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Linear magnetoresistance in a high quality two-dimensional electron system W. PAN, Sandia National Labs, H.L. STORMER, Columbia University and Bell Labs, Lucent Technologies, D.C. TSUI, Princeeton University, L.N. PFEIFFER, K.W. BALDWIN, K.W. WEST, Bell Labs, Lucent Technologies — In a high quality two-dimensional electron system of density $n \sim 1 \times 10^{11}$ cm^{-2} and mobility $\mu \sim 10 \times 10^6$ cm^2/Vs, at the temperature (T) of 1.2K, the diagonal magnetoresistance, R_{xx}, shows a strictly linear magnetic (B) field dependence, except for sharp spikes at B- fields where the integer quantum Hall effect develops. As T is lowered to $\sim$ 35 mK, the main feature of R_{xx} is now dominated by multiple minima and peaks, due to the formation of integer and fractional quantum Hall states. However, when plotting R_{xx} at the even-denominator fillings ($\nu = 1/4$, 1/2, 3/4, and 3/2) as a function of B field, the same linear B field dependence is recovered. Interestingly, this linear magnetoresistance cannot be understood under the composite fermion model. Rather, it can be explained in terms of a slight, unintentional electron density gradient in our sample: Practically all R_{xx} features can be reproduced quantitatively through R_{xy}. We will discuss the implications of this finding.

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