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Propagation of information in long-range interacting lattice systems ZHE-XUAN GONG, MICHAEL FOSS-FEIG, Joint Quantum Institute, SPYRIDON MICHALAKIS, California Institute of Technology, ALEXEY V. GORSHKOV, Joint Quantum Institute — Propagation of information in short-range interacting lattice systems is restricted to within a linear "light cone," as demonstrated by the well-known Lieb-Robinson bound, thus ensuring a well defined notion of maximum propagation velocity. Whether long-ranged interactions can lead to a different shape of this light cone, and the divergence of the associated velocity, is an important but largely unexplored question. We prove that for a wide class of long-range interacting lattice systems, a linear light cone still exists for certain regions of space and time, and for some experimentally relevant classes of models this linear light cone persists in the entire space-time. We then give counter-examples showing that, for well-engineered lattice system, long range interactions can indeed give rise to a sub-linear "light cone," and thus a divergent speed of information propagation.

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