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Summary: In the present paper, we investigate the collapsed phase of the interacting partially-directed self-avoiding walk (IPDSAW) that was introduced in Zwanzig and Lauritzen (J Chem Phys 48(8):3351, 1968) under a semi-continuous form and later in Binder et al. (J Phys A 23(18):L975-L979, 1990) under the discrete form that we address here. We provide sharp asymptotics of the partition function inside the collapsed phase, proving rigorously a conjecture formulated in Guttmann (J Phys A 48(4):045209, 2015) and Owczarek et al. (Phys Rev Lett 70:951-953, 1993). As a by-product of our result, we obtain that, inside the collapsed phase, a typical IPDSAW trajectory is made of a unique macroscopic bead, consisting of a concatenation of long vertical stretches of alternating signs, outside which only finitely many monomers are lying.

MSC:
60K35 Interacting random processes; statistical mechanics type models; percolation theory
82B41 Random walks, random surfaces, lattice animals, etc. in equilibrium statistical mechanics

Keywords:
polymer collapse; large deviations; random walk representation; local limit theorem

Full Text: DOI

References:
[14] Perfré, E., Wachtel, V.: Local tail asymptotics for the joint distribution of length and of maximum of a random walk


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