Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Negative differential conductivity induced current instability in two-dimensional electron gas system in high magnetic fields CHING-PING LEE, Department of Physics, National Tsing Hua University, Taiwan, SUSUMU KOMIYAMA, Department of Basic Science, University of Tokyo, Japan, JENG-CHUNG CHEN, Department of Physics, National Tsing Hua University, Taiwan — High mobility two-dimensional electron gas (2DEG) formed in the interface of a GaAs/AlGaAs hetero-structure in high magnetic field (B) exhibits interring nonlinear response either under microwave radiation or to a dc electric field (E). It is general believed that this kind nonlinear behavior is closely related to the occurrence of negative-differential conductance (NDC) in the presence of strong B and E. We observe a new type NDC state driven by a direct current above a threshold value ($\boldsymbol{I_{th}}$) applied to a 2DEG as a function of B at relatively high temperatures (T). A current instability is observed in 2DEG system at high $B\sim$6-8 T and at high $T\sim$ 20- 30 K while the applied current is over $\boldsymbol{I_{th}}$. The longitudinal voltage V_{xx} shows sub-linear behavior with the increase of $\boldsymbol{I}$. As the current exceed $\boldsymbol{I_{th}}$, V_{xx} suddenly drops a ΔV_{xx} and becomes irregular associated with the appearance of hysteresis with sweeping $\boldsymbol{I}$. We find that $\boldsymbol{I_{th}}$ increases with the increase of B and of T; meanwhile, ΔV_{xx} is larger at higher B but lower T. Data analysis suggest that the onset of voltage fluctuation can be described by a NDC model proposed by Kurosawa *et al.* in 1976. The general behaviors of T and B dependence of current instability are analog to those recently reported at lower both T and B. This consistence suggests the same genuine mechanism of NDC phenomena observed in 2DEG system.

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Date submitted: 14 Nov 2014 Electronic form version 1.4