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Entanglement entropy of the ground state of the Lieb-Liniger model C. M. HERDMAN, P.-N. ROY, University of Waterloo, ROGER MELKO, University of Waterloo and Perimeter Institute for Theoretical Physics, ADRIAN DEL MAESTRO, University of Vermont — We consider the entanglement between two spatial subsystems in the Lieb-Liniger model of contact interacting bosons in continuous space in one dimension. Using a continuous-space ground state path integral quantum Monte Carlo method, we numerically compute the Rényi entropy of the reduced density matrix of the subsystem as a measure of entanglement. Our numerical algorithm is based on the replica method previously introduced by the authors, which we have extended to efficiently study large spatial subsystems using a ratio approach. We confirm a logarithmic scaling of the Rényi entropy with subsystem size that is expected from conformal field theory and compute the non-universal sub-leading constant for interaction strengths ranging over several orders of magnitude. In the strongly interacting limit, we find agreement with the known free fermion result.

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