ITER Thermal Shields at the Starting Phase of Procurement

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on behalf of the ITER Organization and the ITER DA's

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The ITER thermal shields (TS) form a continuous barrier between the superconducting magnet system and the warm tokamak components. The TS function is to limit the heat load to the coils operating at 4.5 K from internal/external sources to levels that can be tolerated by the coils and reasonably removed by the cryogenic system. In particular, the shields intercept thermal radiation from the vacuum vessel (VV) and port walls, and the cryostat walls and in-cryostat components. The TS system consists of four main sub-components – the equatorial thermal shields (ETS), the upper and lower cryostat thermal shields (CTS), and the support TS. The ETS consists in its turn of the vacuum vessel TS (VVTS) and the equatorial CTS. All main sub-components are supported independently. For instance, the ETS is supported against the toroidal field (TF) coil with the set of inboard and outboard supports, and the upper and lower CTS are supported against the cryostat lid and floor with flexible supports. Each sub-component is split into parts to allow assembly and/or reduce electromagnetic loads (using electrical breaks). These parts consist of silver-coated panels of a single wall design and equipped with the pipes cooled by the gaseous helium.

Prior to delivery to the pit, the VVTS parts will be assembled over the VV sector to form the VVTS sector. After assembly with two TF coils and completion of supplementary pre-assembly operations, the complete sub-assembly will be delivered to the pit. The VV sectors will be sequentially assembled and welded via splice plates forming triplets (each spanning 120º), and the final welding operations will be performed in parallel. The joints between the VVTS sectors will be made before welding of the VV sectors. After completion of the sector welding, the port components will be installed and welded. Finally, the remaining CTS components will be assembled to complete the machine assembly inside the cryostat.

The TS system will be procured by the Korean Domestic Agency (KO DA) following the Procurement Arrangement (PA) between the ITER Organization and the KO DA. The PA has been concluded in the first half of 2010. Prior to the PA signing, the TS design and supporting analyses/studies were proven by the design reviews held in 2009 and early 2010. Following these reviews, several modifications have been implemented into the TS design and the PA specifications.

Details of the current TS design, results of related studies and the procurement strategy are reported in this paper.