Contribution ID: **41** Type: **Talk**

Recent topics on ac loss characteristics of Spiral Copper-plated Striated Coated-conductor cables (SCSC cables)

The Spiral Copper-plated Striated Coated-conductor cable (SCSC cable) is our novel concept of high current cable with low ac loss, in which copper-plated multifilament (striated) coated conductors are wound spirally on a metal core in multiple layers. Whereas copper-plating allows current sharing among filaments against local defects in filaments, the spiral geometry of filaments decouples them against transverse ac magnetic field to reduce ac loss effectively. The structure of an SCSC cable, in which copper-plated filaments are spiraled, is like the structure of a conventional LTS wire, in which filaments embedded in copper matrix are twisted. In this presentation, we report two recent topics on ac loss characteristics of SCSC cables.

The first topic is the estimation of ac losses under magnetic fields with various amplitudes and at various temperatures. We measured coupling losses of SCSC cables in a wide range of frequency up to 20 kHz at various temperatures. We can determine a coupling time constant from the peak of a coupling loss –frequency curve. Using determined coupling time constants, we can calculate coupling loss under the magnetic field with an arbitrary amplitude and at an arbitrary temperature. Meanwhile we found that the hysteresis loss of an SCSC cable can be calculated reasonably by using the formula by Brant and Indenbom for a filament with a correction factor for field orientation. Combining these methods for calculating coupling loss and hysteresis loss, we can estimate ac losses in various coils such CS coils of tokamaks and beam bending magnets for synchrotron at various operating conditions.

The second topic is the enhancement of robustness against local defects in filaments. Multifilament coated conductors used in SCSC cables are with copper-plating, which allow current sharing among filaments so that a current can bypass a local defect in a filament. However, this current sharing through copper generates a finite voltage. We propose the use of multifilament coated conductors with inter-filament superconducting bridges, which allow current sharing without any resistance. The magnetization loss characteristic of this new type of SCSC cable is studied numerically and will be studied experimentally.

This work was supported in part by JST-ALCA-Next Program Grant Number JPMJAN24G1 and in part by JSPS KAKENHI Grant Number JP24H00316, Japan.

Session

EM & Mechanical Properties

Authors: Prof. AMEMIYA, Naoyuki (Kyoto University); UEGAKI, Hiiragi (Kyoto University); Dr SOGABE, Yusuke

Presenter: Prof. AMEMIYA, Naoyuki (Kyoto University)

Session Classification: Electromagnetic and Mechanical Properties 1