

## Overview on the Research and Development of HTS Conductors and Irradiation Studies Within the European DEMO Project

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**Abstract**— Despite the EU-DEMO tokamak design is mainly based on LTS conductors, the hybrid design of the Central Solenoid (CS) foresees a graded layered structure, making use of HTS conductors in the high field region of the coil. A set of requirements have been defined in order to compare the different layouts proposed for the central solenoid: an operating current of 60 kA, a peak field ok 18 T, an inlet temperature of 4.5 K and a minimum bending radius of 1.5 m.

Presently two designs have been proposed within the WPMAG project: ASTRA (Aligned Stacks Transposed in Roebel Arrangement) and SECAS (SECTOR ASsembled cable). For ASTRA that is a Roebel cable designed by EPFL composed of non-twisted stacks, the results of the SULTAN tests will be presented. SECAS conductor, which is based on braided stacks enclosed in copper sectors, has been recently proposed by ENEA. The preliminary results on sub-cable samples will be shown. In addition, I will present the modelling and optimization activity carried out by the University of Twente on the CORC-like conductors manufactured by ASIPP within the European-Chinese collaboration on magnet design. The main goal is to understand if the CORC-like conductors may be suitable for the EU-DEMO CS.

EU-DEMO programme is also supporting studies for modelling of radiation effects on TF cables and coils and, since 2014, experiments on neutron irradiation of HTS tapes under different conditions, addressed to future power plants that could potentially involve HTS conductors in TF coils. A brief outline will be given on these topics covered in the project.

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