A dilute solution of long-flexible polymer chains trapped between two parallel walls: Massive field theory approach

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The massive field theory approach in fixed space dimensions $d < 4$ is applied to investigate a dilute solution of long-flexible polymer chains in a good solvent trapped between two parallel impenetrable walls. The proposed calculations were performed for all cases of polymer-surface interactions: for two repulsive walls, two inert walls and combination of one repulsive and one inert wall. Taking into account the well known correspondence between the field theoretical ϕ^4 $O(n)$-vector model in the limit $n \to 0$ and the behavior of long-flexible polymer chains in a good solvent allowed to calculate up to one-loop order the monomer density profiles across the slit. Besides, the two-loop order calculations for the critical exponents characterizing the density profiles of end points near the walls were carried out. The obtained results are in good agreement with previous theoretical investigations [1],[2] and with results of Monte Carlo simulations for the case of two repulsive walls [3].

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