Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Topological and metric properties of linear and circular DNA chains in nano-slits and nano-channels[1] ENZO ORLANDINI, Univ of Padova, CRISTIAN MICHELETTI, SISSA, Trieste — Motivated by recent advancements in single DNA molecule experiments, based on nanofluidic devices, we investigate numerically the metric and topological properties of a modelof open and circular DNA chains confined inside nano-slits and nano-channles. The results reveal an interesting characterization of the metric crossover behaviour in terms of the abundance, type and length of occuring knots. In particular we find that the knotting probability is nonmonotonic for increasing confinement and can be largely enhanced or suppressed, compared to the bulk case, by simply varying the slit or channel trasversal dimension. The observed knot population consists of knots that are far simpler than for DNA chains in spherical (i.e. cavities or capsids) confinement. These results suggest that nanoslits and nanochannels can be properly designed to produce open DNA chains hosting simple knots or to sieve DNA rings according to their knotted state. Finally we discuss the implications that the presence of knots may have on the dynamical properties of confined DNA chains such as chain elongation, injection/ejection processes and entanglement relaxation.

[1]We acknowledge financial support from the Italian ministry of education, grant PRIN 2010HXAW77

Enzo Orlandini
Univ of Padova

Date submitted: 14 Nov 2013 Electronic form version 1.4