Magnetoresistance Peak in the $\nu = 2$ Bilayer Quantum Hall State under Tilted Magnetic Field

Akira Fukuda[a], Shinsuke Kozumi[b], Daiju Terasawa[b], Anju Sawada[a], Zyun F. Ezawa[b], Norio Kumada[c], and Yoshiro Hirayama[c]

[a]Research Center for Low Temperature and Materials Sciences, Kyoto University, Kyoto 606-8502, Japan
[b]Graduate School of Science, Department of physics, Tohoku University, Sendai 980-8578, Japan
[c]NTT Basic Research Laboratories, NTT Corporations, 3-1 Morinosato-Wakamiya, Atsugi 243-0198, Japan

The bilayer quantum Hall (QH) state is a fascinating system which is constructed by adding the layer degree of freedom, which is represented as "pseudospin", to the ordinal monolayer QH system. As a result of the combination of both spins and pseudospins, the $\nu = 2$ bilayer QH state has revealed a variety of quantum phases. Recently the magnetoresistance peak was found in the $\nu = 1$ bilayer QH state around the commensurate-incommensurate (C-IC) transition point. In this work we have carried out similar quantum magnetotranport experiments in the $\nu = 2$ bilayer QH state with an in-plane magnetic field applied. We have carefully examined the behavior of the magnetoresistance for a sweep of the magnetic field at a fixed total density. Although no anomalous behavior in magnetoresistance was found below the tilting angle $\theta_{\mathrm{C}} = 61^{\circ}$, a peak has been observed above θ_{C}. This structure resembles the peak reported in the $\nu = 1$ QH state, and we expect it to be a signal of a phase transition in the $\nu = 2$ QH state. We analyze this anomaly whether it results from the level crossing or the C-IC transition.

Sorting category: Db Conducting electrons in condensed matter

Keywords: quantum Hall effect, bilayer system

LT1121