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Particle partition entanglement of one-dimensional spinless fermions HATEM BARGHATHI, EMANUEL CASIANO-DIAZ, ADRIAN DEL MAESTRO, University of Vermont — We investigate the scaling of the Rényi entanglement entropies for a particle bipartition of interacting spinless fermions in one spatial dimension. In the Tomonaga-Luttinger liquid regime, we calculate the second Rényi entanglement entropy and show that the leading order finite-size scaling is equal to a universal logarithm of the system size plus a non-universal constant. Higher-order corrections decay as a power-laws in the system size with exponents that depend only on the Luttinger parameter. We confirm the universality of our results by investigating the one dimensional $t - V$ model of interacting spinless fermions via exact-diagonalization techniques. The resulting sensitivity of the particle partition entanglement to boundary conditions and statistics points to its utility in future studies of novel quantum liquids.

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