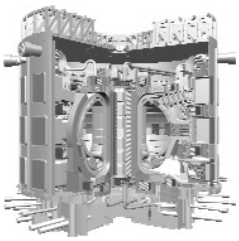

ITER CTA NEWSLETTER

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MEETING OF THE ITER CTA PROJECT BOARD

by Dr. V. Vlasenkov, PB Secretary

The latest meeting of the ITER CTA Project Board took place in Moscow, Russian Federation on 22 April 2002 on the occasion of the Third Negotiators Meeting (N3). Thirteen participants, representing PB Members and experts from Canada (CA), the European Union (EU), Japan (JA), the Russian Federation (RF) and the International Team (IT) attended the meeting chaired by Acad. E. Velikhov.

The Project Board took note of the comments made concerning the status of the Participant Teams (PTs) as follows:

- CA PT reported the establishment of a new company, Iter Canada Host Inc. to deliver the host scope of supply, as described in the CA offer to host ITER. Iter Canada Host Inc., has established contracts with five companies for engineering support that will form the CA PT. The Canadian Regulator, CNSC, has approved the scope of the Environmental Assessment (EA), and work is progressing. The Regulator indicated that the least stringent level of EA, the screening level, is satisfactory, reflecting positively on ITER's safety and viability.

Participants in the Meeting

- JA PT is waiting for a Government decision on a candidate site for ITER. The preferred procurement allocation is being reviewed by the industry. Discussions on the licensing process are ongoing with the regulatory authority.
- EU PT commented that the design and R&D activities foreseen for the year 2002 are progressing. The EFDA work programme for 2003 and the work plan until the end of 2004 have been approved, guaranteeing support for ITER design and R&D activities.
- RF PT is working in accordance to the federal programme (2002 - 2005) which is oriented towards the preparation of the RF industries for the construction of ITER. RF Minatom, and some companies, have made the investment necessary in order to reach a production of superconducting strands of up to 50 tonnes/year. A list of design tasks is under discussion with the IT and will be formulated soon.

The IT Leader reported that the IT supported and reviewed the first official safety documents submitted to the Regulators in Canada and France. Feedback is expected before the end of the year. The IT initiated co-ordinated technical work in the area of the high priority procurement specifications, including the rules to write them. The IT has devoted effort in the areas of the Vacuum Vessel and Magnet towards the assessment of their design and improvements of some of their details.

All PTs and the IT analysed the most recent results in magnet testing which do not provide a full understanding of the margins in performance of the superconductor. More testing will be appropriate in the SULTAN (EU) facility.

The IT Leader introduced his input paper to the N3 on some technical criteria for the definition of the non-common area of the procurement. The PB agreed on the principles shown in this document, recognizing that some details of the non-common scope require further discussion with respect to each site offer.

The PB recognized the need to address some difficulties identified in co-ordinating the tentative preferences of the Participants, during NSSG-2, for procurement allocation, such as over- or undersubscription of some procurement packages.

The PB confirmed the need for testing of the PF insert, now being built by the EU and RF PTs in the CS Naka (JA) test facility, at the beginning of 2004. A proposal by the JA PT to build an EC Gyrotron test facility was discussed. The PB recognized the need to develop a testing facility for a 1 MW CW launcher.

The PB took note of the potential collaboration between Participants on the construction and testing of the first ITER Neutral Beam line before the normal procurement schedule.

An EU PT proposal on re-establishment of the Test Blanket Working Group (TBWG) was endorsed, with the scope of activities, reporting and membership as outlined in the proposal.

The PB took note of the IT Leader report on the ongoing evaluation of configuration management software which will be used during the ITER construction and operation phases. After extensive assessment the software is expected to be operational by the end of the year.

The next meeting of the PB will be held on 3 - 4 June 2002 in Cadarache, France in conjunction with N4.

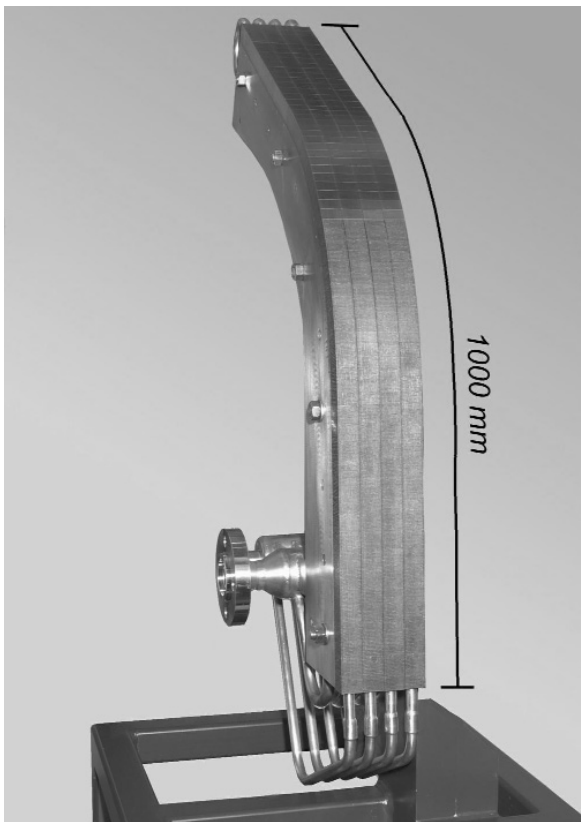
"EU DIVERTOR CELEBRATION DAY"

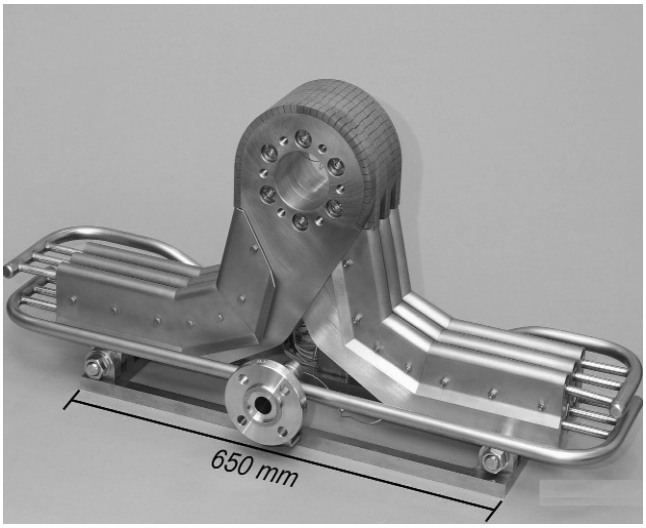
by Dr. M. Merola, European Fusion Development Agreement (EFDA), Garching

During the ITER EDA and CTA period, the EU Party has carried out an extensive R&D programme on high heat flux components, which culminated with the successful manufacturing of a complete set of near full-scale prototypes for each divertor component, namely the vertical target, the dome liner and the cassette body. (Photos of the three divertor components are on pages 3 and 4.)

On the occasion of the completion of these manufacturing activities, on 16 January 2002, an "EU Divertor Celebration Day" was organized at Plansee AG, Reutte, Austria. Dr. Michael Schwarzkopf, Chief Executive

Officer of Plansee AG, and Prof. Angelo Airaghi, President of Ansaldo Ricerche, led the delegation of the two industrial companies which were the main contributors to the manufacturing activities. About 30 participants attended the meeting including Dr. Robert Aymar, ITER Director, Prof. Karl Lackner, EFDA Leader and Dr. Roberto Andreani, EFDA Associate Leader for Technology, as well as representatives from the CEA, ENEA, IPP and ÖAW Euratom Associations.





Dome Liner prototype with tungsten armour

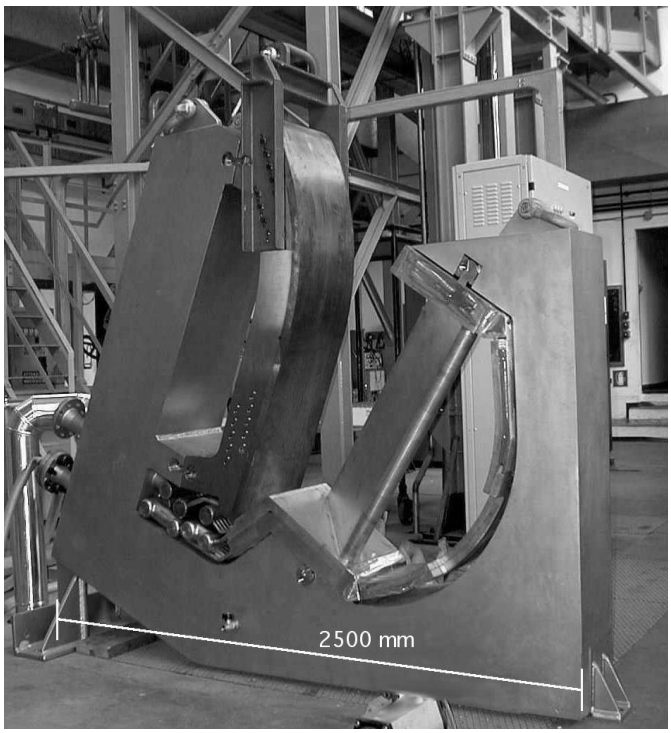
Vertical Target prototype with CFC and tungsten armour

On behalf of Plansee, Mr. Bernd Hofmann, the General Manager of Plansee for the production of refractory metals, welcomed the participants and expressed the pleasure of Plansee at hosting this meeting. He outlined the commitment of the Plansee management to nuclear fusion. In the past decade Plansee has continuously sponsored plasma facing component (PFC) R&D and thereby steadily raised their performance limits. In these years Plansee maintained an adequate level of personnel and equipment resources, necessary for the development and fabrication of PFCs, even during periods of lower external demands. This resulted in the release of special fabrication techniques from other production divisions and the creation of a group of specialists, uniquely dedicated to this topic. Mr. Hofmann concluded by expressing the intention of Plansee to continue this policy.

Dr. Robert Aymar, ITER Director, presented an outline of the ITER project. He recalled that the programmatic objective of this next step machine is to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes. The main technical objectives consist in (1) demonstrating extended burn of DT plasmas, with steady state as the ultimate goal, (2) integrating and testing all essential fusion power reactor technologies and components and (3) demonstrating the safety and environmental acceptability of fusion. After a description of the main technical features of the machine he stressed the importance of the start of the formal negotiations to set up the International Agreement under which ITER could be built.

Dr. Roberto Andreani, EFDA Associate Leader for Technology, presented an outline of the EU fusion technology programme for the coming years. It includes a series of activities related to the next step (ITER) and to the long term development, to be performed by the Associations and by European industry, financed by the Community and co-ordinated by the EFDA Garching Close Support Unit. In particular, the activities related to ITER are proposed in view of: (1) the completion of the R&D activities already launched during the

ITER CTA; (2) the implementation of the activities requested by the ITER International Team concerning the finalization of the design in preparation for the completion of the technical specifications for the procurement of the items with the longest delivery times; (3) the preparation of the European site(s) proposal through the work of the European ITER Site technical Study (EISS) group; (4) the need to undertake manufacturing R&D to allow European industry to be effective and competitive in the areas of interest expressed for the ITER procurement packages through the Fusion Industry Committee.



Outboard Cassette Body with integration prototypes assembled onto it

Dr. Richard Tivey, ITER Divertor Group Leader, showed the design of the ITER divertor. The procurement of this component is covered by the Procurement Packages 17.P1 "Divertor Cassette Integration" and 17.P2 "Divertor Plasma-Facing Components". It consists of the supply of 54 cassettes bodies and 6 spares with the related PFCs. Prior to the series production, one prototype shall be manufactured and tested for each of the components to be delivered. Dr. Tivey concluded his talk by emphasizing the impressive achievements obtained in the R&D carried out within the ITER project.

Mr. Bertram Schedler, who is in charge of activities for nuclear fusion at Plansee, focused in his presentation on the developments of technologies relevant for the divertor during the last decade at Plansee. He outlined the importance of synergies at the start of the corresponding activities in the early nineties. At that time the development and manufacture of PFCs profited from already available joining techniques being used in graphite backed X-ray targets for the medical industry and high voltage circuit breakers, which are employed for the transmission of energy. He outlined how the changing requirements for PFCs have influenced the Plansee preferred technology from brazing to the latest hot isostatic pressing. Mr. Schedler concluded his talk by describing the manufacture and testing of the vertical target and dome liner full-scale divertor prototypes.

Dr. Marco Grattarola, Ansaldo Ricerche PFC Group Leader, described the activities on high temperature brazing technology carried out in the recent years at Ansaldo Ricerche. This work is carried out by a group of dedicated staff and demonstrate a renewed interest of Ansaldo Ricerche in the area of PFCs. In particular, a manufacturing technology based on silver-free high temperature brazing has been developed, and further activities are planned to improve the related performance and reliability. His presentation concluded with a description of the full-scale divertor integration prototypes manufactured by Ansaldo Ricerche. The objectives for these components were the demonstration of the engineering concept of the divertor, the verification of the integration with the cassette body and the thermo-hydraulic testing of the whole divertor unit.

Prof. Chung Wu, EFDA Responsible Officer for Plasma/Wall Interaction, summarized the EU development of three-dimensional carbon fibre reinforced carbon (CFC) composites. The grades now available offer optimized high thermal conductivity and mechanical properties in the three directions, and proved to be particularly suited for the armour of the most loaded areas of the ITER divertor.

In his talk Dr. André Grosman, on behalf of the CIEL (French acronym for Internal Components and Limiters) Project team from the Association Euratom-CEA Cadarache stressed the challenge represented by the realization of high quality actively cooled PFCs. In this respect, great experience has been gained by the CEA teams since the beginning of Tore Supra operation, which culminated with the realization of the finger elements of the new toroidal pump limiter, designed for Tore Supra as a major part of the CIEL project. This project also includes a quasi-full coverage of the vacuum vessel and ports with actively cooled stainless steel panels and a rather complete thermographic monitoring of the limiter. The development work for the finger elements in the mid nineties proved that the selected concept could meet the requirements (including a peak heat flux higher than 10 MW/m2). The manufacturing process (660 elements with a total area of 7 m2) showed the absolute need for strict control tests during fabrication and for thermographic examinations as final acceptance tests. The unavoidable difficulties encountered could be solved by a close collaboration between the supplier and the customer. He also emphasized the great experience gained in Europe in the last years in overcoming such difficulties and the very challenging task, which high heat flux PFC manufacturing still represents.

Dr. Hermann Renner, W7-X Division Head at IPP Greifswald, and Dr. Jean Boscary, W7-X Responsible Officer at IPP Greifswald, presented a talk on the forthcoming manufacturing activities for the divertor for the stellarator WENDELSTEIN 7-X (W7-X). This component will consist of 1300 actively cooled target elements with a total area of 30 m2 and will involve the largest worldwide series production of high heat flux components prior to the construction of ITER. It includes water-cooled PFCs to allow steady state operation and to provide an efficient particle and power exhaust for a maximum pulse duration of 30 minutes. The divertor elements are designed to withstand 10 MW/m2. They are based on the flat tile concept and use the same armour material and the same heat sink material foreseen for the ITER divertor. This fact is leading to a close collaboration between the W7-X project and the EU ITER Party with mutual benefits. After completion of the basic design activity of W7-X, the work is now being put out to tender.

Participants in the Meeting

In his concluding remarks, Dr. Mario Merola, EFDA Responsible Officer for the Divertor Technology, reported that the fabrication of the first vertical target prototype was completed in 1998. This component contained, on a medium-size scale, all the main features of the corresponding ITER divertor design, and was high heat flux tested up to 20 MW/m2 for 2000 cycles without failure. In the same year a full-scale section of the outboard divertor cassette body was also completed by means of welded forged plates, rather than by casting, with a corresponding drastic reduction of costs. Finally, in 2001, near full-scale vertical target and dome liner prototypes were delivered. Dr. Merola concluded his talk by pointing out that the EU has shown a systematic capability to manufacture high heat flux components together with mastery of the required non-destructive examination techniques and quality assurance procedures. This demonstrated, on the prototype scale, the manufacturing feasibility of the ITER divertor and puts the EU in the position to start the related procurement as soon as the decision about ITER construction is taken. The time period remaining until then will be used to optimize the fabrication processes and to develop more cost effective alternatives.

LIST OF PARTICIPANTS

Robert Aymar	ITER IT
Richard Tivey	ITER IT
Chris Ibbott	ITER IT
Vladimir Barabash	ITER IT
Karl Lackner	EFDA CSU Garching
Roberto Andreani	EFDA CSU Garching
Wolfgang Daenner	EFDA CSU Garching
Mario Merola	EFDA CSU Garching
Chung Wu	EFDA CSU Garching
Jim Palmer	EFDA CSU Garching
Gottfried Vieider	Expert
Michael Schwarzkopf	Plansee
Günther Kneringer	Plansee
Wolfgang Köck	Plansee
Bernd Hofmann	Plansee
Robert Riedl	Plansee
Bertram Schedler	Plansee
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