



Contribution ID: 697

Type: **Regular 15 minutes Oral Presentation**

## Electro-mechanical measurements of mechanical lap joint of HTS STARS conductors

*Wednesday, August 30, 2017 5:45 PM (15 minutes)*

Segment-fabrication of high-temperature superconducting (HTS) coils has been proposed for huge and complex superconducting magnets. In Japan, the LHD-type helical fusion reactor, FFHR, designed by National Institute for Fusion Science, adopts the segment-fabrication for its helical coils as the challenging option. The fabrication method is called “joint-winding”, in which the HTS helical coils are wound by connecting Stacked Tapes Assembled in Rigid Structure (STARS) conductors with an appropriate length. The STARS conductor consists of simply stacked rare-earth barium copper oxide (REBCO) tapes embedded in copper and stainless steel jackets. Insulating material is situated between the copper and the stainless steel jackets. At the joint section, REBCO tapes are connected by bridge-type mechanical lap joint, developed by Tohoku University. Indium foils are inserted between joint surfaces, then the copper jacket and insulator are set, and the stainless steel jackets are welded. In this study, a mechanical lap joint of a 10-kA-class STARS conductor with a cross-sectional diameter of 20 mm was fabricated. The conductor has five layers of 10-mm-wide copper stabilized REBCO tapes and each layer is connected by the mechanical lap joint with an indium foil with a joint length of 15 mm. The stacks are embedded in a copper jacket, glass-fiber-reinforced plastics layer, and a stainless steel pipe. After pre-evaluations of critical current and joint resistance at 77 K, self-field in Tohoku University, the conductor is to be transported to Karlsruhe Institute of Technology. We plan to perform electro-mechanical measurements of the joint by means of the FBI (F: force, B: magnetic field, I: current) measurement facility at a temperature of 4.2 K, a DC current up to 10 kA, a magnetic field of up to 12 T and a tensile force up to 100 kN. The details of the results will be presented at the conference.

### Submitters Country

Japan

**Primary author:** Dr ITO, Satoshi (Tohoku University)

**Co-authors:** Mr NISHIO, Tatsuki (Tohoku University); Prof. YANAGI, Nagato (National Institute for Fusion Science); Dr TERAZAKI, Yoshiro (National Institute for Fusion Science); Dr BAGRETS, Nadezda (Karlsruhe Institute of Technology – KIT); WOLF, Michael J. (Karlsruhe Institute of Technology, Institute for Technical Physics, Karlsruhe, Germany); Dr TAMURA, Hitoshi (National Institute for Fusion Science); Dr WEISS, Klaus-Peter (Karlsruhe Institute of Technology, Institute for Technical Physics, Karlsruhe, Germany); Prof. HASHIZUME, Hidetoshi (Tohoku University); Prof. SAGARA, Akio (National Institute for Fusion Science); Dr FIETZ, Walter (Karlsruhe Institute of Technology)

**Presenter:** Dr ITO, Satoshi (Tohoku University)

**Session Classification:** Wed-Af-Or26

**Track Classification:** B1 - Superconducting Magnets for Fusion