Different Signatures of the Total Filling Factor 1 State

LARS TIE-MANN, YOUNGSOO YOON, STEFAN SCHMULT, MAIK HAUSER, WERNER DIETSCHE, KLAUS VON KLITZING, Max-Planck Institute for Solid State Research — Bringing two 2-dimensional electron systems in close proximity can yield a correlated state as the electrons will experience the presence of the neighboring system. At the individual filling factors of 1/2 this leads to a new double-layer ground state as positive and negative charges from opposite layers couple to excitons. Many remarkable properties were found such as vanishing Hall and longitudinal resistances in the counterflow configuration [1], a resonantly enhanced zero bias tunneling peak [2], and more recently, a critical DC tunneling current and vanishingly small inter-layer resistances in DC measurements [3]. We will show how it is possible to combine the results of these three different measurements into a consistent picture. Under certain conditions it is possible to exceed the critical currents but still observe a minimum at total filling factor 1 in the counterflow configuration.