

## **Dynamic Resistance of YBCO-Coated Conductors in Applied AC Fields with DC Transport Currents and DC Background Fields**

Robert C. Duckworth, Yifei F. Zhang, Tam Ha, and Michael J. Gouge

**Abstract** - In order to predict heat loads in future saturable core fault-current-limiting devices due to ac fringing fields, dynamic resistance in YBCO-coated conductors was measured at 77 K in peak ac fields up to 25 mT at 60 Hz and in dc fields up to 1 T. With the sample orientation set such that the conductor face was either parallel or perpendicular to the ac and dc applied fields, the dynamic resistance was measured at different fractions of the critical current to determine the relationship between the dc transport current and the applied fields. With respect to field orientation, the dynamic resistance for ac fields that were perpendicular to the conductor face was significantly higher than when the ac fields were parallel to the conductor face. It was also observed that the dynamic resistance: 1) increased with increasing fraction of the dc transport current to the critical current, 2) was proportional to the inverse of the critical current, and 3) demonstrated a linear dependence with the applied ac field once a threshold field was exceeded. This functional behavior was consistent with a critical state model for the dynamic resistance, but discrepancies in absolute value of the dynamic resistance suggested that further theoretical development is needed.

**Index Terms** - Loss Measurement, Fault Current Limiters, Dynamic Resistance

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