DEMOUNTABLE CONNECTION OF THE iTER FIRST WALL [[1]](#footnote-1)\*)

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Within the scope of works under the ITER project a lot of engineering challenges have been met in recent years for the topic of the plasma facing components (PFC) which involve the Divertor and the First Wall. In addition to the main sophisticated tasks of development of the PFC design and manufacturing techniques, many difficult accompanying problems have been solved with respect to provision of required conditions for PFC examination and testing. These solutions include the demountable connection of the First Wall Panels (FWP).

The FWP demountable connection is the high-vacuum leak-tight (based on special seals) connection of the outlet branches of the FWP cooling channels and pipes of the pressurized helium supply system for a vacuum test facility. When using a classical method, this connection is made by welding of the branches and the pipes to each other, and then the FWP is cut off and cleaned after the vacuum tests. The demountable connection has a number of advantages: the absence of deformations under welding stresses, a lower risk of damage to the plasma facing elements (no welding and further machining), the absence of an additional source of contamination (machining after tests). Meanwhile, the main difficulty is that it is required to ensure the high reliability of the demountable connection during the whole cycle of the tests. It is worth noting that in the ITER project the demountable connection is intended to be used only at the stage of the final tests of finished goods, and this kind of connection will not be used directly in the ITER machine operation.

The JSC “NIIEFA” has developed and justified by calculations the design of the FWP demountable connection with double-circuit sealing and differential pumping. The all-metal spring-loaded rings were selected as the seals. The ring involves the elastic metal shell with soft ductile coating and the coil spring placed inside the shell and allowing to maintain the elastic deformations in the seal area. In 2021 the mock-ups of the FWP demountable connection prototype were manufactured, and the tests were started to try the technical solutions and approaches including preliminary and final vacuum tightness tests, the study on the mock-up element deformations after the tests, as well as the studies on microhardness (surface hardening) and contamination (soft sealing metal transfer) of interfacing surfaces. These tests shall confirm the operability of the technical approach and define the limits of its application. However, since the welding operation will be used at later stages of assembly and replacement of the FWP inside the ITER machine, a series of tests of mock-up weldability was performed to analyze the possible problems with weldability of the FWP branches after the use of the demountable connection.

A half of the planned tests has been carried out at the moment. The final results and the final conclusion to the operability of this approach and to its introduction into the actual tests of the ITER FWP are to be obtained to the end of 2023.

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