

ON THE DIFFUSIVE-MEAN FIELD LIMIT FOR WEAKLY INTERACTING DIFFUSIONS EXHIBITING PHASE TRANSITIONS

G. PAVLIOTIS

ABSTRACT. I will present recent results on the statistical behaviour of a large number of weakly interacting diffusion processes evolving under the influence of a periodic interaction potential. We study the combined mean field and diffusive (homogenisation) limits. In particular, we show that these two limits do not commute if the mean field system constrained on the torus undergoes a phase transition, i.e., if it admits more than one steady state. A typical example of such a system on the torus is given by mean field plane rotator (XY, Heisenberg, $O(2)$) model. As a by-product of our main results, we also analyse the energetic consequences of the central limit theorem for fluctuations around the mean field limit and derive optimal rates of convergence in relative entropy of the Gibbs measure to the (unique) limit of the mean field energy below the critical temperature. This is joint work with Matias Delgadino (U Texas Austin) and Rishabh Gvalani (MPI Leipzig).