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Frozen Charges, Persistent Eddy Currents, and Nearly Perfect Diamagnetism in Stacked Integer Quantum Hall Layers CAGLIYAN KURDAK, University of Michigan, LEE A. FARINA, University of Michigan — Faraday's law of induction for an integer quantum Hall liquid dictates that after the application of a small additional magnetic field an integer number of electrons for each additional magnetic flux quanta must enter the 2DEG. Since the diagonal conductivity is close to zero, these charges are nearly frozen. The electric field associated with these charges leads to a persistent eddy current flowing in the bulk of the 2DEG. The magnetic field generated by the persistent eddy currents is much smaller than the additional magnetic field applied. However, the magnetic field generated by the persistent eddy currents can be greatly enhanced in closed stacked layers of integer quantum disks. In fact, we find that when the number of layers is much greater than inverse fine structure constant, these persistent eddy currents can perfectly screen the applied additional magnetic field at zero temperature.

Cagliyan Kurdak
University of Michigan

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