Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Excitonic Josephson effect in $\nu_t = 1$ quantum Hall bilayer systems YA-FEN HSU, Department of Electrophysics, National Chiao Tung University, Hsinchu 300, Taiwan — The many similarities between exciton condensates and cooper pairs have driven intense interests to search for exciton-superfluidity effect. The Josephson-like tunneling conductance peak in a single quantum Hall (QH) has been viewed as a strong signature of exciton superfluidity. However, in fact, the Josephson-like effect is not an exact analogy of Josephson effect in superconducting junctions. Therefore, we study three kinds of excitonic Josephson junctions (JJs) composed of QH bilayers: SS, SNS, and SS'S junctions in a pseudospin picture. By solving the Landau-Lifshitz-Gilbert equations, we find, in contrast with superconducting JJs, interlayer single-particle tunneling raises spatial inhomogeneity in supercurrent and system-size dependent current-phase-relation. In addition, under the effect of the tunneling, the supercurrent could not flow through the normal metal via Andreev reflection. Interestingly, anomalous supercurrents occur in SNS junctions even in absence of Josephson interference: the tunneling would set the phase to zero at NS interfaces, which will lead to a phase bias across a Josephson-like junction (i.e. single condensate system) with a nonzero ground state phase, and hence induces the anomalous supercurrent.

Ya-Fen Hsu
Department of Electrophysics, National Chiao Tung University,
Hsinchu 300, Taiwan

Date submitted: 08 Jan 2015 Electronic form version 1.4