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DNA transport in magnetic arrays NICOLAS MINC, JEAN-LOUIS VIOVY, KEVIN DORFMAN, Institut Curie, MMBM TEAM — We present a experimental/theoretical study of the microfluidic electrophoresis of long DNA in an innovative matrix consisting of a hexagonal array of magnetic bead columns. Using videomicroscopy, we examined the motion of long T4 DNA (169 kbp) under a wide range of array densities and electric fields. By tracking the motion of many individual DNA molecules, we computed (i) the distribution of collision times; (ii) the collision probability; (iii) and the mean passage time through the viewing area. Based on our single molecule results, we will present a model focusing upon the non-Markovian characteristic of the transport in the array. DNA transport is represented by a Scher-Lax walk, where each molecule undergoes cycles of collisions. The model qualitatively and quantitatively captures the main features on separation in microarrays. As this work represents the first systematic theoretical study of dispersion in these devices, it is a significant step towards a detailed understanding of realistic miniaturized separation systems.

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