Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Mixed State Dissipation in Zero Temperature Limit Enhanced by Two Gap Effect in MgB_2 Thin Films YING JIA, YAN HUANG, HUAN YANG, LEI SHAN, CONG REN, HAI-HU WEN, National Lab for Superconductivity, Institute of Physics, Chinese Academy of Sciences, CHENGGANG ZHUANG, YI CUI, QI LI, XIAOXING XI, Department of Physics, The Pennsylvania State University, University Park, Pennsylvania 16802, USA — Through the measurements of resistive transition, point contact tunneling spectrum and Hall effect on crystalline MgB_2 thin films, the dissipation in the mixed state has been exclusively investigated. It is found that the resistive transition broadens monotonously with the magnetic field leading to a non-vanishing mixed state dissipation in zero temperature limit. Hall effect and point contact tunneling measurements indicate that this dissipation is contributed by the vortex motion and associated with the losing of long range phase coherence induced by the proliferation of the quasiparticles from the π-band. These results suggest the existence of the vortex quantum liquid enhanced by the two gap effect. Some preliminary results on mesoscopic-bridges will also be reported showing the interesting interplay of the two band superconductivity.

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Date submitted: 03 Dec 2006 Electronic form version 1.4