Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Long Range Bond-Bond Correlations in Polymer Melts[1] SERGEI OBUKHOV, University of Florida, JOACHIM WITTMER, HENDRICK MEYER, JORG BASCHNAGEL, ALBERT JOHNER, LETITIA MATTIONI, MARCUS MÜLLER, ALEXANDER SEMENOV — It is commonly accepted that in concentrated solutions or melts high-molecular weight polymers display random-walk conformational properties without long range memory between subsequent bonds. This has been anticipated already in the 1950s by Flory in his famous "ideality hypothesis." The absence of memory means that the correlation function, $C(n)$, of two bonds separated by n monomers along the chain should exponentially decay with n. This is the standard basis for defining an important experimental measure of chain stiffness, the persistence length. In our work we present numerical results and theoretical arguments, demonstrating a non-exponential, long ranged decay of $C(n)$ (see figure). Suggesting a profound analogy with the well-known long range velocity correlations in liquids and granular materials we find $C(n)$ to decay algebraically as $n^{-3/2}$. As a consequence, the operational definition of the persistent length should be carefully revisited.

[1] Supported by LEA

Sergei Obukhov
University of Florida

Date submitted: 04 Dec 2004

Electronic form version 1.4