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On Lieb-Robinson bounds for long-range interacting bosons

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Abstract:

We prove a thermodynamically stable Lieb-Robinson bound (LRB) for bosons with long-range interaction on lattices. The condition is that the initial state admits (i) uniformly bounded density from above and (ii) no particle in the region separating the initial supports of the observables entering the LRB. Furthermore, if the initial state has controlled density from both above and below, then the validity threshold for decay rate of the hopping terms can be improved to $\alpha > d+ 2$. The proof is based on the weak LRBs and the thermodynamically stable bounds on particle transport obtained in recent joint works with Lemm, Rubiliani, and Sigal.