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Highly sensitive measurement of AC loss characteristics of short and straight HTS tapes under transverse magnetic fields by a pickup coil method

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In order to develop high temperature superconducting (HTS) tapes with excellent low-loss characteristics, a measurement system that enables us to measure AC loss characteristics of HTS tapes with high sensitivity is indispensable. We have successfully reduced background losses, which are apparent losses obtained by a pickup coil method in case where no specimen is located inside pickup coils. As a result, we have developed a measurement system by the pickup coil method that can measure AC loss characteristics of short and straight HTS tapes under transverse magnetic fields with high sensitivity. In the pickup coil method, pickup coils consist of a main pickup coil to measure signals of a specimen and a compensation coil to compensate signals from the main pickup coil when there is no specimen. In order to reduce background losses, first, a magnet for applying external transverse magnetic fields was designed and manufactured so that a pickup coil and a compensation coil could be arranged symmetrically. Next, the parameters of pickup coils were optimized to reduce the phase difference between the pickup coil voltage and the compensation coil voltage, which is one of the main cause of background losses. Furthermore, from the measurement results of background losses using various pickup coils, the relationship between the phase differences and the background loss was experimentally and theoretically examined.

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