

Abstract Submitted
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Entropic trapping of single DNA molecules emerging from a nanopore¹ XU LIU, MIRNA MIHOVILOVIC, DEREK STEIN, Brown University — We developed nanostructures with a cavity that receives and entropically traps a single DNA molecule after it translocates a nanopore in the cavity wall. The 1.5 μm -high, 2.2 μm -wide cavity has a 200 nm-wide opening across from the nanopore that is too large to affect the electrical resistance of the structure in solution, but small enough to confine λ DNA. A voltage bias drew a DNA molecule through the nanopore, resulting in a blockage of the ionic current. 2 ms after the end of the translocation was detected, the bias was removed. A predetermined pause time, t_p , elapsed before a bias of the opposite polarity was applied. The current was monitored to detect the recapture of the same molecule. We found that the mean interval between the voltage reversal and the molecule's recapture, t_r , increased with t_p until $t_p = 700$ ms, where it saturated at $t_r \approx 250$ ms. The molecules were recaptured with nearly unit efficiency for all t_p tested, up to $t_p = 50$ s. By contrast, when DNA emerged from a nanopore into an open reservoir with no cavity, t_r increased continuously with t_p , and the probability of recapturing the molecule within 5 s of the voltage reversal dropped precipitously for $t_p > 1$ s.

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