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Dephasing in a 5/2 quantum Hall Mach-Zehnder interferometer due to the presence of neutral edge modes YEHUDA DINAII, Ohio State Univ - Columbus, MOSHE GOLDSTEIN, Tel Aviv University, Israel, YUVAL GEFEN, The Weizmann Institute of Science, Israel — Non-Abelian statistics is an intriguing feature predicted to characterize quasiparticles in certain topological phases of matter. This property is both fascinating on the theoretical side and the key ingredient for the implementation of future topological quantum computers. A smoking gun manifestation of non-Abelian statistics consists of demonstrating that braiding of quasiparticles leads to transitions among different states in the relevant degenerate Hilbert manifold. This can be achieved utilizing a Mach-Zehnder interferometer, where Coulomb effects can be neglected, and the electric current is expected to carry clear signatures of non-Abelianity. Here we argue that attempts to measure non-Abelian statistics in the prominent quantum Hall fraction of 5/2 may fail; this can be understood by studying the corresponding edge theory at finite temperatures and bias. We find that the presence of neutral modes imposes stronger limitations on the experimental conditions as compared to quantum Hall states that do not support neutral edge modes. We discuss how to overcome this hindrance. Interestingly, neutral-mode-induced dephasing can be quite different in the Pfaffian state as compared to the anti-Pfaffian state, if the neutral and charge velocities are comparable.

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