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Non-Abelian Interferometry

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Topologically-ordered phases supporting excitations with non-Abelian braiding statistics are expected to occur at several observed fractional quantum Hall plateaux. These states are of particular interest as they may provide a platform for topological quantum computation. Interferometric experiments are likely to play a crucial role in both determining the non-Abelian nature of these states and in their potential applications for quantum computing. I will discuss interferometric experiments designed to detect such non-Abelian quasiparticle statistics – one of the hallmark characteristics of the Moore-Read and Read-Rezayi states, which are likely candidates for the observed fractional quantum Hall plateaux at $\nu = 5/2$ and $12/5$ respectively. Aside from their potential utility for experimental verification of non-Abelian anyonic statistics, such interferometric experiments would provide the most promising route to qubit read-out in a topological quantum computation. With these potential applications in mind, I will also address interferometric measurements of states having superpositions of anyonic charges and discuss their measurement collapse behavior.