Structural analysis of the Full-W ITER divertor Dome [[1]](#footnote-1)\*)

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In the frame of the ITER project the Russian Federation is responsible, among other things, for procurement of the Divertor Dome. The total number of Dome structures in the tokamak is equal to 54. The design and analysis of the Dome performed in 2008-2010 have confirmed the workability and structural integrity of the DOME reference design in the so-called hydrogen phase of tokamak operation. In 2012, new plans were introduced for ITER machine operation. The ITER Organization proposed the Full-W Divertor design, in particular, the Divertor and the Dome should operate in the neutron phase. The structural analysis of the Dome performed in 2012-2014 showed, that the reference design does not satisfy the ITER Structural Design Criteria for In-Vessel components (SDC-IV). In 2015-2010, RF DA specialists of the JSC “NIIEFA” carried out R&D activities to develop the Dome design satisfying the Structural Design criteria for In-Vessel components. As result, the full-scale DOME prototype was manufactured and successfully delivered in ITER Organization in December, 2021.

The following aspects might be highlighted for the ITER Divertor Dome:

1. strength of the Dome supports;
2. strength of the Dome steel supporting structure (Dome SSS);
3. strength of the Dome Plasma-facing units (PFUs);
4. adhesion strength of tungsten tiles.

The performed design and analysis have shown that:

Static and cyclic strength of the Dome supports depends, first of all, on electromagnetic forces at plasma disruptions.

Static and cyclic strength of the Dome SSS is determined both by electromagnetic forces at plasma disruptions and thermal loads caused by neutron heating in Dome materials.

Static and cyclic strength of PFUs and their cooling pipes is determined by electromagnetic forces at plasma disruptions.

Adhesion strength of tungsten tiles is determined by surface heat fluxes acting on the plasma-facing surfaces of PFUs.

As the result, the full-scale Dome prototype has been developed satisfying the SDC-IV criteria for the first ITER Divertor set.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/E/ru/IQ-Labusov.docx) [↑](#footnote-ref-1)