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Design Finalization and R&D Activities before the Start of Manufacture of ITER Thermal Shield

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ITER Thermal Shield (TS) plays the role of reducing the heat load transferred by thermal radiation and conduction from warm components to the magnet structures that operate at 4.5 K. Thermal radiation to the magnet structures is minimized by cooling the TS at 80 K helium temperature and by providing the TS surfaces with low emissivity using silver coating.
Korea Domestic Agency (KODA) has performed the TS design with the collaboration of industries since 2007. The final design of TS main components was approved in October 2012. After the approval of the TS final design, fine tuning of the final design had been performed considering the interface with the adjacent components and the updated assembly schemes. The manifold pipes around the TS main components are to be installed in the tokamak to supply helium gas to the TS. The final design of the manifold was performed after the final design of the TS main components had been completed. The manufacturing drawing was approved in April 2014.
Full-scale mock-up of Vacuum Vessel Thermal Shield (VVTS) 10 degree sector was developed to prevent possible risks of manufacturing. All the manufacturing processes except the silver coating were tested and verified in the fabrication of mock-up. Pre-qualification tests were conducted to find proper processes for forming and welding. Welding joint shape between panel and flange was validated by the mock-up. Shell thickness change was measured after bending, forming and buffing processes. Sequential press-bending was successfully tested for the fabrication of complex VVTS ports. Bending jig for the 3D shape of cooling tube routing was also developed in detail and tested for the VVTS port cooling tube.
This paper shows the key results from final design and R&D of ITER TS performed by Korea before the start of manufacturing. The manufacturing of VVTS is now on-going and the first two 40 degree sectors of the VVTS will be manufactured until the end of 2015.

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