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Scaling of entanglement in (2 + 1)-dimensional critical field theories[1] XIAO CHEN, GIL YOUNG CHO, THOMAS FAULKNER, EDUARDO FRADKIN, UIUC — We study the universal scaling behavior of the entanglement entropy of critical theories in (2+1) dimensions. We specially consider two fermionic critical models, the Dirac and quadratic band touching models, and numerically study the two-cylinder entanglement entropy of the models on the torus. We find that the entanglement entropy satisfies the area law and has a finite subleading term which is a scaling function of the length scales of the torus. To find the analytic form of the scaling function, we test three possible scaling functions derived from the quasi-one-dimensional conformal field theory, the bosonic quantum Lifshitz model, and the holographic AdS/CFT correspondence. To high precision, we find that the subleading term is consistent with the scaling form of the quantum Lifshitz model for both the fermionic models and that of the AdS/CFT correspondence for the Dirac model. Based on this observation and the previous studies on the subleading terms of entanglement entropy of bosonic critical theories which were found consistent with the scaling subleading term of the quantum Lifshitz model, we propose a universal scaling form of the subleading term for the entanglement entropy of (2+1)-dimensional critical models on the torus.

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