

Design of JT-60SA Magnets and Associated Experimental Validations

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Abstract - In the framework of the JT-60SA project, aiming at upgrading the present JT-60U tokamak toward a fully superconducting configuration, the detailed design phase led to adopt for the three main magnet systems a brand-new design. Europe (EU) is expected to provide to Japan (JA) the totality of the toroidal field (TF) magnet system, while JA will provide both Equilibrium field (EF) and Central Solenoid (CS) systems. All magnet designs were optimized through the past years and entered in parallel into extensive experimentally-based phases of concept validation, which came to maturation in the years 2009 and 2010. For this, all magnet systems were investigated by means of dedicated samples, e.g., conductor and joint samples designed, manufactured and tested at full scale in ad hoc facilities either in EU or in JA. The present paper, after an overall description of magnet systems layouts, presents in a general approach the different experimental campaigns dedicated to qualification design and manufacture processes of either coils, conductors and electrical joints. The main results with the associated analyses are shown and the main conclusions presented, especially regarding their contribution to consolidate the triggering of magnet mass production. The status of respective manufacturing stages in EU and in JA are also evoked.

Index Terms - Fusion, JT-60SA, superconducting magnets, tokamak.

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