Contribution ID: **20** Type: **not specified**

Applicability evaluation of quench detectable hybrid REBCO tape to HTS magnet for fusion reactors

Sunday 10 December 2017 15:50 (30 minutes)

High-temperature superconducting (HTS) magnet is an attractive option for fusion reactors, especially, the LHD-type helical fusion reactor FFHR-d1, which can employ segment-fabrication of huge and complex helical coils. We have proposed both joint-winding of the HTS helical coils wound by connecting half or one-pitch conductor segments and remountable HTS helical coils assembled from demountable coil segments, as primary and advanced options, respectively. For these designs, mechanical joint (demountable joint) of HTS conductors have been developed and an applied current of 100 kA and a joint resistance of ˜2 nano-ohms at 20 K, 5.3 T were achieved. The critical current almost agreed with predicted value even with the joint region. Though the cryogenic stability of the HTS conductor is sufficiently high with its high critical temperature and massive copper stabilizer, protection of the magnet system should be well prepared. We are now investigating a new method to detect quench for HTS applications; a quench detectable hybrid REBCO tape with a superconducting wire for quench detection. In this presentation, we report numerical and experimental evaluations of NbTi/YBCO hybrid tape fabricated as a proof-of-principle testing. In addition, we also examine which superconducting material is suitable as a sensor depending on operating conditions and how the quench detection given by this method affects the expected hotspot temperature in the HTS conductor for FFHR-d1.

Primary author: Dr ITO, Satoshi (Tohoku University)

Co-authors: Mr HASEGAWA, Shin (Tohoku University); Prof. YANAGI, Nagato (National Institute for Fusion Science); Prof. HASHIZUME, Hidetoshi (Tohoku University)

Presenter: Dr ITO, Satoshi (Tohoku University)

Session Classification: Session II