Tube Radius in Entangled Networks of Semiflexible Polymers
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Munich, Germany — The mechanical properties of the cytoskeleton play an im-
portant role in many cellular functions like locomotion or adhesion. One of the
cytoskeleton’s dominant constituents is a network structure composed of the semi-
flexible polymer F-Actin. To connect the single polymer properties to the macro-
scopic behavior of the network, a single polymer is considered to be constrained to a
tube established by neighboring filaments. Here we focus on the tube’s diameter in
entangled networks. While scaling laws for the tube diameter are well established,
the absolute value is still under debate and different theoretical concepts and exper-
imental measurements exist. We present a new approach to the problem and have
conducted extensive computer simulations to check the validity of our assumptions.
A model of independent rods is used to describe the confinement of a single semi-
flexible polymer in the network environment. A self-consistency approach allows
us then to derive an absolute tube radius for the network as a function of several
parameters and compare our results to experimental measurements.