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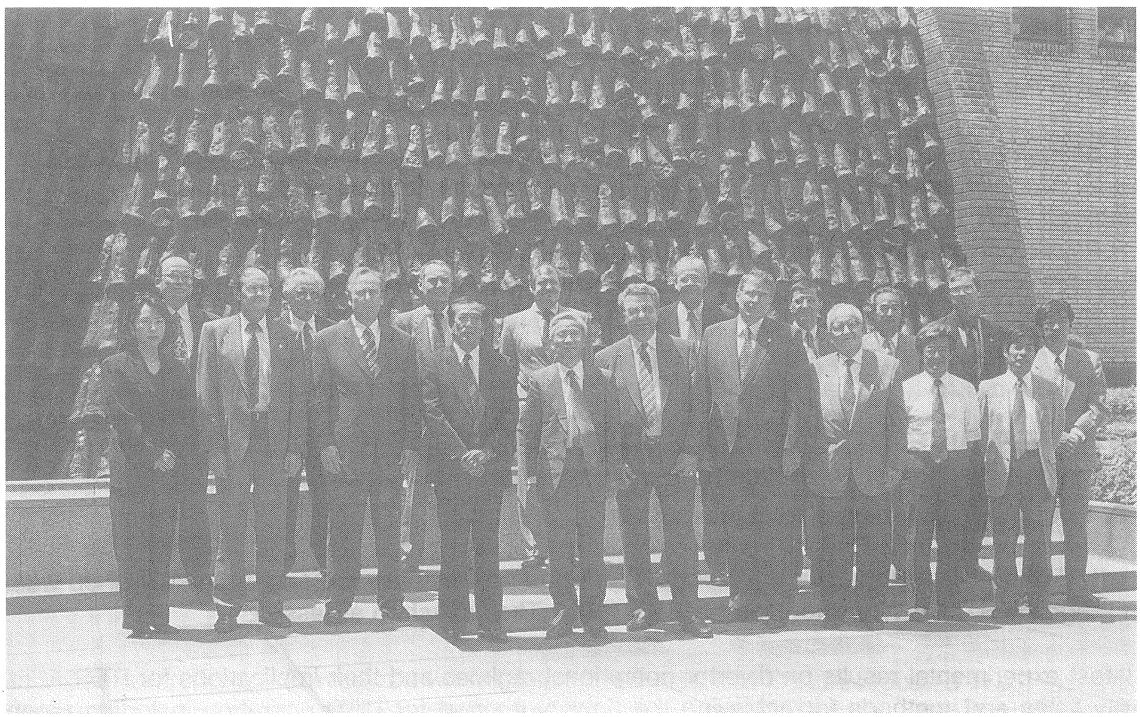
TENTH MEETING OF THE ITER MANAGEMENT ADVISORY COMMITTEE (MAC)

by Dr. M. Yoshikawa, MAC Chair

The 10th Meeting of the ITER MAC was held at JAERI Headquarters in Tokyo on 5 - 6 June 1996. The replacement of a Japanese MAC member was announced; Mr. T. Nagamatsuya was replaced by Dr. H. Kishimoto. Further, it was announced that the JA and RF MAC Contact Persons are Dr. S. Matsuda and Dr. L. Golubchikov, respectively.

The ITER Director summarized the progress made in the ITER Engineering Design Activities (EDA) in the period between the 9th ITER Council Meeting (IC-10) last January and May 1966. The overall focus of the Project is towards the next major milestone, namely the presentation of the Detailed Design Report to IC-11 at the end of 1996. At the same time, the Joint Central Team and Home Teams have worked intensively on the Seven Large R&D Projects. The Physics R&D carried out in the Parties' voluntary Physics programmes continues to progress well within the effective structure of the Expert Groups. The immediate target is to prepare for the review of the overall Physics Performance of ITER in autumn 1996, in context with the Detailed Design Report.

Following the Director's Status Report, MAC reviewed the Work Programme and schedule of the Seven Large R&D Tasks, proposals for the 1997 Joint Fund Budget, and the schedule of ITER meetings.



Participants in the Meeting

Work Programme - MAC reviewed and supported the work plan and schedule of the Seven Large R&D Projects as parts of the ITER EDA R&D Programme. MAC stresses the importance for each of the Parties to maintain priority support for the large R&D projects, so as to maintain its own scope of work in order to avoid jeopardizing the use of other Parties' resources and to keep the projects on schedule.

Joint Fund - MAC reviewed consolidated accounts for the ITER Joint Fund Budget of 1995 as presented by the Director. On the basis of the information provided, it is recommended that the ITER Council approve the consolidated annual accounts of the ITER Joint Fund for 1995.

MAC reviewed the Director's proposals for the 1997 Joint Fund Budget and its allocation to Agents and main Budget Articles. MAC recommends to the ITER Council to approve the Joint Fund Budget and allocations for 1997 as proposed by the Director.

Certain Interface Issues - MAC expressed high appreciation of the work performed by the Interface Sub-Group (ISG) and accepted the report of the ISG to MAC on some interface issues regarding final disposal, ownership and liabilities.

Proposed Schedule of ITER Meetings - MAC reviewed and supported the schedule of Technical Meetings and Workshops proposed by the Director and agreed that the Director and the Home Team Leaders review the work plan regarding diagnostic design.

MAC tentatively decided that the MAC-11 meeting will be held in Tokyo on 21 and 22 November 1996.

SCHEDULE OF ITER MEETINGS AND WORKSHOPS

Meeting on Thermo-Hydraulics, 23-25 September, Abingdon, EU
Test Blanket Working Group 3, 23-25 September, Paris, EU
5th Technical Meeting on Safety and Environment, 1-8 October, San Diego, US
TAC/JCT Informal Safety Assessment, 4-5 October, San Diego, US

The following five Expert Group Workshops will be held on 12-13 October in Montreal, Canada:
Diagnostics
Confinement and Transport
Disruptions, Plasma Control & MHD
Divertor Physics and Divertor Modelling & Database
Energetic Particles, Heating & Current Drive

5th Confinement Modelling Database Expert Group Workshop, 13-16 October, Montreal, Canada
Divertor Modeling and Database Expert Group Workshop, 14 October, Montreal, Canada
Combined ITER TAC/ITER Physics Committee, 14-15 October, Montreal, Canada
ITER Physics Committee (continuing) 16 October, Montreal, Canada

FOURTH ITER DIVERTOR PHYSICS AND DIVERTOR MODELLING AND DATABASE EXPERT GROUP WORKSHOP

by Dr. D. Post, ITER San Diego Joint Work Site

The Fourth ITER Divertor Physics and Divertor Modelling and Database Expert Group Workshop was held at the San Diego ITER Joint Worksite, March 11-15, 1996. The workshop assessed:

- the latest experimental results on divertor operational regimes and their implications for ITER,
- density limits and methods for achieving the density needed for ITER operation including recent pellet fuelling experiments on ASDEX and compact toroid fuelling experiments on Tokamak de Varennes and several new theories for the density limit,

- a number of specific design issues for ITER including machine conditioning, vacuum leaks and dust,
- the status of the Divertor Database and its analysis,
- the status of divertor modelling with emphasis on applications to the ITER design, and
- reviewed He transport issues and ELMs.

Results presented from all of the divertor experiments indicate that the peak heat loads on divertor plates can be reduced by a factor of 5 or more through use of intense fueling with hydrogen and impurities. This level of reduction is adequate for ITER. However, the heat reduction was often achieved at the cost of reduced plasma performance so that further optimization is needed. The temperatures at the divertor plate during "detached" operation are low enough (~1 eV) that volume recombination is a strong effect in these regimes and could be very important for operating the ITER divertor. The density limit in tokamaks remains a key issue. Initial ASDEX Upgrade pellet fuelling experiments indicate that achieving good plasma performance above the density limit remains difficult. Central fuelling offers the greatest potential for operation above the usual density limit observed with gas puffing. While pellets will not be able to reach the center of ITER plasma, favourable results for fuelling with Compact Toroids, which have the potential to reach the center of plasma in ITER, were reported on the TdeV tokamak. The group strongly endorsed an effort to test this technique on a larger tokamak. The operating window for detached operation is another issue, particularly since detached operation may require edge densities above the Greenwald density limit. However, Alcator C-Mod reported achieving detached plasmas with densities as low as 0.25 times the Greenwald limit so that the issue remains open. The group also endorsed baking out the graphite tiles in ITER to a temperature of at least 300°C.

The group endorsed the present cassette design for the divertor because it maintains its flexibility to make changes in the divertor design up until the end of the EDA. By then, results from new configurations on most of the large divertor experiments (e.g., JET, ASDEX Upgrade, DIII-D and JT-60/U) will be available to guide the choice of the optimum divertor configuration.

The first version of the divertor plasma parameter database was assembled for the meeting. The initial database consisted of 434 time slices from 5 divertor experiments (DIII-D, ASDEX Upgrade, Alcator C-Mod, JT-60U and JET). The database will be analyzed to develop scalings for the ratio of the edge to central density, the radial decay length of the power in the scrape-off layer, the particle confinement time, the ratio of the peak to average heat flux in the divertor and the ELM characteristics. A preliminary analysis of the data indicates that the energy deposited on the divertor plates per ELM in ITER could be as high as 3% of the total stored energy. Reports on detailed analysis of the database are planned for the next expert group meeting (October 1996). In addition, problems with consistency of the data will be resolved and additional data will be added.

Results were reported on validating the divertor modelling codes with data from JET, ASDEX Upgrade, Alcator C-Mod, DIII-D and JT-60/U. In general, the codes are able to reproduce many of the features of the experiments, including the general features of impurity and hydrogen radiation losses, the drop in plasma pressure from the mid-plane to the divertor plate, and the compression of neutral gases in the divertor. Some initial modelling of the ITER divertor was reported. These preliminary results indicate that the ion thermal force and other effects will concentrate the impurities in the outer region of the scrape-off layer, potentially reducing the helium concentration in the private flux region where the pumps are located and increasing the pumping requirements for the reference vertical target plate design. Partially based on the successes of the model validation effort, the effort to apply the codes to model the performance of the ITER divertor will be increased. A reference set of parameters and a list of questions that the codes should address were defined for the initial modelling effort. The codes were asked to estimate the impurity level required to radiate about 100 MW in the divertor and scrape-off layer, and to study the relative radiation efficiencies of Ne and Ar.

One of the most interesting theoretical reports was a preliminary theory by F. Perkins, which indicated that the density limit could be due to a combination of the ballooning mode beta limit at the edge and a limit on the edge temperature due to MARFE formation. This theory predicted an edge density limit which had a scaling similar to that of the Greenwald limit. Other theoretical developments included further work on recombination effects involving vibrationally excited molecules, the importance of three-body and two-body recombination in detachment, particularly in reproducing the experimentally observed drop in the ion-saturation current.

The meeting was attended by 48 expert group members and invited experts (see listing overleaf).

Workshop Participants

EU: S. Bosch, A. Loarte, J. Neuhauser, G. Pacher, H. Pacher, R. Raman, D. Reiter, R. Schneider, J. Winter
JA: T. Fujimoto, A. Hatayama, N. Hosogone, K. Itami, K. Nakamura, N. Ohno, N. Ohyabu, M. Shimada, S. Takamura, T. Tamano
US: B. Braams, S. Cohen, D. Hilis, D. Hill, D. Hwang, G. Jackson, C. Karney, S. Krasheninnikov, C. Lasnier, B. Lipschultz, A. Mahdavi, E. Oktay, T. Osborne, G. Porter, M. Rensink, T. Rognlien, R. Stambaugh
JCT: J. Dietz, Y. Igitkhanov, G. Janeschitz, A. Kukushkin, R. Little, F. Perkins, D. Post, S. Putvinskij, M. Rosenbluth, M. Sugihara, J. Wesley, N. Fujisawa

AGENDA FOR THE 16TH IAEA FUSION ENERGY CONFERENCE

by Drs. T. Dolan and U. Schneider, Physics Section, IAEA

The Technical Programme Committee (TPC) for the 16th IAEA Fusion Energy Conference (7-11 October 1996, Montreal) met in Vienna on 21-23 May 1996. The members of the TPC were nominated by the International Fusion Energy Committee based on their expertise, reputation and geographic regions. The Committee consisted of V. Abramov (RF), R. Andreani (Italy), R. Blanken (US), G. Chenevert (US), J. Dietz (ITER), T. Dolan (IAEA), A. Gibson (JET), K. Lackner (Germany), K. Mima (Japan), V. Mukhovatov (ITER), M. Nagami (Japan), T. Sato (Japan), U. Schneider (IAEA), C. Schueller (Netherlands), M. Seki (Japan), A. Sen (India), R. Stambaugh (US), W. Tang (US), E. Wang (China), and L. Zakharov (USA).

With the experienced leadership of Chairman A. Gibson, the Committee selected the papers and organized the Agenda for the Fusion Energy Conference. The Committee evaluated 329 papers, 13 of which were accepted as overview papers, 96 as oral presentations, including 13 rapporteured and 14 combined talks, and 178 posters, including 8 combined posters. All in all 287 highly qualified contributions will be presented in 20 oral and 7 poster sessions during the five days conference. (In comparison: 15th Conference at Seville in 1994: duration 6 days, 24 oral and 9 poster sessions, 235 contributions). The time allocated for overview and oral presentation differs and ranges between 15 and 30 minutes, except for the ITER presentation with 40 minutes.

As recommended by the International Fusion Research Council, generic names (such as heating, transport, divertors) were preferred for session titles instead of machine names (such as tokamaks and mirrors). An exception was made in the case of ITER, because of its unique status. The Committee worked co-operatively to select papers of high technical quality, while keeping in mind secondary criteria of balance by topic areas and by geographic regions. The resulting Agenda for the Conference is shown overleaf.

Oral Sessions

Day	Time	Session	Title of Oral Session
Monday,			
7 October 1996	08:30-09:00		Opening Ceremony
	09:00-09:40	O1	Overviews 1 (Part 1, 1 talk)
	10:00-12:30	O1	Overviews 1 (Part 2, 6 talks)
	14:00-18:00	B1	Inertial Confinement I (5 talks)
Tuesday,			
8 October 1996	08:30-10:20	C1	Helical Systems (5 talks)
	10:40-12:25	G1	Reactor Studies (5 talks)
	14:00-15:50	A1	Concept Optimization I (6 talks)
	16:10-18:00	D1	Transport Theory (6 talks)
Wednesday,			
9 October 1996	08:30-10:20	A2	Confinement & Alpha Particles (6 talks)
	10:40-12:35	B2	Inertail Confinement II (7 talks)
	14:00-15:50	A3	Operational Limits & Disruptions (5 talks)
	16:10-18:00	D2	MHD & Energetic
	16:10-18:00	D2	MHD Energetic Particle Theory (6 talks)
Thursday,			
10 October	08:30-10:20	A4	Divertor Experiments (5 talks)
	10:40-12:30	D3	Divertor Edge Physics & Alternatives (6 talks)
	14:00-15:50	F	ITER (5 talks)
	16:10-18:05	G2	Technology & New Devices (5 talks)
Friday,			
11 October 1996	08:30-10:25	C2	Alternative Systems Experiments (6 talks)
	10:40-12:35	E	Heating and Current Drive (6 talks)
	14:00-15:50	A5	Concept Optimization II (6 talks)
	16:10-18:00	A6	Transport Experiments (6 talks)

Poster Sessions

Day	Time	Session	Title of Poster Session
Tuesday,			
8 October 1996	08:30-12:30	AP1	Confinement (14 posters) Waves, Disruptions, Instabilities (11 posters)
	14:00-18:00	GP	Technology (13 posters) New Devices (2 posters) Reactor Studies (14 posters)
Wednesday,			
9 October 1996	08:30-12:30	AP2	Divertor Experiments (8 posters) Tokamak Concept Optimization (9 posters)
	14:00-18:00	BP	Inertial Confinement (20 posters)
Thursday,			
10 October 1996	08:30-12:30	CP&EP	Helical Systems (12 posters) Alternative Systems (14 posters) Heating and Current Drive (9 posters)
		DP	Theory Poster Session (24 posters)
Friday,			
11 October 1996	08:30-12:30	FP	ITER Poster Session (28 posters)

The 16th IAEA Fusion Energy Conference will be held at the Palais des Congrès located in the Montreal World Trade Center, at the heart of the financial district and the gateway to the Old City. The Chairman of the 16th IAEA Fusion Energy Conference in Montreal is R. Bolton, Director General, Centre Canadien de Fusion Magnétique, 1804, Boulevard Lionel-Boulet, Varennes (Québec), Canada.

Items to be considered for inclusion in the ITER Newsletter should be submitted to B. Kouvchinnikov, ITER Office, IAEA, Wagramerstrasse 5, P.O. Box 100, A-1400 Vienna, Austria, or Facsimile: +43 1 237762 (phone +43 1 206026392).

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