

US Test Blanket Program

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US ITER Home Team Meeting
San Diego, CA
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Outline

- Events and Achievements
- Technical Issues and Action Plans

ITER Blanket Testing Program

Events and Achievements during Last Quarter

- The TBWG-5 meeting was held at UCLA, Los Angeles on 6-8 October, 1997 with the main objectives of
 - status report on ITER breeding blanket design (A significant benefit in the new design approach is the possibility of sharing data obtained from the R&D conducted for the DEMO blanket programs, particularly for beryllium pebble beds)
 - status report on DEMO Test Blanket DDDs

An updated version was forwarded to JCT on early August.

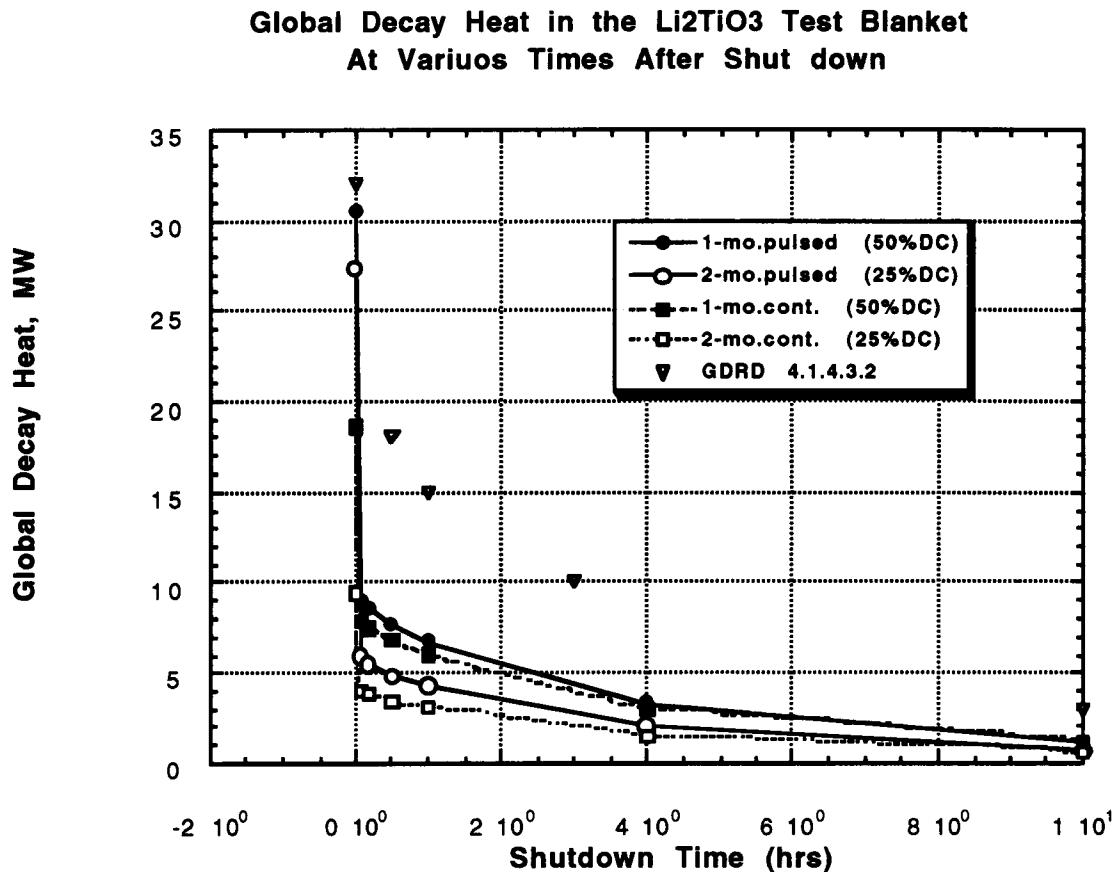
The final version for the FDR is due by 15 November 1997.

 - report on test blanket module safety analyses
- Li test blanket module safety issues
- Decay heat levels in the He-cooled solid breeder test modules under several operational scenarios
- finalization of the ITER test port design approach

Events and Achievements during Last Quarter (Cont'd)

- The IEA Executive Committee meeting for the IEA Implementing Agreement (IA) on Nuclear Technology of Fusion Reactors was held at Los Angeles, on 5 October, 1997
 - in relation to the mission defined in *Article 2b* of the Terms of Reference concerning the coordination between the R&D plans of the parties, TBWG developed a list of collaborative areas on ITER Test Module R&D.
 - IEA Executive Committee agreed to all items.
- A six month summary of TBWG progress prepared by the Chair and Co-Chair was sent to ITER Council and Parties' Fusion Program Directors.
- The 6th meeting of TBWG will be held in Russia, May, 1998.

The global decay heat in the solid breeder test module is noticeably lower than the maximum upper limits specified in the GDRD 4.1.4.3.2



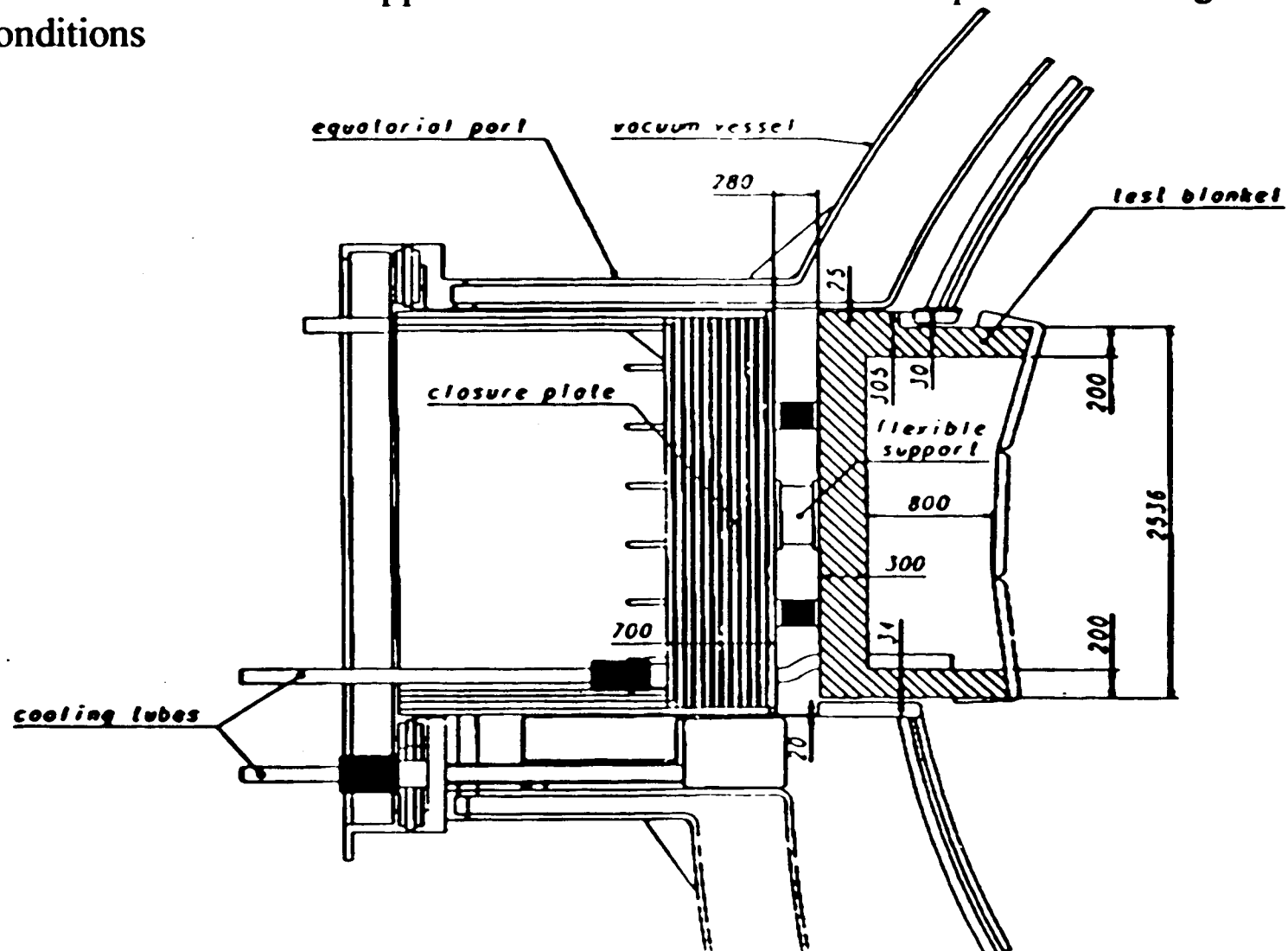
The operating scenarios considered are:

- (1) Scenario 1: one month pulsed operation at 100% power, 50% duty cycle in each 2-hrs window (1-hr off followed by 1-hr on)
- (2) Scenario 2: two months pulsed operation at 100% power, 25% duty cycle in each 2-month window (3-hrs off followed by 1-hr on)
- (3) Scenario 3: one month continuous operation, 50% power (50% duty cycle)
- (4) Scenario 4: two months continuous operation, 25% power (25% duty cycle)

An Integrated Port Design Approach Is Adopted by the JCT for the Final Design Report

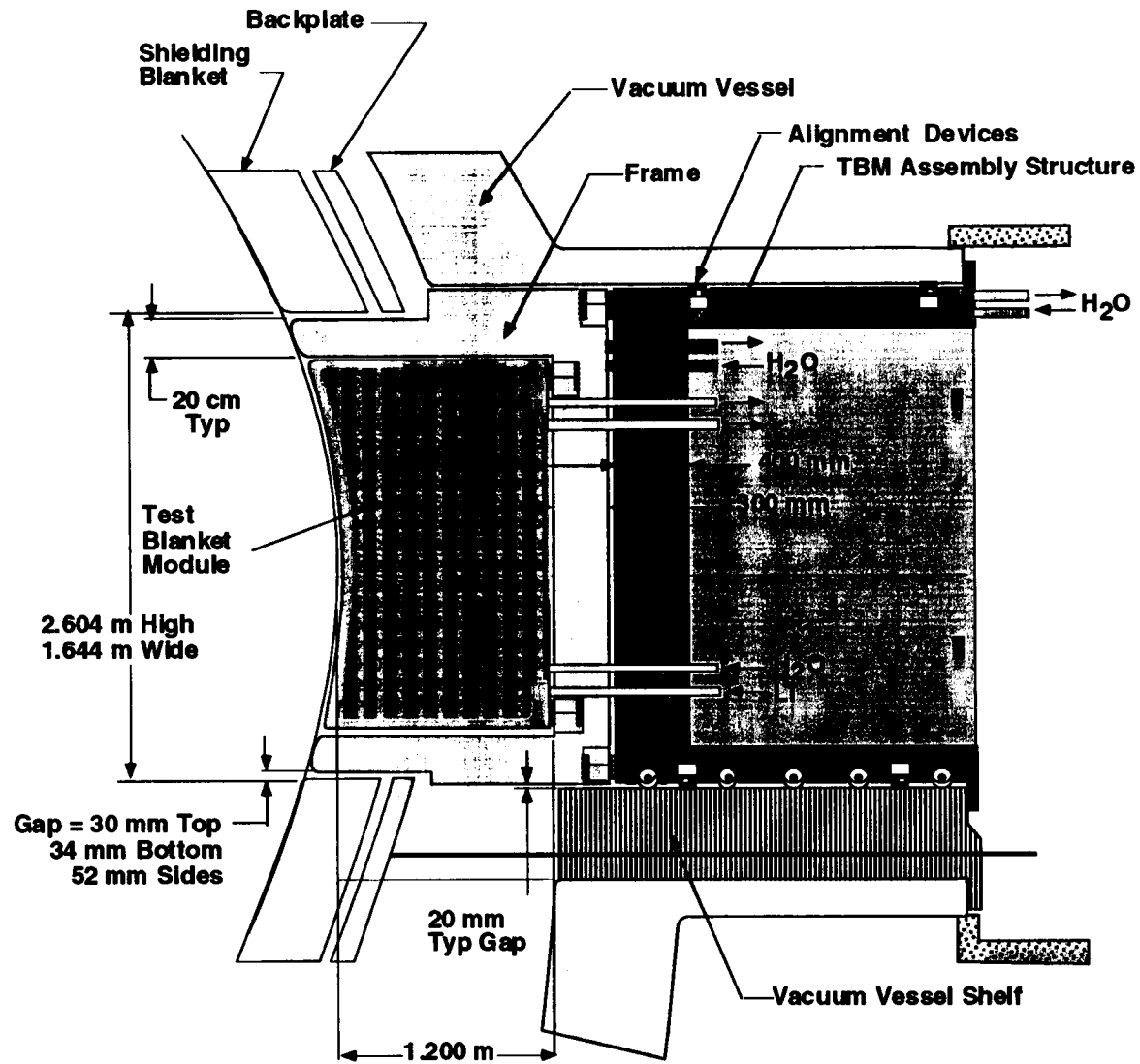
General Features

- Common frame designs with two frame depths (120 cm vs. 80 cm as shown) to hold different test modules' sizes
- Utilization of flexible supports to accommodate thermal expansion and high loading conditions



Technical Issues

- The potential of a water/Li reaction (a hypothetical event with frequency $< 10^{-6}$ /a) inside the VV requires that the lithium inventory be kept below 35 kg to meet a limit of 5 kg of H₂ from the test modules (the overall limit is 10 kg which includes H₂ from the Be-steam reaction).
 - The US is proceeding to define a blanket design with a lithium inventory of less than 35 kg.
 - JCT safety representatives agree that limitation of the inventory of Li such that no more than 5 kg of H₂ can be produced in water/Li reactions would certainly strongly simplify the safety approach.
 - The US test blanket safety member indicates that a MELCOR-type calculation would also need to be done later which would include the beryllium-steam reaction to show that the overall hydrogen generation could be less than 10 kg.
- The TBWG Chairman stressed that a sound justification program concerning feasibility and benefits would be required for the ITER blanket testing program.



Prepared by the US Test Blanket Working Group

Schematic View of ITER Test Port Design Containing a Li Test Module

Action Plans

- Completion of the US Test Blanket DDDs
 - Evaluation of feasibility and benefits of ITER test program.
 - Examination of the effect of pulsing on blanket module testing based on current ITER operating scenarios
 - Assessment of the testing information relating the level of confidence on a typical DEMO availability as a function of ITER fluence
 - Definition of test module instrumentation and verification of capability to perform in the ITER fusion environment (magnetic field, radiation, heating, etc.)
3. Documentation of current US blanket R&D results relevant to the ITER breeding blanket design- In accordance with the mission defined in Article 2a of the Terms of Reference.
The reference ITER breeding blanket design adopted in the Final Design Report is based on a beryllium pebble bed neutron multiplier and a Li_2ZrO_3 ceramic pebble bed breeder.
4. Further implementation of the mission as defined in Article 2b of the Terms of Reference concerning the coordination between the R&D plans of the parties.