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Demonstrating non-Abelian statistics of Majorana fermions using twist defects HUAIXIU ZHENG, ARPIT DUA, LIANG JIANG, Yale University — We study the twist defects in the toric code model introduced by Bombin [Phys. Rev. Lett.105, 030403 (2010)]. Using a generalized 2D Jordan-Wigner transformation and a projective construction, we show explicitly the twist defects carry unpaired Majorana zero modes. In addition, we propose a quantum non-demolition measurement scheme of the parity of Majorana modes. Such a scheme provides an alternative avenue to demonstrate the non-Abelian statistics of Majorana fermions. The braiding operation is simulated by an efficient measurement-based approach that removes the uncertainty associated with the previous forced measurement scheme.

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