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Cluster state generation using long-range interactions ELENA KUZNETSOVA, TANK BRAGDON, ROBIN COTE, SUSANNE YELIN, University of Connecticut — We propose and analyze generation of the cluster state with neutral atoms and polar molecules in optical lattices using long-range dipole-dipole and van der Waals interactions. The cluster state can be realized by performing a phase gate between pairs of neighboring atoms. A finite number of operations is required, making it easily scalable to a large number of qubits. We discuss the viability of the scheme with Rb and alkali dimers as examples.

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