

Abstract Submitted  
for the MAR12 Meeting of  
The American Physical Society

**Thermodynamic limit, quasi-stationary states and the range of pair interactions** ANDREA GABRIELLI, Istituto dei Sistemi Complessi - CNR (Rome, Italy), MICHAEL JOYCE, LPNHE - Université Paris 6 (France), BRUNO MARCOS, Lab. J.A. Dieudonné, UMR 6621, Université de Nice (France) — “Quasi-stationary” states are approximately time-independent out of equilibrium states which have been observed in a variety of systems of particles interacting by long-range interactions. We investigate here the conditions of their occurrence for a generic pair interaction  $V(r \rightarrow \infty) \sim 1/r^\gamma$  with  $\gamma > 0$ , in  $d > 1$  dimensions. We generalize analytic calculations known for gravity in  $d = 3$  to determine the scaling parametric dependences of their relaxation rates due to two body collisions, and report extensive numerical simulations testing their validity. Our results lead to the conclusion that, for  $\gamma < d - 1$ , the existence of quasi-stationary states is ensured by the large distance behavior of the interaction alone, while for  $\gamma > d - 1$  it is conditioned on the short distance properties of the interaction, requiring the presence of a sufficiently large soft-core in the interaction potential.

Andrea Gabrielli  
Istituto dei Sistemi Complessi - CNR (Rome, Italy)

Date submitted: 25 Oct 2011

Electronic form version 1.4