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Scaling of Entanglement Entropy in Point Contact Free Fermion Systems[1] BASSIR CARAVAN, GREGORY LEVINE, Hofstra University, BARRY FRIEDMAN, Sam Houston State University — The scaling of entanglement entropy is computationally studied in several $1 < d \leq 2$ dimensional free fermion systems that are connected by one or more point contacts (PC). For both the k-leg Bethe lattice ($1 < d < 2$) and $d = 2$ rectangular lattices with a subsystem of L^d sites, the entanglement entropy associated with a *single* PC is found to be generically $S \sim L$. We argue that the $O(L)$ entropy is a reflection of the subdominant $O(L)$ entropy of the bulk entropy-area law. For $d = 2$ (square) lattices connected by m PCs, the area law is found to be $S \sim aL^{d-1} + bm \log L$ and is thus consistent with the anomalous area law for free fermions ($S \sim L \log L$) as $m \to L$. For the Bethe lattice, the relevance of this result to Density Matrix Renormalization Group (DMRG) schemes for interacting fermions is discussed.

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