Contribution ID: **527** Type: **Contributed Oral Presentation**

Development of MgB2 conductors for low field coils and feeders in DEMO fusion energy reactors

Monday 29 June 2015 12:15 (15 minutes)

An International Collaboration for Advancement of Magnesiumdiboride Superconductors (ICAMS) has been initiated to develop MgB2 superconductors for fusion reactor magnets. Today NbTi is the undisputed superconductor for use in the Poloidal Field coils (PF), Correction Coils (CC), graded Toroidal Field (TF) coils and Feeders of a fusion machine. A major advantage of MgB2 is it's higher operating temperature and larger temperature margin. The larger temperature margin allows cost reduction of the cryogenic system and improvement of reliability. For any fusion machine design in the next decade, it is likely that NbTi will be used for the lower field PF, CC or graded TF coils and feeders but MgB2 wire is a serious candidate for future machines. A Cable-In-Conduit Conductor (CICC) concept is adopted with a strand cable pattern designed for minimum interstrand coupling loss to limit the heat load and maximum strand mechanical support to avoid degradation from thermal and electromagnetic stress. The lead for the design and eventual test is a full-size MgB2 Poloidal Field conductor. The prospective to use state of the art MgB2 strands for the PF and CC superconductors of a fusion device is analyzed with the code JackPot-ACDC. The strand critical parameters for second-generation multifilamentary HyperTech MgB2 strand with a diameter of 0.83 mm serve as a critical input for the analysis of the computed conductor performance. The predicted MgB2 PF CICC performance is compared with the requirement of the present ITER PF design with maximum operating current of 45 kA and nominal peak field of 6 T. The organization scheme of the ICAMS collaboration and first results are presented.

Author: NIJHUIS, Arend (University of Twente)

Co-authors: DEVRED, Arnaud (DAPNIA); ZHOU, Chao (U); QIN, Jinggang (ASIPP); Dr DIJKSTRA, Marcel (University of Twente); RINDFLEISCH, Matthew; SUMPTION, Mike (The Ohio State University); PRADHAN, Subrata (Institute for Plasma Research); HAUGAN, Timothy (U.S. Air Force Research Laboratory); Mr BAGNI, Tommaso (University of twente); Prof. WU, yu (ASIPP)

Presenter: NIJHUIS, Arend (University of Twente)

Session Classification: M1OrA - Superconductor Cables I: HTS and LTS

Track Classification: ICMC-04 - MgB2 Processing and Properties