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Fri-Mo-Or26-04: Preparation of the ITER Central Solenoid Assembly

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The Central Solenoid (CS) is a key element of the ITER Magnet system, including six identical coils, called modules, assembled together to form a 4 m outer diameter, 13 m high solenoid. It is a superconducting magnet, using a 45 kA Nb3Sn conductor internally cooled by circulation of supercritical helium at 4.5 K with a peak field up to 13 T. It is enclosed inside a structure providing vertical pre-compression and mechanical support. Procurement of the components and the special assembly tooling of the ITER CS is the responsibility of US ITER, the ITER Domestic Agency of the USA, while the ITER Organization (IO) will carry out the assembly of these components.

US ITER has awarded several contracts since 2011 to supply seven modules, including a spare, structure components, and the special tooling required for the CS pre-assembly. All deliveries are scheduled with the objective to start the CS assembly at IO site early 2021. IO is now actively preparing this new phase.

The paper describes the general CS pre-assembly activities from modules stacking to the pre-compression at 210 MN. The special assembly processes and related tooling are detailed. A focus is given on the module lifting operation, the busbar joint assembly and the pre-compression.
For these last two processes, IO has investigated alternative assembly options. For the busbar joint, the baseline process is a soldered joint. An alternative option based on the compaction of indium wires is presented and compared with the baseline. The CS pre-compression baseline assembly process relies on the tightening of 45 multi-jackbolt tensioners (MJT). The qualification of this process on a mockup will be presented. In parallel, an alternative option using dedicated hydraulic tensioners has been studied and compared as a matter of cost, risk and schedule to the baseline process.

The views and opinions expressed herein do not necessarily reflect those of the ITER Organization.

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