

# ITER Test Program

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# ITER Test Program

## Events and Achievements during Last Quarter

- 1) Lisbon Pre-TBWG Meeting with the Director
- 2) TBWG Meeting in Paris, September
- 3) DDD drafts were completed by all parties
  - Review comments were circulated
  - Parties are currently revising their DDD reports
- 4) M. Abdou was asked to prepare Executive Summary for the entire Test Program  
  
(to link parties' contributions and make it look as one ITER Test Program)
  - M. Abdou sent Draft late October
  - Comments are due this week
  - Revision will be made and widely circulated (TAC, etc.)
- 5) Dai-Kai Sze replaced Thanh Hua

**Pre-meeting of TBWG-3 between the Parties' Contact Persons  
and the ITER Director**

**SOFT Conference Centre**

**Lisbon, Tuesday 17 September 1996**

**Summary of Main Conclusions**

1. Revue of TBWG operation and mission for future meetings
  - 1.1 The Director makes a report to each meeting of the ITER Council on TBWG progress, which is considered important.
  - 1.2 There was general agreement on the following points proposed by M. Abdou and R. Parker:
    - 1.2.1 Completion of homework tasks on time is fundamental for the success of the Working Group.
    - 1.2.2 The objectives and dates for future TBWG meetings should be set ~3 months in advance of the meeting.
    - 1.2.3 A draft agenda should be circulated at least 1 month in advance of the meeting.
    - 1.2.4 A list of main conclusions/actions to be distributed before the end of each meeting.
    - 1.2.5 The first draft of the minutes should be distributed within 1 week after the meeting to all members for comments. Any comments should be sent to the Secretary within one week.
    - 1.2.6 A fast response to enquiries between the parties and the JCT would be helpful and is to be encouraged.
    - 1.2.7 Copies of minutes, including any revisions and other important communications are to be sent to HTL's.

The Contact Persons were urged to take home the message that completion of the homework tasks is vital for the JCT for the completion of the EDA.

- 1.3 The Director stressed that the short-term milestones in the blanket development programmes are critical to the JCT for the interfaces between the test modules, the test blanket and the machine (e.g. maintenance procedures are required by February 1997.) Medium-term milestones should also be more clearly defined.
- 1.4 Contact persons were urged to take initiative on resolving issues relating to inter-party collaboration.

- 1.5 The following issue should be covered in a future meeting of the TBWG:  
- Consideration of the relevance (including extent and usefulness) of tests on the ITM's in ITER to the development of DEMO-Blanket Concepts, including the degree of extrapolation of the results which will be required.
2. Revue of Draft Agenda for TBWG-3 Meeting
- 2.1 Item 7.2 on Port assy design etc. will be integrated with item 6 on test blanket system etc.
- 2.2 Items 5 and 6 will be taken after item 8.
- 2.3 A revue of the design work on the ITER breeding blanket will be included in the agenda of a future TBWG meeting (e.g. TBWG-4), after work relating to the breeding blanket has been completed for the JCT in the first semester of 1997.

3. Requirements on Test Blanket System/interfaces with ITER

- 3.1 On the interface between the front face of the ITM and the vacuum vessel 1st wall, the JCT are flexible. It may be recessed 5-10 cm, but if co-planar with 1st wall, it must conform to 1st wall layout. If recessed, 2 straight sections in the poloidal direction could approximate to 1st wall curvature. Beryllium coating is required, but the thickness is not important.
- 3.2 The design of pipe runs should be consistent with maintenance requirements, which have to be defined by the Parties and agreed with the JCT.
- 3.3 Studies are ongoing or planned in J + EU on the issue of installing components in ferro magnetic (F/M) material in an austenitic device. The Director stated that preliminary evaluations have indicated that it could be accommodated, through correction coils may be necessary and a degree of symmetry in the location of components is an advantage ; i.e. a single F/M component would be undesirable. Detail studies are required.
- 3.4 The transport containers for the ITM's will be designed as a sealed confinement but will not be shielded and not actively cooled. Precautions will be required to prohibit man access during component transfers.

4. Port Allocation and port sharing

After much discussion, this item was best summarised by the statement from R. Parker; that the number of ports that could be available should not be considered as a constraint on the developing designs and R&D work in the national programmes. A decision should be taken at a later date, based on realistic designs and supporting R&D programmes.

There has been an active exchange of ideas on port sharing, particularly between J and EU.

The EU position is that they are prepared to share a port for both blanket concepts under development, but reserve their position regarding the sharing of any elements of the ancillary circuits and infrastructure. The Japanese would also share a port for both of their concepts. Their favoured top and bottom configuration for the helium-cooled concept would fit with the EU plans and there would be

adequate space for two independent cooling systems. They are currently investigating whether a side-by-side arrangement for port sharing with the water-cooled concept would be the most suitable configuration. The RF favour a joint design for the liquid lithium/vanadium concept with the US but would like a small sub-module for their helium-cooled ceramic concept. Such an arrangement appears to be more problematic for integration with the plans of the other parties.

The US will contribute to world-wide development on a helium-cooled ceramic blanket. They favour lithium titanate as breeder material. The possibility of the US building a helium-cooled ceramic ITM should not be ruled out, through building a liquid lithium/vanadium ITM currently appears less likely. The US position was that ancillary circuits and infrastructure should be kept largely separate.

#### 5. Collaboration in R&D and in-ITER testing

The parties should give further consideration for discussion of this issue in TBWG-3 on 25 September 1996.

Those present at Pre-meeting:

R. Aymar, JCT - ITER Director  
R. Parker, JCT  
E. Proust, EU  
S. Païdassi, EU  
H. Takatsu, J  
T. Kuroda, J  
Y. Strebkov, RF  
I. Kirillov, RF  
M. Abdou, US  
C. Baker, US  
S. J. Booth, Secretary

Highlights of TBWG-3  
CEA Headquarters  
Paris, September 23-25, 1996

- Dr. S. Paidassi (EC, DG XII-Fusion Directorate) was introduced as a new European member of the TBWG and as EU contact person. S. Booth takes over the role of Technical Secretary to the TBWG from Dr. F. Cozzani.
- The TBWG Co-Chairman had been very impressed with the content and quality of the DDDs submitted by the Parties. The DDDs have been installed in the public folders at the 3 JWS's available for the JCT and Parties.
- Each Party is to improve its own DDD based on the comments from the JCT. The DDD in the public folders will be updated accordingly once the revised electronic copy is received.
- An executive summary incorporating Parties' Test Blanket DDDs has been prepared under the coordination and major input of the US contact person (M. Abdou). We are in the process of receiving comments. The document will be sent to TAC for review around Mid-November.

# Parties' R&D Plans for Breeder Blanket Modules and for their Testing in ITER

## EU

- Will collaborate with other parties in the areas of:
  - ferritic/martensitic steel
  - ceramic breeder materials
  - beryllium
  - tritium extraction from He and from H<sub>2</sub>O

## JA

- Would make the following facilities available for international collaboration:
  - an in-pile test facility of the Japanese Materials Testing Reactor (JMTR)
  - an out-of-pile test facility for a water-cooled system (15MPa/300°C)
- Provide data base from the Japanese Universities on liquid metal R&D work

## RF

- Await Ministry's approval

## US

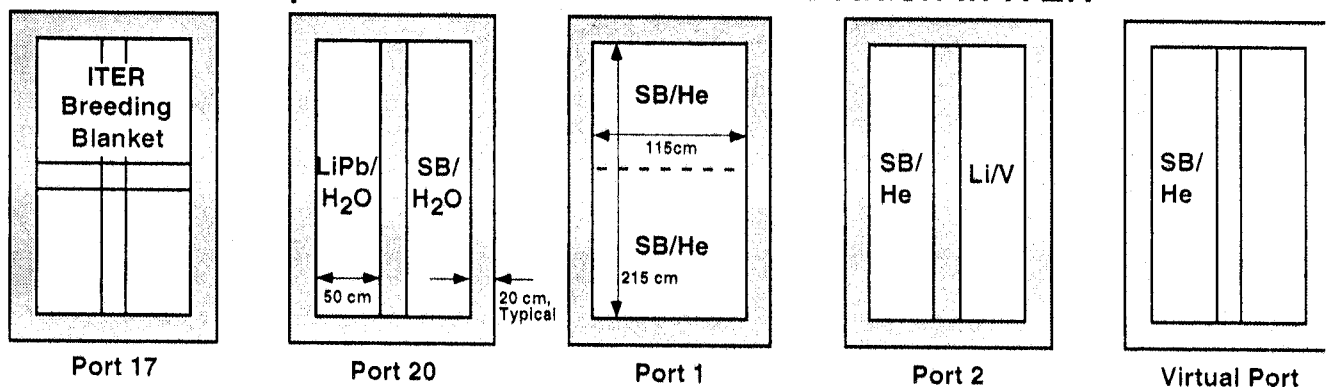
- No official US DEMO-related program
- No current US commitment to build a blanket test module for ITER
- Would be interested in collaborating with other parties
- Collaboration on test program needs to be negotiated as part of the construction agreement

## Test Port Allocation-

A tentative test port allocation layout based on non-party specific assignment and the use of a virtual port

- Due to the serious constraints on the available number of test ports, each party had to fit all its blanket test modules in one port or less.
  - Since each party has defined two blanket concepts, the space available for each blanket concept is less than one half of a test port. EU and Japan selected to use only one blanket module for each concept. The US preferred two or more submodules to provide for adequate engineering scaling for various testing issues and to account for possible statistical variations and failures.
- All the parties have a helium-cooled, solid breeder blanket concept as one of their two blanket concepts selected for testing on ITER.
- There is a need for a fifth port to better meet the currently indicated testing needs of the parties. A virtual fifth port is assumed for now to accommodate these needs.

### Proposed Test Blanket Port Allocation In ITER





## Test Blanket R&D is the Key to Realize Meaningful Testing on ITER

- The parties should elaborate a detailed test plan for their concepts, indicating the features, main milestones and required associated effort-if possible- of the R&D programs, leading to installation in ITER of an ITM at the time they propose.
- The contact persons will submit the plan one month before the next TBWG meeting. The plan should include details of the program and planning envisaged for tests to be conducted in ITER prior to DT operation.
- The discussion on the collaboration on R&D between the parties will be continued during TBWG-4 (April, 1997), after the submission of the detailed test plan.

Much work remains to be done in TBWG. This includes:

1. Criteria for qualifying a blanket module or submodule for actual insertion and testing in ITER
2. Definition of test module instrumentation and verification of capability to perform in the ITER fusion environment (magnetic field, radiation, heating, etc.)
3. Analysis to show that the results to be obtained from the test modules as designed can be extrapolated to DEMO and reactor conditions (e.g. higher wall loads and the need to demonstrate tritium self sufficiency)
4. Further discussion among the parties to define collaboration on R&D for the test program, as well as possible collaborations on the construction and operation of test articles.