

## Interface of Blanket Testing and ITER design.

V.Chuyanov<sup>1</sup> and ITER Test Blanket Working Group

<sup>1</sup> *ITER International Team , ITER Garching Joint Work Site, Boltzmannstr. 2, 85748 Garching, Germany, chuyanv@itereu.de*

One of the objectives of ITER is to demonstrate fusion technology in an integrated system by performing testing of nuclear components required to utilize fusion energy, in particular- to test design concepts of tritium breeding blanket relevant to a DEMO reactor. In the current ITER design three equatorial ports which can accommodate modules with the face cross section up to 1310 mm wide x 1760mm high have been allocated for blanket modules testing.

Typical testing conditions foreseen now include a surface heat flux of 0.25 MW/m<sup>2</sup>, a neutron wall load of 0.78 MW/m<sup>2</sup>, a pulse length of 400 s with a duty cycle of 25%. After first 10 years of operation one may expect to reach the total neutron fluence at the surface of test blanket modules (TBMs) ~0.12 Mwy/m<sup>2</sup>.

Progress in physics of hybrid and non-inductive current drive may lead in the second 10 years of operation to very long pulses (many thousands seconds) with a similar neutron wall loading and accumulation of neutron fluence at least up to 0.3 Mwy/m<sup>2</sup>.

TBMs will be mounted on water-cooled steel frames with additional shielding and inserted in equatorial ports by standard ITER remote handling equipment for installation, removal and transportation of port plugs to and from a hot cell.

The tritium measuring equipment will be located in containers in front of ports. The heat exchangers and safety (the pressure suppression tank for the water-cooled TBM) equipment may be placed inside of the ITER Tokamak Cooling Water System vault if the space in front of ports is not enough. Tritium removal equipment may be installed in Tritium building.

In special cases some equipment may be placed inside the ports (for example liquid lithium loop to minimize amount of lithium. Heat rejection and accumulation of produced tritium will be provided by ITER.

TBMs replacements will be synchronized with ITER operation and will be performed in the ITER hot cell, where the whole TBMs/shield plug systems will be remotely transported. Arrangements for Hot cell post irradiation examination will depend on selected site or further decisions. Currently the ITER hot cell is not big enough and not properly equipped for such a task.

Test modules must not compromise ITER safety and reliability. As a result they must satisfy several requirements depending on their design. Water-cooled modules must not leak frequently inside the main vacuum vessel and must have their own pressure suppression system. Helium leaks are permitted. Mass of liquid lithium is strictly limited to avoid hydrogen explosion.

Pressure to reduce the ITER cost has led to decreased neutron flux and fluence and to more limited testing conditions. Nevertheless, performed analysis indicates that breeding blanket testing in ITER is extremely important for DEMO breeding blanket development. The best effort has to be done to coordinate parties activities in this area and to achieve the best use of space and time available for blanket testing in ITER.