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UPDATES ON CEA DESIGN AND EXPERIMENTAL ACTIVITIES ON EU DEMO TF

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In the framework of EU design activities for dimensioning the future fusion DEMOnstration reactor (DEMO), extensive analyses were conducted in EUROfusion context, aiming at ultimately defining the design of the DEMO magnets system. In this objective CEA proposes design for all cryomagnetic systems especially on the Toroidal Field (TF) coils.

In the last DEMO reactor baseline, CEA designs for TF system was including two options: one without radial plates (called WP#3) whose concept shows a square conductor and an ITER-like concept with radial plates (called WP#4) which has a round conductor embedded in steel plates.

In order to consolidate both designs CEA developed specific tools that assess thermal-hydraulic and mechanical aspects in a detailed way to allow ensuring a refined criteria compliance. The use of those tools avoid relying on conservative approaches at pre-design stage, which often end in material over-dimensioning and therefore penalizing cost and space occupation merits. The tools will be applied on both TF concepts and the refined designs will be exposed.

On the other hand CEA designed and manufactured in collaboration with ASIPP a full-size conductor sample based on WP#3 concept, which is supposed to operate at 95 kA and 12T.

This sample was tested in SULTAN facility (Villigen, CH) and in JOSEFA (CEA, France) to assess its behaviour in both DC and AC regimes. The first analyses of the experimental results are presented and the first conclusions on conductor critical performances discussed.

Primary authors: ZANI, Louis (CEA); BONNE, François (CEA); CORATO, Valentina (ENEA); LE COZ, Quentin (Assystem); HOA, Christine (CEA SBT); LACROIX, Benoit (CEA); MISIARA, Nicolas (CEA); NICOLLET, Sylvie (CEA); NUNIO, Francois (CEA); QIN, Jinggang (ASIPP); SEDLAK, Kamil (EPFL Lausanne); STEPANOV, Boris (EPFL-SPC); TORRE, Alexandre (CEA); VALLCORBA, Roser (CEA - Saclay); WU, Yu (ASIPP); ZHANG, Yongliang (ASIPP)

Presenter: ZANI, Louis (CEA)

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