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Experimental Evaluation of Current Distribution in Three-Strand Transposed Parallel Conductors Composed of REBCO Superconducting Tapes

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AC applications of REBa₂Cu₃O_y (REBCO) superconducting tapes require large current capacity and low AC loss properties. We have already proposed transposed parallel conductors in our previous study on the development of superconducting power transformers and rotating machines. The parallel conductor with the optimal transposition does not induce the additional AC loss. However, if the transposition points deviate from the optimal ones, shielding current is induced among the constituent tapes and AC loss increases. In the case of three-strand parallel conductors subject to uniform magnetic field, the tapes should be transposed twice at equal intervals. In our previous study, we evaluated additional AC loss properties of three-strand REBCO parallel conductors theoretically and experimentally, in the case that the two transposition points deviate by arbitrary length from optimal ones. Our theoretical equation of the additional AC loss was in agreement with the measured one. When winding the coil, it is difficult to transpose at the optimal points due to manufacturing errors and other factors. Therefore, in this paper, we evaluated the variation in current experimentally when slightly deviated from the optimal point. We measured the current distributions of the three-strand REBCO parallel conductor with three Rogowski coils. The details of the observed result and the discussion will be presented at this conference. This research is based on results obtained from a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO), the Japan Science and Technology Agency (JST): Advanced Low Carbon Technology Research and Development Program (JPMJAL1405), and the Japan Society for the Promotion of Science (JSPS): Grant-in-Aid-for Scientific Research (JP18H03783 and JP19K14964).

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