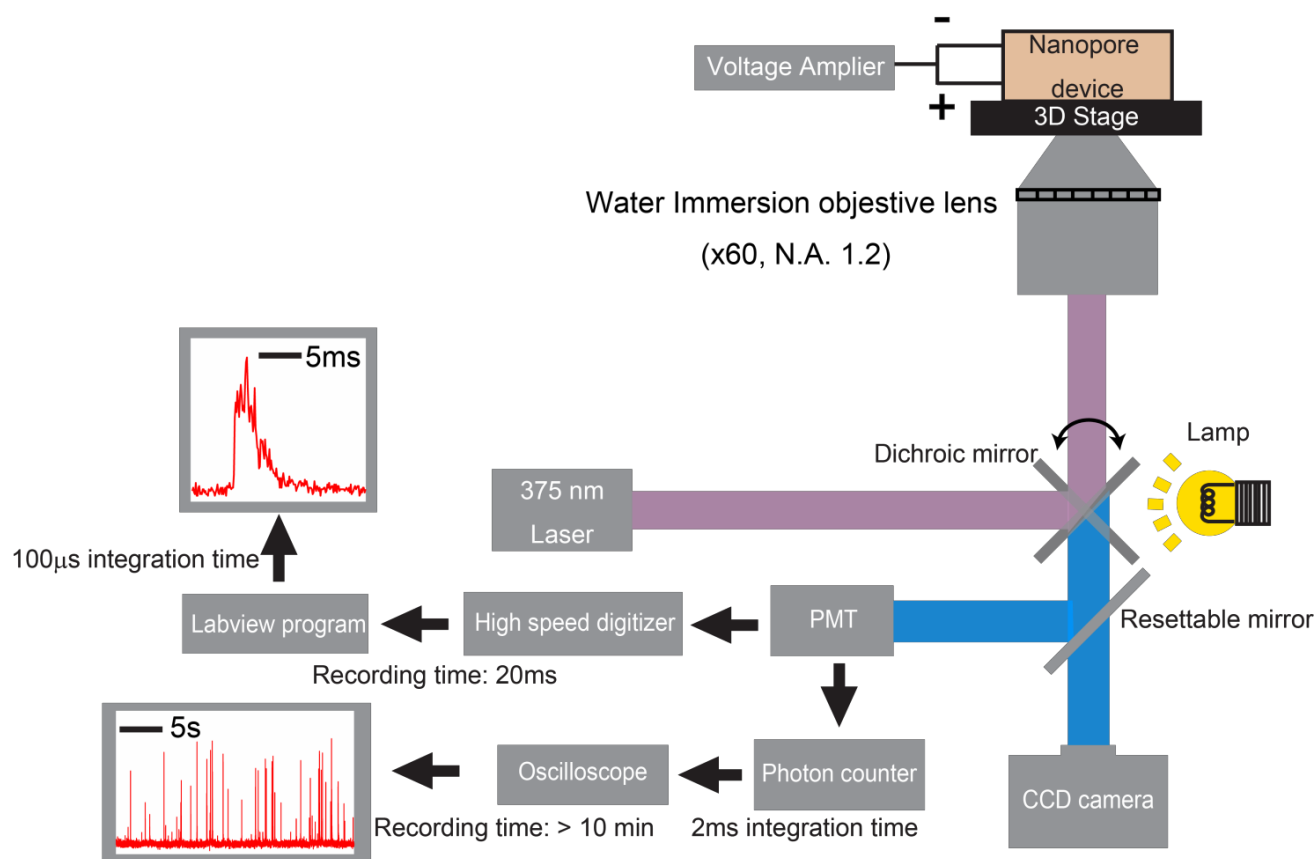
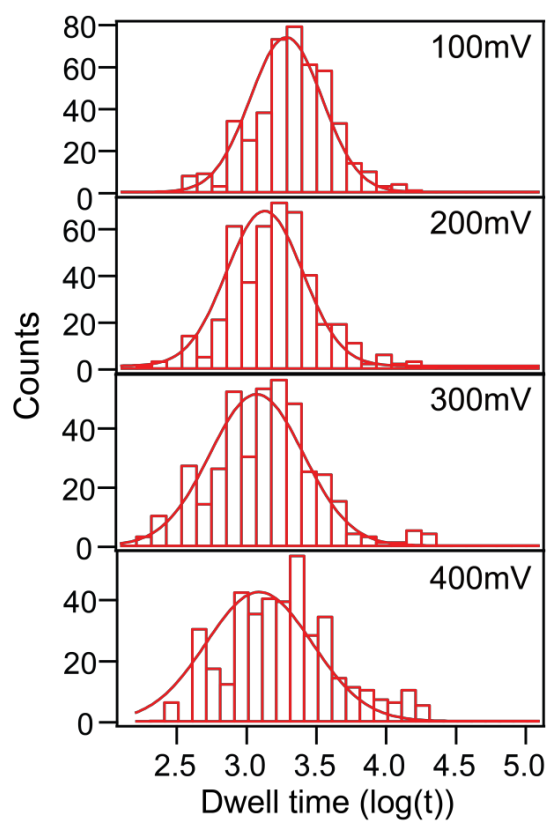


Figure S1. Experimental setup. Nanopore device was placed on 3D stage (FS-1020PXY, SIGMA TECH and TDC001, Thorlab). 375 nm laser was collimated before focusing on a Silicon membrane using a N.A. 1.2, water immersion objective lens (60x, UPlanApo, Olympus). Dichroic mirror (Di02-R405, Semrock) was placed in microscope (TE2000-U, Nikon). Membrane image was obtained using CCD camera by rotating dichroic mirror to illuminate lamp light. Resetttable mirror was used to control light path to CCD and Photo multiplier (PMT). When a photon arrives at PMT, it burst 1 V pulse with 20 nm width signals. The number of pulse signals was counted using photon counter (SR400, Stanford Research Systems), which converted electrical signal amplitude corresponding photon counts per 2 ms. The signal was recorded using Oscilloscope. For FSPS, pulse electrical signal was recorded using High speed digitizer with sampling rate and the number of it was counted by Labview program.

a.



b.

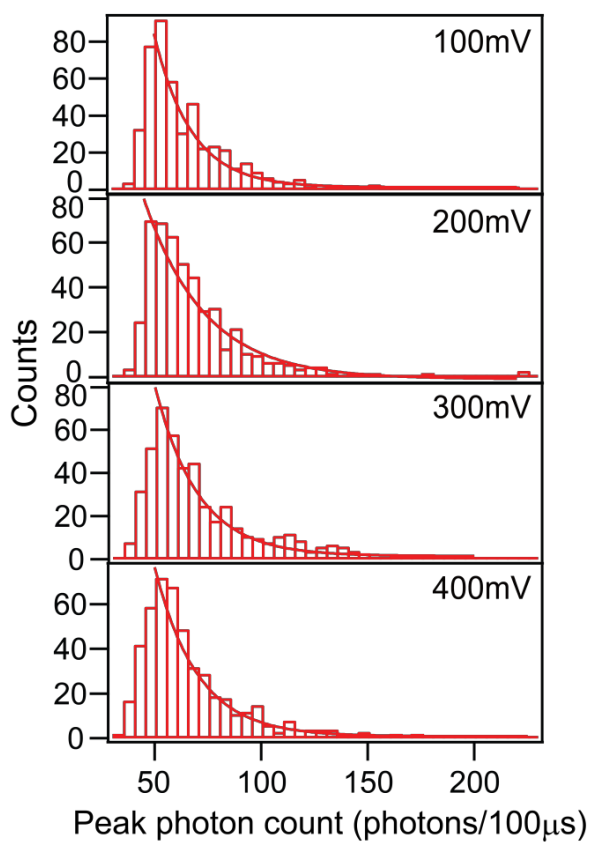


Figure S2. (a) Histograms of FB logged dwell time. (b) Histograms of FB peak photon counts.

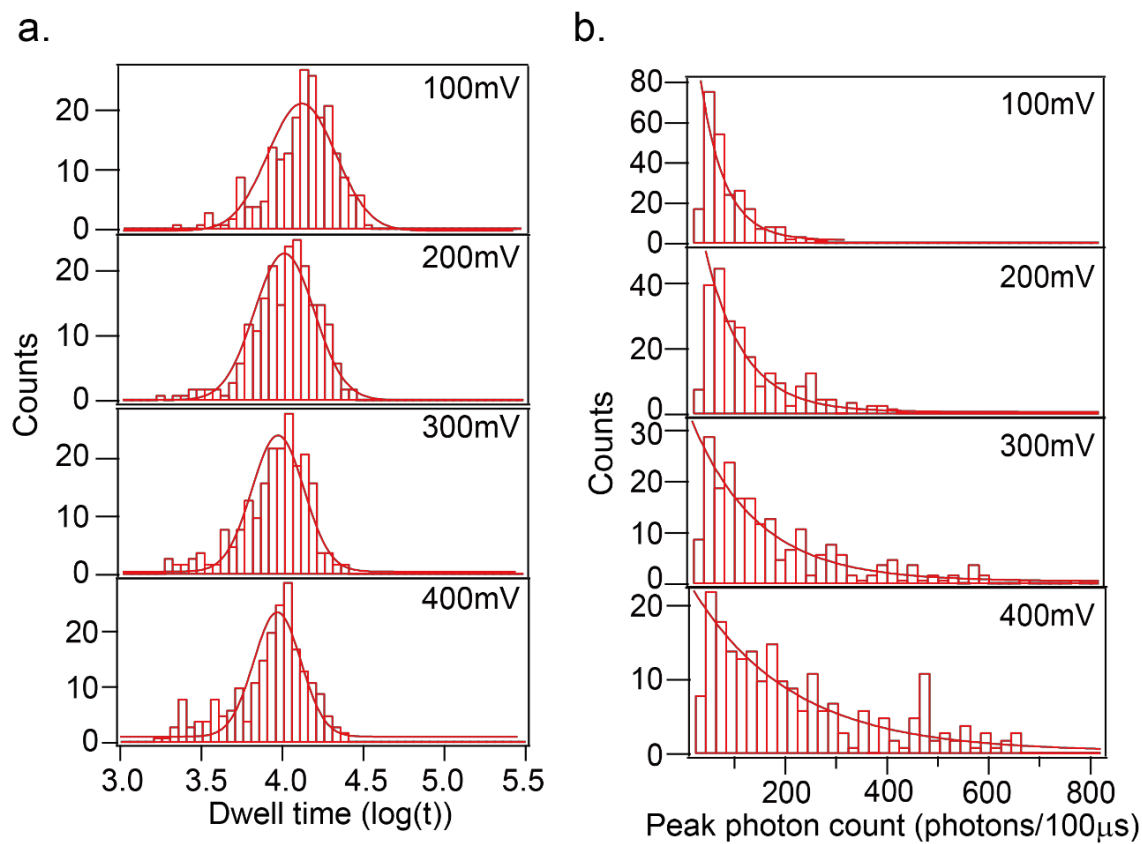


Figure S3. (a) Histograms of Lambda DNA logged dwell time. (b) Histograms of Lambda DNA peak photon counts.

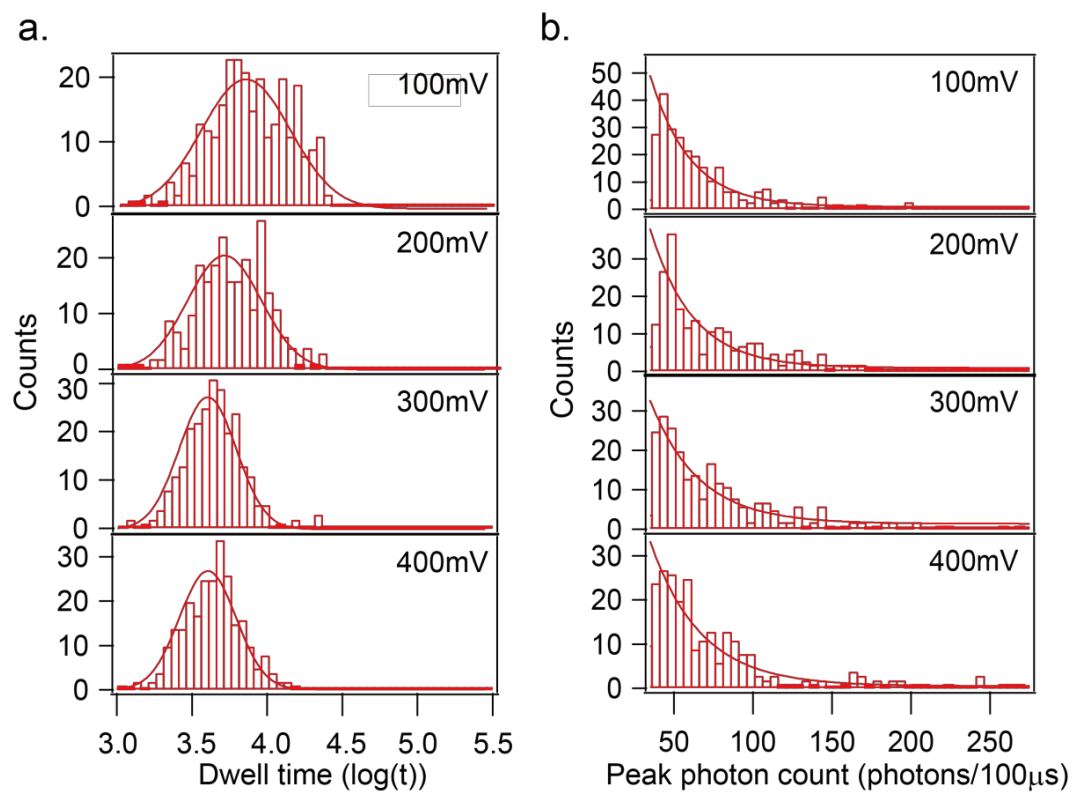


Figure S4. (a) Histograms of 6 kbp DNA logged dwell time. (b) Histograms of 6 kbp DNA peak photon counts.

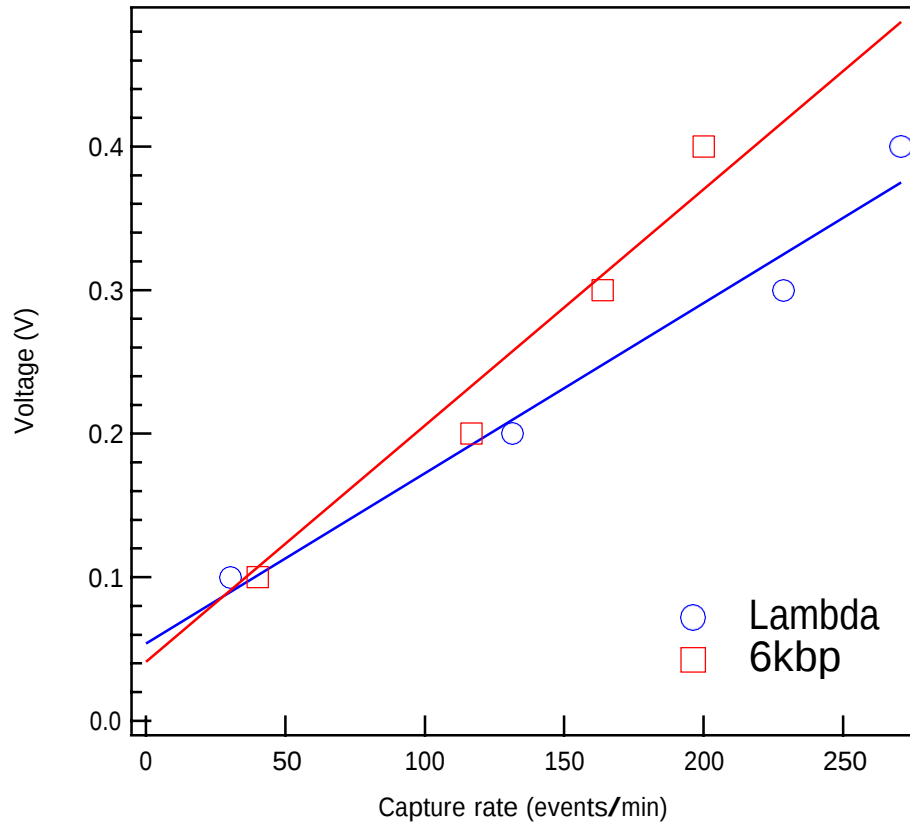


Figure S5. Lambda/6kbp capture rate (R) v.s. Voltage (V). Blue and red represent Lambda DNA and 6kbp DNA, respectively. Line fitting on lambda DNA and 6kbp DNA were $V=1.2 \times 10^{-3} \times R + 0.054$ and $V=1.6 \times 10^{-3} \times R + 0.042$. The extrapolated fitting lines provide threshold voltage of lambda DNA and 6kbp DNA, 0.054V and 0.042V, respectively. Capture rates at any voltages were measured by counting photon bursts at continuous PL trace (Figure 1C).

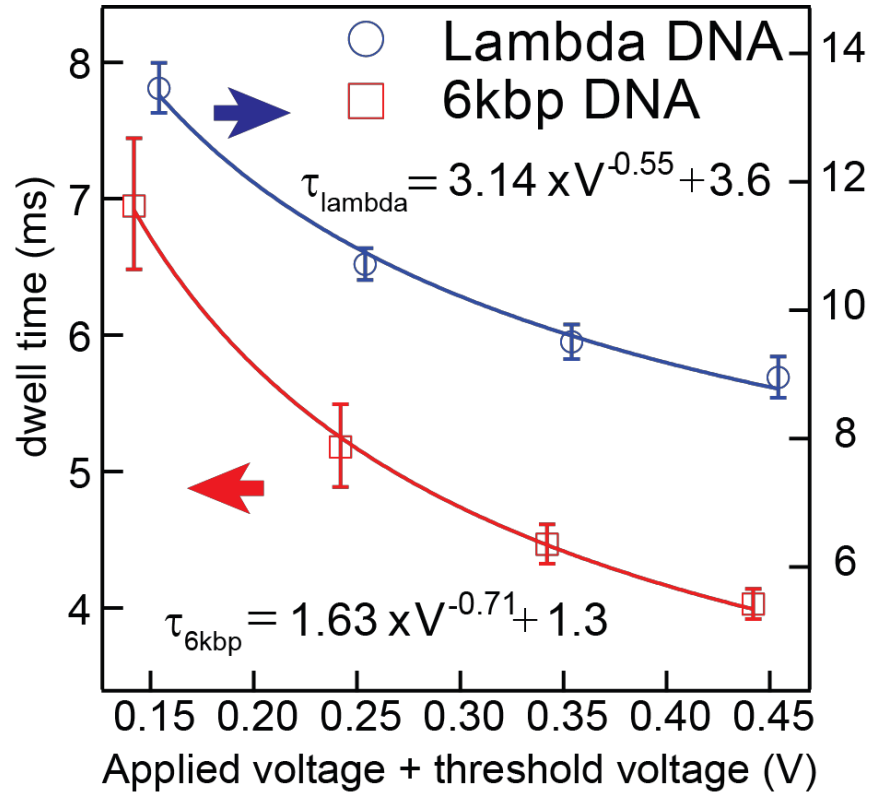


Figure S6. Dwell time v.s. Applied voltage+ threshold voltage. Threshold voltage of Lambda DNA (Blue) and 6kbp DNA (red) are estimated from Figure S5, 0.054V and 0.042V. Fitting equation on Lambda DNA and 6kbp DNA are $\tau_{\text{lambda}} = 3.14 \times V^{-0.55} + 3.6$ and $\tau_{\text{6kbp}} = 1.63 \times V^{-0.71} + 1.3$, respectively.