Contribution ID: **540** Type: **Poster Presentation of 1h45m**

Characteristics of an HTS dipole magnet

Wednesday, 30 August 2017 13:15 (1h 45m)

High T_c superconductor (HTS) could be a key to evolve the magnet technology as it is superior to low T_c superconductor (LTS) in terms of the critical current density, critical magnetic field, and critical temperature. $REBa_2Cu_3O_{7-x}$ (REBCO) coated conductor (CC), which is in common use as the commercially available HTS, is suitable for fabrication of the magnet since it is easy-to-use for winding magnet coils. There is however a concern about application of REBCO CC as exemplified by large shielding currents which could eventually cause a large field error. In addition, one needs to take account of the slow normal zone propagation velocity that HTS owns. Once we solve these issues, use of HTS could be spread across various magnetic devices, including a rotating gantry which provides effective treatment of cancer for the external beam radiotherapy. Indeed, HTS is expected to provide stable operation even in high-field environment and thus enables us to miniaturize the existing huge system such as the gantry for heavy-ion radiotherapy. Verification test of the HTS dipole magnet for the rotating gantry was conducted in collaboration with KEK, Toshiba Corporation, and Kyoto University. Fabrication of the model magnet was complete in 2016, and field measurement was also made in the same year. In conclusion, we found larger field non-uniformity as compared to our numerical calculation, reason of which can partially be explained by mi-aliments of the coils. After that, we decided to continue the measurement using the model magnet in order for a further investigation into characteristics of the HTS magnet such as temporal variation of the magnetization due to the shielding current and flux jump. In this paper, we report results from the continued measurement with the HTS dipole magnet.

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Session Classification: Wed-Af-Po3.03

Track Classification: C3 - HTS Insert and Model Magnets