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Wed-Af-Po3.22-04 [82]: A pulsed current based critical current measurement system for long REBCO coated conductors

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Long wire critical current (I_c) characterization is important for fabrication of superconducting magnets. Many inductive and transport I_c measurement methods have been developed for km scale rare earth cuprate (REBCO) based Coated Conductors (CC), which is the most promising high temperature superconducting (HTS) material for magnet applications. As a direct indication of the current carrying capability, transport measurement if favored by most tape users. However, the traditional transport measurement technique has its limitations for long tape characterization. The speed of transport measurements is usually not high enough for kilometers of tape, and direct current (DC) measurement also has a certain risk of tape damage due to the Joule heating at current contacts, especially for some special CCs with higher contact resistance, e.g. stainless steel encapsulated CCs. For long wire measurements, the risk of tape damage is generally higher than acceptable. A transport measurement system was developed in this work, where pulsed current is used to reduce Joule heating thus reduce the risk of tape damage. To avoid the low measurement speed of normal pulsed current measurements, a special technique is adopted. Different long CCs, especially the ones with different encapsulation layer materials were measured by the system. During the tests, no tape damage was found. The I_c results were compared with the conventional four-point method for the short samples, the measured I_c values well correspond to each other.

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