

# Scanning Hall Probe Measurement and the Estimation of Hysteresis Loss in a $\text{SmBa}_2\text{Cu}_3\text{O}_{7-\delta}$ Coated Conductor in Magnetic Field and Current with Phase Differences

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We have measured magnetic field distribution near the surface of a  $\text{SmBa}_2\text{Cu}_3\text{O}_{7-\delta}$  coated conductor (CC-tape) in external magnetic field and transport current using scanning Hall probe method. The magnetic field and the transport current were varied in the range of  $\varphi_B B_{\text{peak}} \sim \varphi_I B_{\text{peak}}$  and  $\varphi_B I_{\text{peak}} \sim \varphi_I I_{\text{peak}}$  with phase differences of  $45^\circ$  and  $90^\circ$ . From the measured field profiles, sheet current density  $J(x, B_a, I_a)$  and magnetic flux density  $B_0(x, B_a, I_a)$  distributions were calculated numerically. With these profiles, we estimated the hysteresis energy loss  $Q$  in the CC-tape and compared with theoretical values based on Brandt's calculation. The deviation from the theoretical values was analyzed by a simple model introducing a new concept of critical values in current density.

Keywords : coated conductor, SmBCO, magnetic hysteresis loss, scanning Hall probe method