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Thu-Mo-Po4.07-08 [53]: Coupling time constants measurements of spirally-wound striated coated conductors

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Striation is one of the approaches to reduce ac losses and shielding-current-induced fields (SCIFs) in conductors or coils made with coated conductors. If filaments in a striated coated conductor are decoupled, the magnetization of the coated conductor is reduced, and, then, the ac loss as well as the SCIF is reduced. Striated coated conductors can be classified into two types: one in which superconductor filaments are insulated electrically and another in which superconductor filaments are not insulated electrically. If filaments are transposed ideally, filaments are decoupled ideally in the former. However, from the viewpoint of current sharing between filaments, which improves the robustness of coated conductors against quench / thermal runaway, the latter is preferable.
In this presentation, we focus on striated coated conductors in which filaments are not insulated electrically. It should be noted that the striation is effective only when a striated coated conductor is twisted. However, twisting a tape-shaped coated conductor is not practical. Instead of twisting, numerical analyses suggested that winding a striated coated conductor on a round former like CORC wire is effective to decouple filaments. We prepare striated coated conductors in which filaments are insulated electrically. Then, we fabricate sample pieces of striated coated conductors in which filaments are not insulated electrically as follows: depositing melted indium on filaments; soldering copper film on filaments. Such a sample piece is wound on a round GFRP former, and the frequency dependence of its magnetization loss is measured to determine its coupling time constant: from the peak of "magnetization loss vs. frequency" plot, we can determine the coupling time constant. At first, measurements were done with an indium-deposited striated coated conductor which was wound on a round GFRP former. The determined coupling time constant showed effect of spiral geometry to decouple filaments.

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