Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Parafermions in spin lattices ARPIT DUA, HUAIXIU ZHENG, LIANG JIANG, Yale Univ — We investigate the twist defects in the Z_N Toric code model first introduced by Bombin [Phys. Rev. Lett.105, 030403 (2010)] for the Z_2 model and then generalized and studied by You et al. [Phys. Rev. B 86, 161107(R) (2012)]. Using topological entanglement entropy (TEE) and generalized Jordan-Wigner transformation, we show explicitly that the twist defects carry unpaired Parafermion zero modes. We also demonstrate the fusion rules of these Parafermion modes using the TEE calculation. In addition, we propose a scheme for quantum non-demolition measurement of the topological charge of these modes. This scheme can be used to implement measurement-based braidings (MBBs) on Parafermions to implement gates for quantum computing.

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Date submitted: 06 Nov 2015 Electronic form version 1.4