University of Notre Dame
College of Science
Department of Physics

CONDENSED MATTER SEMINAR

Nonconventional Fractional Quantum Hall States

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The fractional quantum Hall effect is a fascinating phenomenon which is induced by electron-electron interactions in strongly correlated two-dimensional electron systems. Almost all fractional quantum Hall states of the lowest Landau level can be accounted for by the elegant model of noninteracting composite fermions. The states of the second Landau level, however, appear to be different from those of the lowest Landau level and continue to challenge our understanding. Recent theoretical works find that some of the states of the second Landau level might support exotic non-Abelian quasiexcitations. Our progress in cooling electrons to about 5~mK allowed us to observe a new fractional quantum Hall state at the Landau level filling factor 2+6/13. We find that energy gaps of the prominent 2+1/3 and 2+2/3 states are consistent with and those of the weaker 2+2/5 and 2+6/13 states deviate significantly from the values predicted by the model of noninteracting composite fermions. These observations constitute evidence that the 2+2/5 and the newly seen 2+6/13 states are of exotic origin. The demonstration of the nonconventional nature of these odd denominator fractional quantum Hall states is an important milestone in our understanding of the perplexing physics of the second Landau level.

ALL INTERESTED PERSONS ARE CORDIALLY INVITED TO ATTEND

Host: Jacek Furdyna