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Modeling DNA-translocation through nanopores: Two case studies

Peter Reimann*, **Andreas Meyer, Thomas Töws, Sebastian Getfert**

Fakultät für Physik, Universität Bielefeld, Bielefeld, Germany
*reimann@physik.uni-bielefeld.de

In the first part we reconsider the model of Lubensky and Nelson for the electrically driven translocation of polynucleotides through an alpha-hemolysin pore [1]. We show that the model correctly describes two further important properties of the experimentally observed translocation time distributions, namely their spread (width) and their exponential decay [2].

In the second part we focus on the translocation of elongated cylindrical particles (oligomers, nanorods, etc.) through a solid state nanopore. Particular emphasis is put on the interplay of electrophoresis, electroosmosis, and osmotic pressure beyond the realm of small Debye lengths. We find that the net potential energy difference across the membrane may be of opposite sign for short and long particles. Thermal noise thus leads to biased diffusion through the pore in opposite directions. The specific particle length at which this transport inversion occurs can be controlled by means of a membrane gate electrode [3].

References

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