



Contribution ID: 46

Type: **Oral presentation (15min)**

Design of a cosine-theta dipole magnet wound with coated conductors considering their deformation at coil ends during winding process

Thursday 10 July 2014 16:45 (15 minutes)

When using coated conductors in accelerator magnets, one of the major technical issues is their field qualities. In order to generate the precise magnetic field, first, we must design and control the shape of the coils precisely. Furthermore, tape magnetizations can affect the field quality.

If we wind a cosine-theta coil with coated conductors, they must deform three-dimensionally to form the coil ends. Their edge-wise bending is difficult, whereas they are more tolerable against the flat-wise bending and the torsion: the shape of the turn of a coated conductor which satisfying the constant-perimeter condition is most natural. Meanwhile, this shape of the turn is identical for a specified base line on the coil bobbin, and the angle of a coated conductor against the face of the bobbin at a coil end varies turn by turn: gaps might appear between turns. If we wind each turn so that the coated-conductor face could be completely parallel to that of the inner adjacent turn in order to eliminate the gap, edge-wise bending strains appear in coated conductors. By using differential geometry, we calculated the mechanical strain in the coated conductors at the coil ends and discussed on more-likely shapes of coated conductors. Based on the consideration on the deformation of the coated conductors at coil ends, we designed a cosine-theta dipole magnet in which higher harmonics of the magnetic field is less than 0.1% of the dipole component. Our future plan includes electromagnetic field analyses of the designed magnet to study the influence of the tape magnetization on the field quality.

This work is supported in part by METI as Development of Fundamental Technologies for HTS Coils Project.

Author: Prof. AMEMIYA, Naoyuki (Kyoto University)

Co-authors: Mr MIYAHARA, Hidetoshi (Kyoto University); Prof. OGITSU, Toru (High Energy Accelerator Research Organization); Dr KURUSU, Tsutomu (Toshiba Corporation)

Presenter: Prof. AMEMIYA, Naoyuki (Kyoto University)

Session Classification: Thu-Af-Orals Session 16

Track Classification: C-09: Accelerators and detectors