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Current Density Distribution in 2G HTS Tape in an External Magnetic Field

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Our recent measurements of critical currents Ic of 2-G HTS tapes in an external magnetic field B demonstrated the difference in Ic(B) depending on mutual directions of transport currents and magnetic fields. Depending on Lorenz force direction the difference of Ic was about 10%. This phenomenon could be explained by suggestion about non-uniformity of Ic across a width of a tape. In this paper we had a goal to study critical current density distribution across a tape in a background magnetic field. The most often method to study current distribution in a cross-section of a superconducting tape is the measuring magnetic field distribution across a tape and then recalculation of fields measurements to current density [1]. Without external field this method could be realized by moving of a single Hall probe across a tape. But this method is difficult to use inside a magnet due to size of a moving mechanism. We suggested the combined method. First, we measured current distribution by use of a single Hall probe with moving mechanism. Then we measured field across a tape by sequence of several Hall probes placed on a single substrate. By comparison of data from these two experiments we could verify data obtained from the sequence of Hall probes and precisely determine its position at a tape. Then we can to measure current distribution of current density across a tape inside a magnet. We did such measurements in magnetic field up to 0.6T at different orientation of magnetic field to surface of a tape. The details of measuring method and results of Ic measurements across 2G HTS tapes are presented.

[1] Pavol Ušák, The measurement of current distribution in superconducting tape. Comparison of destructive and non-destructive methods, Physica C 384 (2003) 93–101

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