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Observation of Inter-valley Gap Anomaly in Two Dimensional Electrons in Si K. LAI, T.M. LU, D.C. TSUI, S.A. LYON, Princeton University, W. PAN, Sandia National Laboratories, M. MUHLBERGER, F. SCHAFFLER, University of Linz, J. LIU, Y.H. XIE, UCLA — We report a systematic study of the energy gaps at the odd-integer quantum Hall states ν=3 and 5 under tilted magnetic (B) fields in the two-dimensional electron system (2DES) in $Si/Si_{1-x}Ge_x$ heterostructures [1]. Consistent with previous studies, we find that out of the coincidence region, the valley splitting is independent of the in-plane B-field. However, the ν=3 valley gap appears to be highly asymmetric and differs significantly on different sides of the coincidence. Similar behaviors were observed in both high ($20m^2/Vs$) and low ($6m^2/Vs$) mobility samples. More surprisingly, instead of reducing to zero at coincidence, as expected in the independent-electron model, the inter-valley gaps at ν=3 and 5 rise rapidly towards the coincidence angles. We will discuss our results in the framework of two known models, level coupling with random-matrix elements and quantum Hall ferromagnetism, and show that the anomaly is related to the strong couplings of the Landau levels close in energy in the coincidence region. [1] K. Lai *et al.*, cond-mat/0510599.

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