**Universal Quantum Computing with Parafermions assisted by a
half fluxon** ARPIT DUA, Department of Physics and Yale Quantum Institute,
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JIANG, Department of Applied Physics and Yale Quantum Institute, Yale University — We propose a scheme to perform a Non-Clifford gate on a logical qudit encoded in a pair of Z_N parafermionic zero modes via the Aharonov Casher effect. $\sqrt{Z}$ is a non-Clifford gate for qudits with N greater than 2, where Z is one of the clock operators for an N-level qudit. This gate can be implemented by moving a half fluxon around the pair of parafermionic zero modes that can be realized in a two-dimensional set-up via existing proposals (such as Nature Comm. 4, 1348). The half fluxon can be created as a part of fluxon-antifluxon pair in a Josephson junction made of spinful chiral p-wave superconductors and then moved around the parafermionic zero modes. Supplementing this gate with the measurement based braiding of parafermions with fixed number of topological charge measurements (arXiv:1607.07475) provides the avenue for universal quantum computing with parafermions.

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