Fusion News

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EFDA
Max-Planck-Institut für Plasmaphysik
Naumann Film

New image film on fusion

A new film on fusion has been prepared by IPP-Garching in the frame of an EFDA contract. The film entitled "Energy of the future - Fusion 2100" is set in a classroom in the year 2100. A teacher explains to the pupils the basics of fusion and the history of fusion research using futuristic teaching kits. Well, convincing the target audience about the advantages of fusion takes place under conditions which contemporary fusion communicators might envy, since in the film fusion power plants have been working for almost 50 years...This is the first common image film on fusion since the very successful movie "Starmakers", which was created in 2000.

New European fusion landscape

2008 has brought a significant change to the structure of the European Fusion Programme. The change was triggered by the set up of the ITER Organisation at the end of 2006. The ITER parties had agreed to provide contributions to ITER through legal entities referred to as "Domestic Agencies". Europe has fulfilled its obligation by launching the European Domestic Agency called "Fusion for Energy", also called F4E, in March 2007.

According its statutes, Fusion for Energy has 3 main tasks:

- to provide the European contribution to ITER
- to provide the European contribution to "Broader Approach" activities with Japan for the rapid realisation of fusion energy
- to prepare and coordinate a programme of activities in preparation for the construction of a demonstration fusion reactor and related facilities.

In parallel to the setting up of F4E, EFDA has been reorganised. A revised European Fusion Development Agreement entered into force on 1 January 2008, defining a new scope as follows:

- Collective use of JET
- Reinforced coordination of physics and technology in EU laboratories
- Training and career development
- EU contributions to international collaborations outside F4E

The European activities contributing to the ITER project, which were previously implemented under EFDA, were transferred to Fusion for Energy on 1 January 2008. EFDA and Fusion for Energy will have close collaboration in several fields in the future as well.

With this issue Fusion News launches a series of articles introducing the different functions of F4E and EFDA.

EFDA
EUROPEAN FUSION DEVELOPMENT AGREEMENT

News

EFDA Steering Committee in Ljubljana and Barcelona

The EFDA Steering Committee has met twice since the beginning of the year, on 10-11 March in Ljubljana, Slovenia (picture) and on 7 May in Barcelona, Spain.

Appointment of new Culham director

UKAEA has announced that Professor Steven Cowley, presently at the University of California Los Angeles and Imperial College, will be the new Culham Director from September 2008 following the retirement of Professor Sir Chris Llewellyn Smith. After doing his undergraduate degree at Oxford and PhD at Princeton, Prof. Cowley worked at Culham in the period 1985-87. Subsequently he worked at Princeton and Imperial College. Over the next few months, before officially taking up his appointment, Professor Cowley will be working regularly with Chris Llewellyn Smith on the long term plan for Culham.

Winner of Nuclear Fusion Award named

The International Atomic Energy Agency has awarded second time a prize called "Nuclear Fusion award" to honour exceptional work published in the journal Nuclear Fusion.

The winner of the 2007 Nuclear Fusion award is C. Angioni from IPP Garching for the paper 'Density response to central electron heating: theoretical investigations and experimental observations in ASDEX Upgrade' (Nuclear Fusion 44 (8) pp. 827-845). The winning paper is freely available to read online at http://www.iop.org/EJ/journal/NuclFus until 31 July 2008.

New director of Directorate Energy (Euratom) in Brussels

In January 2008 Dr. Octavi Quintana Trias was appointed Director of Directorate J, Energy (Euratom) of the Research Directorate General.

Dr. Quintana Trias is a physician by training and was director of one of the largest hospitals in Spain. As a specialist in quality assurance in health care, he had a number of management responsibilities in the Spanish National Health System. He was responsible for the devolution of health care facilities to the regions; he was also Director of International Affairs at the Spanish Ministry of Health.

Dr. Quintana Trias has sound experience in international relations. He was inter alia advisor to the WHO on Health Management issues, Chairman of the Steering Committee on Bioethics of the Council of Europe and Vice-Chairman of the European Group on Ethics. From May 2002 to January 2008, Dr. Quintanta Trias was Director for Health Research in the European Commission's Research Directorate-General. In this position, he successfully set up one of the first Joint Undertakings of the EC research programme.

John D. Lawson passes away

John D. Lawson died at the beginning of this year. He is well known for his derivation of an equation that defines the conditions needed for a fusion reactor to reach a positive energy balance. The criterion was published in January 1957 and is universally known as the "Lawson criterion". Fusion was not Lawson's main research activity, but he made key contributions. While he spent most of his working life working on particle accelerators, he was involved in fusion research in the 50's when he produced his famous criterion and then again from 1975-1976 when he worked at Culham on a design study of a conceptual fusion power reactor based on the reversed field pinch principle.

ICFRM conference in Nice

The 13th International Conference on Fusion Reactor Materials (ICFRM) was held in Nice last December. The ICFRM conferences are held every two years in one of the fusion partner countries, alternating between Europe, Asia and the USA. The scope of the conference ranges from fundamental materials science to in-service materials performance. The main topics of the conference were plasma-facing components developments, multiscale modelling, radiation effects and all aspects related to the development of low activation materials.

In this series, the 13th conference, organised by Euratom-CEA Association, took a special place in several aspects. This was the first major materials conference after the ITER site decision and the first one with a major industrial exhibition called ITER Business Forum 07. IBF/07 covered all the fields of industrial activity connected to the ITER project and was organised around four major components: an industrial conference with thematic workshops, an industrial exhibition, business meetings and a programme of visits (ITER Site, CEA Cadarache site, Sophia Antipolis). Another pioneer feature of the conference was that it aimed at improving synergy between fusion and fission materials development. A specific oral session completed by a poster session was dedicated to cross-cutting materials issues which pointed out synergies with fission GEN IV programme (material for high temperature service, modelling, high temperature design methodology) as well as with the EU research programme on materials for extreme environments (Extremat).

Together, the two events, ICFRM and IBF, attracted about 1400 delegates from the scientific community and industry, as well as 150 exhibitors.

Delegates from 33 countries attended the ICFRM conference, with new ITER partners marking an increased presence. For the first time, the conference welcomed delegates from several countries outside the ITER and IEA communities (e.g. Kazakhstan, Iran).

The number of abstracts received per topic reflected the evolution of the fusion programme. For instance, as we approach the ITER construction phase, the need for R&D work on conventional materials has diminished, and more emphasis is placed on manufacturing of components and licensing.

Several sessions were dedicated to the effect of radiation on the characteristics of functional and structural materials. The conference highlighted the fact that, with the increasing availability of powerful computational tools, multiscale modelling of materials behaviour is rapidly progressing, as illustrated by a large number of papers in this area.

The next ICFRM will be held in Satorro (Japan) in September 2009.

Further information is available on the ICFRM13 website: http://www-fusion-magnetique.cea.fr/icfrm13/

Gateway – new computing facility for tokamak modelling

One of the aims of the EFDA Task Force on Integrated Tokamak Modelling (ITM) is to provide the EU fusion specialists with a complete and flexible suite of reliable software tools and codes that will enable the emulation, preparation and analysis of future ITER plasma discharges. To supply the required hardware and software resources, EFDA has launched the Gateway Project as the first computing facility to be jointly used by the EFDA Associates. The Gateway has been projected to allow the ITM Task Force members to work together on a common platform and share their codes, development tools and technologies.

The Gateway is a relatively small (1 TFlops) installation which is not meant for massive computation but offers other features essential for development activities, such as fast access and a powerful shared storage capacity of ~100 TByte. The facility has been supplied and is operated by ENEA, one of the EFDA Associates, with financial support from Euratom. It is hosted at the ENEA/CRESCO premises in Portici (near Naples, Italy). The operation benefits from full scale system support from the inter-university computing consortium CASPUR.

The project has been very successful, with the facility completed on schedule. The Gateway will be updated in a few months when the high performance computing cluster will be equipped with AMD QuadCore Barcelona processors.

The Gateway cluster is composed of a front end system of 3 computing nodes, where users can log on in an interactive way and 16 worker nodes able to run parallel applications for tokamak modelling. The front-end nodes may be accessed by ITM users through the unique dynamic "gateaway.efda-itm.eu" address. More details about Gateway architecture can be found at the website http://www.efda-itm.eu

Furthermore, ENEA offers free access to the ITM Task Force, for a limited time, to CRESCO, ENEA's supercomputer (25 Tflops peak rate), for scalability tests and benchmarking.

The Gateway Project Board met at Portici on 1 February 2008, accepting the commissioned system and declaring the official start of Operation.

From left to right top row:
Duarte Borba (EFDA), Giuseppe Mazzitelli(ENEA), Ruggero Giannella(EU), Par Strand (ITM Leader), Jerome Pamela (EFDA Leader), Silvio Migliori (ENEA), Andrei Maslennikov(CASPUR),
From left to right bottom row:
Francesco Iannone (ENEA), Dante Giammattei (ENEA), Roberto Guadagni (ENEA)

EFDA during FP7 – Reinforced coordination of physics and technology in EU laboratories Part 1

One of the main objectives of EFDA during FP7 is to further develop and maintain a focused R&D programme in Europe, aiming at the realization of fusion power. The emphasis is on the preparation for the operation and exploitation of ITER and on the establishment of a physics base for DEMO. To this end EFDA will coordinate a range of activities to be carried out by the Associations both in physics and technology. The implementation of these activities will benefit from existing and new structures, such as the Task Forces and Topical Groups.

Topical Groups and Task Forces

The European Task Forces on Plasma Wall Interaction (PWI) and on Integrated Tokamak Modelling (ITM) set up respectively in 2002 and 2003 will continue their activities under the new EFDA, addressing key research areas.

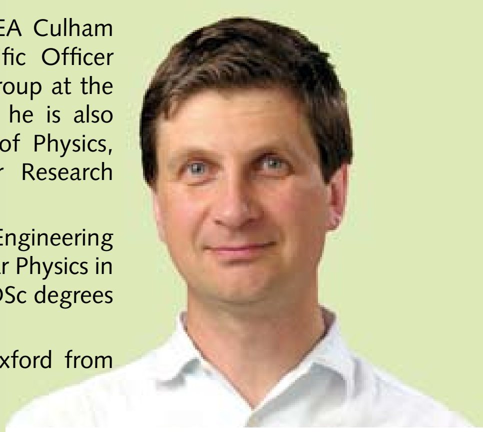
To strengthen the co-ordination in other key areas five Topical Groups have been recently set up: on Fusion Materials Development, Diagnostics, Heating and Current Drive, Transport and MHD.

The role of these newly formed Topical Groups is to develop well-informed and synthetic scientific views on their subject. The Topical Groups will assist the EFDA Leader in the elaboration of the EFDA work programme, providing focus on subjects of particular importance, identifying specific issues and high priority research objectives which need to be addressed and proposing ways to address these issues. The Topical Groups will naturally serve as forums to compare the results obtained in various conditions, assess the relative merits of different approaches and promote new developments.

The Fusion Materials Development Topical Group is presented here. The other Topical Groups will be presented in the next issues of Fusion News.

Fusion Materials Development Topical Group

An ambitious programme on materials is one of the main keys to the successful development of fusion. Indeed one of the attractive features of fusion stems from the fact that no radioactive products result from the reaction itself: the fusion of deuterium and tritium produces helium and neutrons. However, these neutrons are very energetic: their 14 MeV energy is typically one order of magnitude higher than that of neutrons produced in fission reactors. This results in the production of a significant amount of helium in the bulk of the materials which can result in swelling and alteration of the mechanical properties.



Prof. Sergei Dudarev is working at UKAEA Culham Laboratory as a Senior Principal Scientific Officer and the Leader of Materials Modelling Group at the Theory and Modelling Department, and he is also a Visiting Professor at the Department of Physics, Imperial College London and a Senior Research Fellow of Linacre College, Oxford.

He graduated from Moscow Institute of Engineering Physics with a degree in Theoretical Nuclear Physics in 1983, and subsequently gained PhD and DSc degrees at that institute.

Prof. Dudarev's career progressed at Oxford from 1992 to 1999. He joined the UKAEA Association in the same year and has been working there since then. Prior to his appointment to the co-chairmanship of the Fusion Materials Topical Group, Prof. Dudarev had been the Scientific Coordinator of the EFDA Fusion Materials Modelling Programme, acting in this capacity since 2006. He is the author of more than 120 papers published in refereed journals, and a book on High-Energy Electron Diffraction and Microscopy published by the Oxford University Press in 2004.

The question of materials is therefore both an opportunity and a challenge for fusion. The fact that there is freedom to chose and optimise the materials surrounding the plasma in order to minimise activation (and thereby avoid creating long live radioactive waste) constitutes indeed an opportunity. However, the specificity of the reactions produced by the 14 MeV neutrons together with the operating conditions required for the materials (large power fluxes and operating temperatures in the range 400 to 600 Celsius) constitute a challenge which fusion materials R&D has to take up.

The Fusion Materials activity under EDFA will concentrate on long term developments in connection with DEMO design studies (DEMO is the future fusion demonstration reactor foreseen after ITER): e.g. new materials, research areas with high risk, physical understanding to master the evolution of materials properties during operation. These activities will complement the project-oriented developments of Fusion for Energy (see other articles in this issue) and will therefore be prepared and executed in close cooperation with F4E. Whenever developments within EFDA will have reached an appropriate stage of maturity, an assessment will be made in view of a possible transfer to F4E.

The R&D activities address 3 main research objectives:

1. Materials development closely linked with DEMO design

EFDA activities here will focus on materials for DEMO applications. In particular the area of structural materials, functional materials, and advanced joining technology will be addressed.

2. Modelling of radiation effects and experimental validation

A reliable prediction of radiation effects necessitates a good understanding and modelling of the physical mechanisms. This requires the use and development of modelling tools and their experimental validation at the relevant scale. Some of the modelling tools need intensive computation capability and are considered in the definition of future fusion computing centres presently under discussion.

The quality of understanding and the reliability of the predictive capability based on computational material science strongly depends on experimental validation. This requires using well defined materials and irradiation conditions and conducting physical, chemical and mechanical characterisation at the relevant scale. Fission neutron and spallation-neutron mixed spectrum irradiations will be used for exploring the evolution of mechanical properties and microstructures

3. Irradiations

Irradiation campaigns are also required to constitute an engineering database of materials in real operational conditions. The irradiations will be carried out on fission reactors, spallation sources, multiple beam irradiation facilities and on the future International Fusion Materials Irradiation Facility (IFMIF) projected in the mid-term. Post-irradiation examination will include the measurement of physical and mechanical properties, the characterisation of microstructure, He & H retention measurements.

To achieve these objectives three Research Projects and one Research Area have been set up (the Research Projects have well defined objectives, deliverables and milestones, while the Research Area presently requires only looser coordination) :

The Research Projects are as follows :

- Tungsten and tungsten-alloy development for plasma facing components, structural application, heat sink and armour materials
- Nano-structured oxide dispersion strengthened (ODS) ferritic steel (where oxide clusters have dimensions in the nanometer range) development
- Radiation effects modelling and experimental validation

The Research Area will deal with the development of SiC_fSiC (silicon carbide composite made of SiC fibres embedded in SiC matrix) and associated joinings & coatings for fusion reactors.

The co-chairs of the Fusion Materials Development Topical Group are Prof. Sergei Dudarev and Dr. Michael Rieth.

Dr. Michael Rieth has been a Senior Scientist at the Institute of Materials Research I (IMF I) in Forschungszentrum Karlsruhe (FZK) since 2002. He gives also lectures in materials science at the University of Karlsruhe and at the University of Cooperative Education, Karlsruhe. Dr. Rieth is a Workpackage Leader within the European Project GETMAT dealing with metallurgical and mechanical behaviors. His main scientific interests are in materials development for advanced fusion reactor applications as well as in atomistic modelling of metallic materials and nanosystems.

He received his Master of Science degree in electrical engineering from the University of Karlsruhe in 1991 and his doctoral degree in physics from the University of Patras in 2001. He worked as a researcher at the Institute of Materials Research II, FZK, from 1995 to 1999 and at the Engineering Science Department of the University of Patras, Greece, from 1999 to 2000.

Dr. Rieth was the editor-in-chief of the Journal of Computational and Theoretical Nanoscience from 2004 to 2005. He is the author of Nano-Engineering in Science and Technology (World Scientific, Singapore, 2003) and he is editor of the Handbook of Theoretical and Computational Nanotechnology (American Scientific Publishers, Stevenson Ranch, 2006). He has further published patents, book chapters, and numerous research articles in refereed journals.

Fusion for Energy – Europe's new organisation bringing the power of sun to earth!

The ITER international project is the world's largest scientific partnership involving 7 parties representing more than half of the world's population. Its aim is to demonstrate the potential of fusion as an energy source. Each party involved in the project (India, South Korea, USA, European Union, Russia, Japan and China) has established a respective "ITER Domestic Agency" through which their contribution to the ITER project will be managed.

Fusion for Energy is the European Union's organisation responsible for providing Europe's procurements and 'in kind' contribution to ITER. It will also support fusion R&D initiatives through the Broader Approach Agreement signed with Japan and prepare for the construction of demonstration fusion reactors. Fusion for Energy was created by the Council of the European Union on 27 March 2007 for a period of 35 years and it is based in Barcelona, Spain.

Fusion for Energy has a total budget of €4 billion for the first 10 years of its operation. The members composing it are: the 27 members of the European Union, Euratom (represented by the European Commission) and associated third countries (currently Switzerland).

Objectives

According to its statute, Fusion for Energy (F4E) has three main objectives:

First, F4E will provide Europe's contribution to the ITER international fusion energy project. Indeed F4E will pool resources, working closely with European industry and research organisations to develop and manufacture the components that Europe, as ITER's Host Party, has agreed to provide to the device – around 45% of the total (the other 6 parties will each contribute 9%). Most of the components will be contributed 'in kind' (i.e. by providing directly the components themselves, rather than financing them). F4E's role is to mobilise industry and R&D laboratories to deliver high tech components and ensure the successful operation of ITER

Second, in the framework of the international agreement between Euratom and Japan, known as the "Broader Approach", Fusion for Energy will support projects to accelerate the development of fusion power. More specifically, the Broader Approach is made of three projects: IFMIF/EVEDA (Engineering Validation and Engineering Design Activities for the International Fusion Materials Irradiation Facility); the development of a Satellite Tokamak Project (JT60-SA) and the set-up of an International Fusion Energy Research Centre (IFERC).

Third, F4E should also implement a programme of activities to prepare for the first demonstration fusion reactor (DEMO), on the path to commercial fusion energy.

All three objectives form part of the "Fast Track" approach to fusion. Today Europe is in a leading position to implement this approach, starting with delivering its contribution to ITER, then developing Broader Approach projects and later proceeding to IFMIF and DEMO.

Structure

The Director of Fusion for Energy is Didier Gambier, who was appointed in July 2007. He is leading an organisation of currently 100 members of staff, with this figure likely to double in the next couple of years.

Didier Gambier started his scientific career at the French Commissariat pour l'Energie Atomique (CEA) and was later seconded to the Joint European Torus (JET Fusion Project) in the UK after which he became a principal advisor for the ITER Engineering Design Activities in San Diego, USA.

He was subsequently involved in the International Science and Technology Centre (ISTC) in Moscow and became its Executive Director in 2003, before taking on a position in the European Commission in 2004. Didier Gambier has played a leading role in the negotiations leading to the international ITER and Broader Approach Agreements and has been responsible for managing on European Fusion Development Agreement (EFDA) on behalf of the European Commission.

Governance

The Governing Board is the body that brings together representatives from all the Members of 'Fusion for Energy' twice per year and is responsible for taking a number of important decisions and supervising its activities.

The Executive Committee consisting of thirteen members, assists the Governing Board in a range of matters, in particular approving the award of contracts.

The Technical Advisory Panel also plays an important role in providing advice to F4E's Governing Board and Director on the technical and scientific activities

State of play

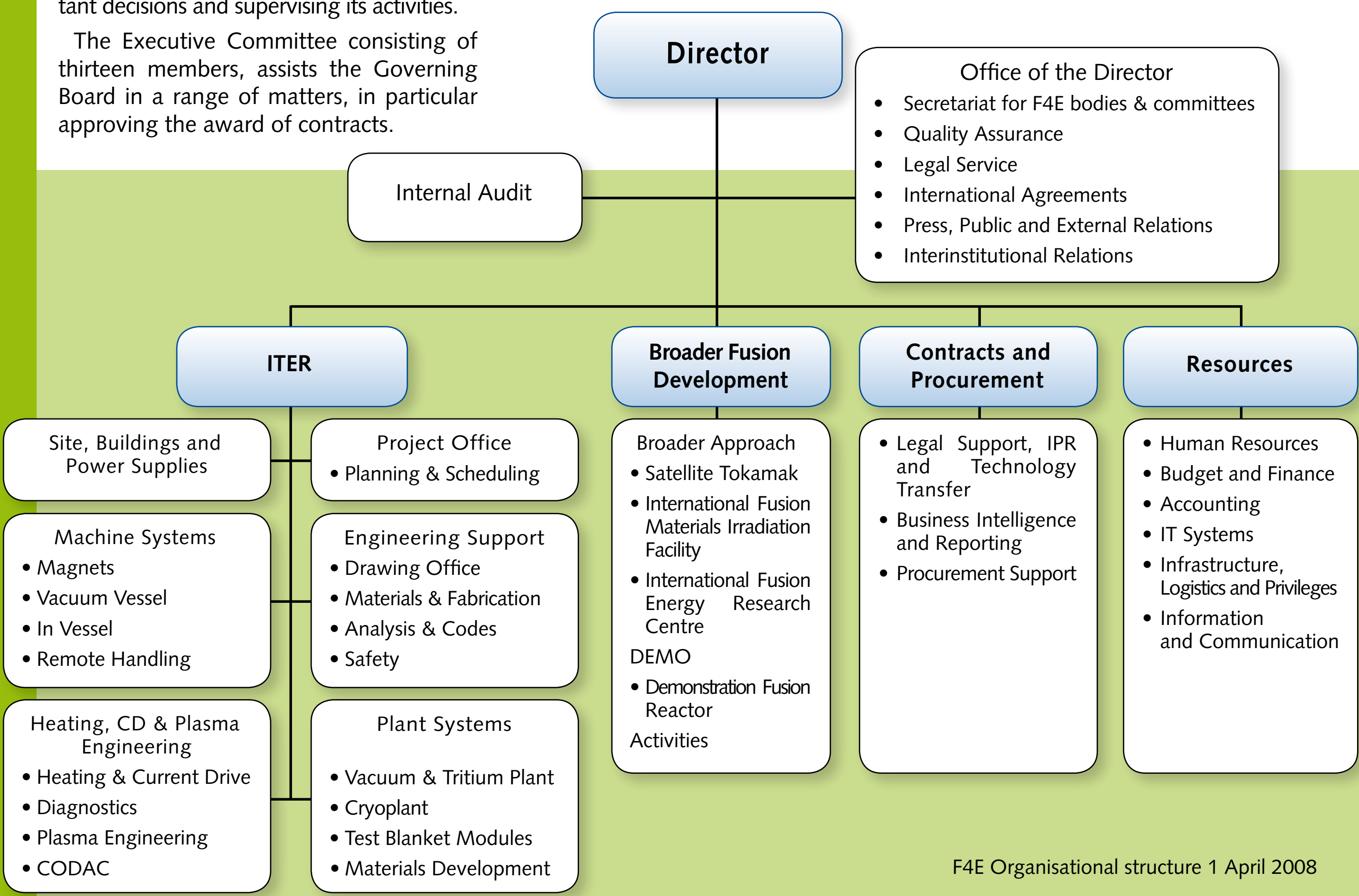
The first administrative Calls for tenders have been launched and first operational Call for Tender was published in March this year for the provision by specialised industry of Chromium plated Copper strands (see http://fusionforenergy.europa.eu/Procurement_operational.htm)

The first Call for Grants has been launched (see http://fusionforenergy.europa.eu/Grants.htm)

Human resources will be one of the most important assets for the success of Fusion for Energy. In particular, the organisation is looking to recruit top notch engineers and technicians to interact with industry, fusion laboratories and other organisations in order to ensure the effective delivery of Europe's international commitments.

F4E's senior management team has been appointed and has been in place since mid April 2008. Currently the organisation counts 100 members of staff and is looking to recruit people more people (see http://fusionforenergy.europa.eu/7_job_opportunities_en.htm).

For more information on Fusion for Energy: http://fusionforenergy.europa.eu



F4E Organisational structure 1 April 2008

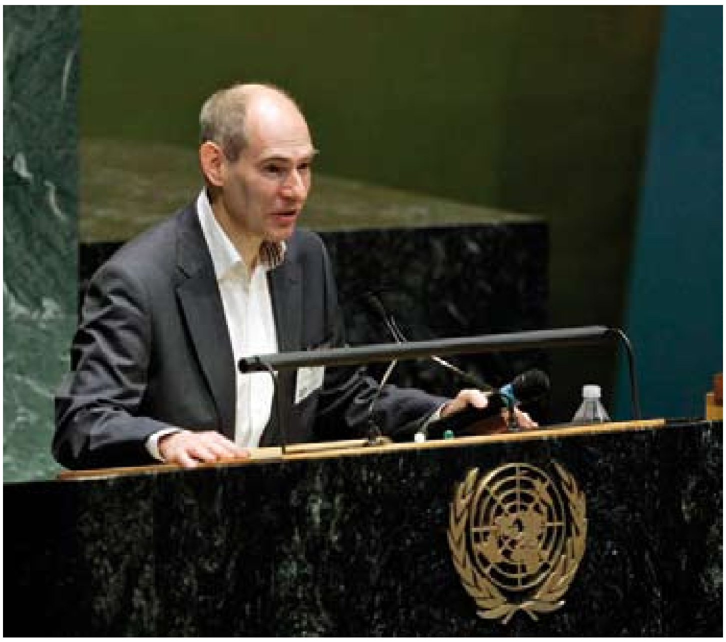
Latest results with an ITER like ICRF antenna on Tore Supra

In ITER, an ion cyclotron resonance frequency (ICRF) system, having a capability to couple 20 MW of radio frequency power into the plasma, is planned for the initial operating phase. One of the essential elements of such a system is the antenna which is rather like the resonant part in an RLC (Resistor, Inductor and Capacitor) electric circuit, connecting the power source and the plasma. The plasma density in front of the antenna is critical. If it is too low, the RF wave cannot pass. The power is then reflected towards the transmitter instead of being transmitted to the plasma, which could be harmful.

Power coupling in the H-mode scenario (considered as the baseline scenario in ITER) is a crucial issue. Indeed, the plasma environment is characterized by periodical fast pressure relaxations at the edge plasma, due to localized Magneto-hydro-dynamics instabilities (so-called Edge Localized Modes, ELM). Such phenomena generate sudden increases of antenna coupling which, if not compensated by the electrical circuit, creates a mismatch which results in repetitive tripping of the power source.

In the framework of the ICRF heating development at CEA Cadarache, an ITER-like prototype (ILP) antenna based on the load-resilient electrical layout foreseen for ITER has been built. This prototype has been recently validated in Tore Supra where plasma exhibiting fast perturbations forced at the edge plasma were used to mimic the sudden increases of the coupling provoked by ELMs. The antenna and its subsystems (phase/power control, arc detection) have behaved as expected and the robustness of an ITER-like array under degraded and perturbed plasma coupling conditions has been validated. The results obtained with the ILP represent a significant milestone on the way towards future integration of IC launchers on ITER and will continue with the commissioning and operation of the JET ITER-like antenna, now installed on the JET device (see related article).

Provided by K. Vulliez and Tuong Hoang on behalf of the Tore Supra Team, Association Euratom-CEA, CEA/DSM/IRFM CEA Cadarache.



An introduction to fusion at UN students´ conference

Over seven hundred high school students from all over the world got together in New York on 6-7 March for an annual student UNIS (United Nations International School) conference. The conference, whose theme this year was ‘Energy, a source of conflict’, took place in the General Assembly Hall in the headquarters of the United Nations. Professor Niek Lopes Cardozo, head of the nuclear fusion research at the FOM-Institute for Plasma Physics Rijnhuizen, made the opening speech at the conference. He presented a version of the Fusion Road Show, an interactive presentation of issues of energy and fusion which reaches some 2000 Dutch students each year, and then joined the students in the debate.

JET back in operation

From April to November 2007 the JET tokamak was in a phase of shutdown for enhancement and refurbishment. The nature of the tasks to be performed required the JET vacuum vessel (which, during experiments, is pumped by turbo-molecular and cryogenic pumps) to be at ambient pressure and temperature. In particular, the extensive use of the remote handling system (a unique feature of JET with an articulated boom) required big ports at two octants of the machine to be opened.

In addition to a significant number of inspections, maintenance tasks and substantial remedial work on key equipments, this shutdown was mainly devoted to the installation of a number of new systems. The most extensive of these systems is the ITER-like Ion Cyclotron Resonance Heating (ICRH) antenna (see fig. 1).

ICRH is an established plasma heating technology using electromagnetic waves in a frequency range comparable to the cyclotron frequency of ions (30 – 55MHz in JET's magnetic fields) to increase the energy of the plasma ions. The ITER-like ICRH antenna is a further development of the existing ICRH systems towards more ITER-relevant conditions. The baseline operational scenario for ITER is the High Confinement Mode, which is, in most cases, accompanied by Edge Localised Modes (ELMs). ELMs are disruptive events at the plasma edge, which are fast and strong variations in the equivalent loading impedance that the plasma presents to the antenna, leading to a reflection of the radio frequency (RF) energy back to the generator and, hence, to a limitation in the amount of energy which can be coupled to the plasma.

The ITER-like antenna has been constructed in an ELM- or load-resilient way, meaning that, although the plasma may vary strongly, this does not translate into large impedance variations, thus allowing the generators to couple RF power to the plasma despite ELMs. As the walls of a future fusion reactor will have to be covered to a high fraction by a blanket (which will use fusion produced neutrons to breed tritium as fuel to the reactor and produce high grade heat for power production) and only a small area will be available for systems like antennas, it is important that any heating system features a high power density. The ITER-like antenna at JET will be capable of delivering 8MW/m2 to plasmas with ELMs at a relatively large distance between antenna and plasma, which, in turn, is another challenging condition for the ITER ICRH system.

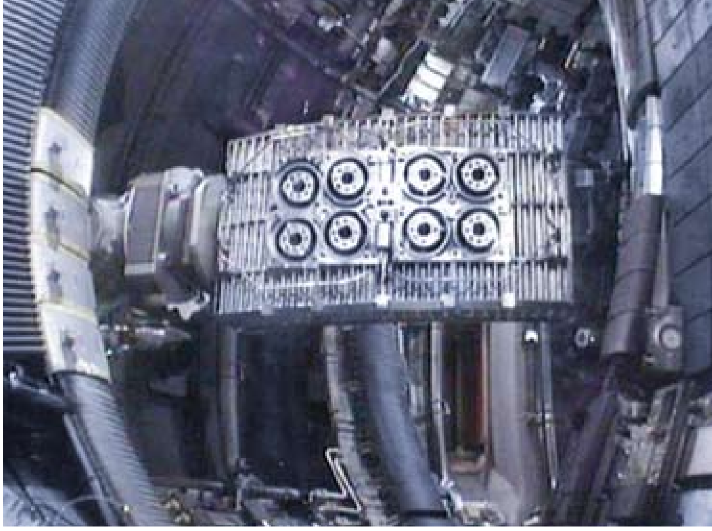


Fig. 1 The ITER like antenna during installation in JET

Another enhancement was the High Frequency Pellet Injector, which is a device capable of shooting small cubes of deuterium ice into the plasma. The motivation for this device is to have a direct fuelling method for the plasma core and to mitigate ELMs.

A second array of Toroidal Alfven Eigenmode antennas has also been installed (see fig. 2). The purpose of these antennas is to excite Toroidal Alfven Eigenmodes (TAEs, a type of instability considered to pose a risk for loss of confinement in ITER) in order to study their impact on the plasma. Other enhancements had to do with upgrading some diagnostic equipment in order to improve the quality of measurements during experiments.

Following the completion of the Shutdown activities JET entered a so-called restart phase. This involves powering up all the electrical systems and pumping down the JET vessel, followed by a period of leak testing, inner-wall conditioning and commissioning the various systems, in particular, the power supplies feeding the toroidal and poloidal field coils and the plasma heating systems. The first technical plasma was obtained on 5 February and, since then, further commissioning of the many systems in readiness for the next Experimental Campaigns is in progress, which started on schedule in April 2008.

The process of elaborating the Experimental Programme of JET for the forthcoming Campaigns has been revised for 2008 to further improve the coherence of the Programme. The aim has been to ensure a common understanding of the main scientific issues and to achieve the highest level of cross-field integration of expertise and scientific goals in the execution. The week beginning 19 November 2007 150 scientists from across Europe met at JET for a General Planning Meeting. They identified the activities which should form the basis of the 2008 Programme, agreed on the main experimental elements required for a focused scientific programme and developed them in sufficient detail that a draft experimental timeline could be established immediately following the meeting. The meeting also identified those scientists who could elaborate further the experiments, identified the modelling needs in support of the Programme and consolidated the programme of High Level Commissioning of the ITER-like ICRH antenna. The outcome of the General Planning Meeting allowed a detailed timeline to be established for the Experimental Campaigns C20-C25 of the JET 2008 Experimental Programme. These Experimental Campaigns will run from April to December 2008.

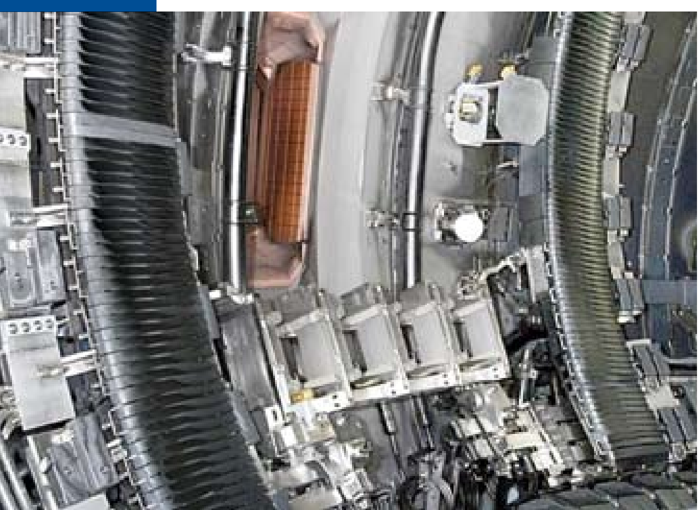


Fig. 2 Toroidal Alfven Eigenmode antenna array installed in JET

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For more information see the websites:
http://www.efda.org
http://www.jet.efda.org
http://www.iter.org

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