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Single-Molecule Denaturation Mapping of DNA in Nanofluidic Channels WALTER REISNER, McGill University - Dept of Physics, NIELS LARSEN, Technical University of Denmark - Dept. of Micro- and Nanotechnology, ASLI SILAHTAROGLU, University of Copenhagen - Wihelm Johannsen Centre for Functional Genome Research, ANDERS KRISTENSEN, Technical University of Denmark - Dept. of Micro- and Nanotechnology, NIELS TOMMERUP, University of Copenhagen - Wihelm Johannsen Centre for Functional Genome Research, JONAS O. TEGENFELDT, Lund Univ./Univ, of Gothenburg - Dept of Physics, HENRIK FLYVBJERG, Technical University of Denmark - Dept. of Micro- and Nanotechnology — Nanochannel based DNA stretching can serve as a platform for a new optical mapping technique based on measuring the pattern of partial melting along the extended molecules. We partially melt DNA extended in nanofluidic channels via a combination of local heating and added chemical denaturants. The melted molecules, imaged via a standard fluorescence videomicroscopy setup, exhibit a nonuniform fluorescence profile corresponding to a series of local dips and peaks in the intensity trace along the stretched molecule. We show that this barcode is consistent with the presence of locally melted regions along the molecule and can be explained by calculations of sequence-dependent melting probability. Specifically, we obtain experimental melting profiles for T4, T7, lambda-phage and bacterial artificial chromosome DNA (from human chromosome 12) and compare these profiles to theory. In addition, we demonstrate that the BAC melting profile can be used to align the BAC to its correct position on chromosome 12.

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