

Abstract Submitted  
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**When is the fractional quantum Hall effect stable<sup>1</sup>** YANG LIU, JAVAD SHABANI, MANSOUR SHAYEGAN, Dept. of Electrical Engineering, Princeton University — The fractional quantum Hall (FQH) effect, signaled by the vanishing of the longitudinal resistance and the quantization of the Hall resistance, is the hallmark of interacting two-dimensional electrons in a large perpendicular magnetic field. The effect is most prominently observed at low Landau level (LL) filling factors ( $\nu$ ) and is conspicuously absent for  $\nu > 4$ . We examine the stability of the FQH states at high fillings in a 2D electron system in a wide GaAs quantum well which we can tune the Fermi energy ( $E_F$ ) to lie, at a given filling factor, in different LLs of two electric subbands. The data provide direct and definitive evidence that the stability of the FQH states is linked to the LL where  $E_F$  resides. We observe FQH states at high filling factors such as  $13/3$ ,  $14/3$ ,  $16/3$ , and  $17/3$ , but only when  $E_F$  lies in the ground state ( $N = 0$ ) orbital LLs of either of the two electric subbands, regardless of the underlying, fully occupied levels.

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