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Distinguishing Particle-Hole Conjugated Fractional Quantum Hall States Using Quantum Dot Mediated Edge Transport HSIN-HUA LAI, National High Magnetic Field Laboratory, KUN YANG, National High Magnetic Field Laboratory and Department of Physics, Florida State University — We first study the edge transport in the $\nu = 1/3$ and $\nu = 2/3$ Fractional Quantum Hall bars mediated by a $\nu = 1$ quantum dot. We conclude that the $\nu = 1/3$ and $\nu = 2/3$ systems show different 1/3-charged quasi-particle tunneling exponents. When the quantum dot becomes large, its edge states join those of the original Hall bar to reconstruct the edge state configurations. In the disorder-irrelevant phase, the two-terminal conductance of the original $\nu = 1/3$ system vanishes at zero temperature, while that of the $\nu = 2/3$ case is finite. In the disorder-dominated phase, the two-terminal conductance of $\nu = 1/3$ system is $(1/5)e^2/h$ while that of $\nu = 2/3$ system is $(1/2)e^2/h$. We further apply the same idea to the $\nu = 5/2$ system which realizes either Pfaffian or anti-Pfaffian states. By engineering a central $\nu = 3$ quantum dot in the $\nu = 5/2$ Hall bar, we study the charged quasi-particle tunneling effects and conclude that the Pfaffian and anti-Pfaffian states show different quasi-particle tunneling exponents. If the quantum dot is large enough for its edge states joining with those of the original Hall bar, the two-terminal conductance of Pfaffian state can be $G_{Pf} \to 2e^2/h$ while that of anti-Pfaffian state is higher, $G_{aPf} > 2e^2/h$.

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