Entanglement entropy of the large $N$ Wilson-Fisher conformal field theory\(^1\) SETH WHITSITT, Harvard Univ, WILLIAM WITCZAK-KREMPA, Université de Montréal, SUBIR SACHDEV, Harvard Univ — We compute the entanglement entropy of the Wilson-Fisher conformal field theory (CFT) in 2+1 dimensions with $O(N)$ symmetry in the limit of large $N$ for general entanglement geometries. We show that the leading large $N$ result can be obtained from the entanglement entropy of $N$ Gaussian scalar fields with their mass determined by the geometry. For a few geometries, the universal part of the entanglement entropy of the Wilson-Fisher CFT equals that of a CFT of $N$ massless scalar fields. However, in most cases, these CFTs have a distinct universal entanglement entropy even at $N = \infty$. Notably, for a semi-infinite cylindrical region it scales as $N^0$ in the Wilson-Fisher theory, in stark contrast to the $N$-linear result of the Gaussian fixed point.

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