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Creating photonic fractional quantum Hall states and braiding anyons[1] SHOVAN DUTTA, ERICH MUELLER, Laboratory of Atomic and Solid State Physics, Cornell University — We present and analyze a protocol in which polaritons in a non-coplanar optical cavity form fractional quantum Hall states. We model the formation of these states and present techniques for subsequently creating anyons and measuring their fractional exchange statistics. In this protocol, we use a rapid adiabatic passage scheme to sequentially add polaritons to the system, such that the system is coherently driven from n to $n+1$-particle Laughlin states. Quasiholes are created by slowly moving local pinning potentials in from outside the cloud. They are braided by dragging the pinning centers around one another and the resulting phases are measured interferometrically. The most technically challenging issue with implementing our procedure is that maintaining adiabaticity and coherence requires that the two-particle interaction energy V_0 is sufficiently large compared to the single-polariton decay rate γ, $V_0/\gamma \gg 10N^2 \ln N$, where N is the number of particles in the target state. While this condition is very demanding for present-day experiments where $V_0/\gamma \sim 50$, our protocol presents a significant advance over the existing protocols in the literature.

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