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"Probing Non-Abelian Statistics With Quasiparticle Interferometry"

A concept of topological order originally introduced in the context of Fractional Quantum Hall Effect has recently become a hot topic in such diverse fields as high-temperature superconductivity, frustrated magnetism and quantum computation. From the point of view of quantum computation, one of the biggest challenges is making it fault-tolerant. Being able to use topological properties to encode quantum information can make it highly resistant to decoherence. Among other things, topological order is manifested by the non-trivial exchange statistics of excitations, Abelian and non-Abelian anyons.

I will discuss our proposal for an interferometric experiment to detect non-Abelian quasiparticle statistics -- one of the hallmark characteristics of the Moore-Read state expected to describe the observed Fractional Quantum Hall plateau at $\nu = 5/2$, as well as the Read-Rezayi state at $\nu = 12/5$. I will also address the implications for using these states for constructing topologically protected qubits such as the one recently proposed by Das Sarma, Freedman and Nayak.