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**Session QC27 - Vortices in Superconductors VI: Hall Effect and Vortex Core States.**  
*ORAL session, Wednesday morning, March 24*  
Room 169W, GWCC

## **[QC27.01] Vortex-State Complex Hall Conductivity of Superconducting YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Epitaxial Films at Radio Frequencies**

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The first intermediate-frequency measurements of the vortex-state complex Hall conductivity  $\sigma_{xy}$  of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> superconducting epitaxial films are reported. A **direct transport measurement** technique from dc to 7 MHz was used. The results are analyzed in terms of a phenomenological model, generalized from that for the dc Hall conductivity, with the assumptions that 1) the sign reversal in the vortex-state Hall conductivity is associated with the different carrier densities within and far away from the vortex cores; 2) the Drude approximation is applicable; and 3) the anomalous sign reversal occurs in the flux-flow limit. The temperature, frequency, and magnetic field (B) dependencies of our  $\sigma_{xy}$  data are in good agreement with the model. The B-dependence of  $\sigma_{xy}$  reveals that both vortices ( $\sigma_{xy}^v \propto B^{-1}$ ) and quasiparticles ( $\sigma_{xy}^q \propto B$ ) contribute to the vortex-state Hall conduction. The magnitude of the real part of  $\sigma_{xy}$ ,  $\sigma_{xy}^{\prime}$ , is in good agreement with our model, while that of the imaginary part,  $\sigma_{xy}^{\prime\prime}$ , is significantly larger than the theoretical prediction. This may be attributed to the unconventional electronic structures in the vortex core of cuprate superconductors with d-wave or mixed pairing symmetries.

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