Classical Map Calculations for Fractional Quantum Hall effect in Graphene- The possibility of Inter-Layer FQHE states.

Chandre Dharma-wardana

National Research Council of Canada, Ottawa, Canada K1A 0R6

chandre.dharma-wardana@nrc-cnrc.gc.ca

The fractional quantum Hall effect (FQHE) is produced by exchange interactions between electron pairs in the same layer and subject to a perpendicular magnetic field. The interactions carry an odd integer m in Laughlin's theory of the FQHE. In multilayer systems, the interlayer interactions may carry an index n. If n>m, with both odd integers, such fluids are believed to be unstable. Here we use Laughlin's classical-plasma mapping of the FQHE to demonstrate that stable fractional quantum Hall states where the interlayer interactions dominate exist, by presenting three such examples. These are a class of interlayer-FQH fluids, resident on SU(2)-bilayers and SU(4)-systems like graphene. They stabilize themselves by anti-correlating their intra-layer and inter-layer pair-distributions. The short-range behaviour mimic the simple one-layer m and n fractions of quantum-Hall fluids while the long-range behaviour is similar to a damped charge-density wave.