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Entanglement entropy between two coupled Tomonaga-Luttinger liquids SHUNSUKE FURUKAWA, YONG BAEK KIM, Dept. of Physics, University of Toronto — We consider a system of two coupled Tomonaga-Luttinger liquids (TLL) on parallel chains and study the Rényi entanglement entropy S_n between the two chains. The limit $n \to 1$ corresponds to the von Neumann entanglement entropy. The system is effectively described by two-component bosonic field theory with different TLL parameters in the symmetric/antisymmetric channels. We argue that in this system, S_n is a linear function of the length of the chains followed by a universal subleading constant γ_n determined by the ratio of the two TLL parameters. We derive the formulae of γ_n for integer $n \geq 2$ using (a) ground-state wave functionals of TLLs and (b) conformal boundary states, which lead to the same result. These predictions are checked in a numerical diagonalization analysis of a hard-core bosonic model on a ladder. Although our formulae of γ_n are not analytic in the limit $n \to 1$, our numerical result suggests that the subleading constant in the von Neumann entropy is also universal.

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