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Energy Gap Reversal of Prominent Fractional Quantum Hall States in the Second Landau Level ETHAN KLEINBAUM, Purdue University, ASHWANI KUMAR, Monmouth College, LOREN PFEIFFER, KEN WEST, Princeton University, GABOR CSATHY, Purdue University — The fractional quantum Hall effect occurs in high quality two dimensional conductors which have been cooled to low temperatures and placed in strong magnetic fields. A large number of the many-body ground states which emerge in this system are described using Jain's model of non-interacting composite fermions. Yet, in a region of the phase space called the second Landau Level, a number of ground states appear to require descriptions beyond Jain's model. In order to better understand these states, we have explored a little studied region of the second Landau level called the upper spin branch. In this region, we find a new fractional quantum Hall state. Surprisingly, a comparison of this new state and others in this region to counterparts in the lower spin branch reveals a reversal in the relative magnitudes of states' energy gaps. We explore possible explanations of this unusual observation. Measurements at Purdue were funded by the NSF Grant No. DMR-1207375 and the sample growth at Princeton was supported by the Gordon and Betty Moore Foundation through Grant No. GBMF 4420, and by the National Science Foundation MRSEC at the Princeton Center for Complex Materials.

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