eNews

July 17, 2010 (Issue 45)

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Dear Burning Plasma Aficionados:

This newsletter provides a short update on U.S. Burning Plasma Organization activities. E-News is also available online at http://burningplasma.org/enews.html. Comments on articles in the newsletter may be sent to the Editor (Tom Rognlien trognlien@llnl.gov) or Assistant Editor (Rita Wilkinson ritaw@mail.utexas.edu).

Thank you for your interest in Burning Plasma research in the U.S.!

Director's Corner by Jim Van Dam

6th ITER Council Meeting

The ITER Council held its sixth meeting (IC-6) on June 16 and 17 in Suzhou, China. Representatives from all seven ITER Members attended this important meeting. An official press release is posted on the ITER web page (http://www.iter.org/newsline/136/293). The Council received various reports, for example, from the ITER Director-General, from the recent meetings of the Science and Technical Advisory Committee (STAC) and the Management Advisory Committee (MAC), and from the Test Blanket Module (TBM) Program Committee. Progress was noted on the Draft Annual Work Plan (AWP) for 2011, Financial Audit, ITER's draft budget for coming years, Export Control, and Peaceful Uses and Non-Proliferation. The Council adopted the ITER Organization's 2009 Annual Report, as presented by Director-General Ikeda. The Council decided on the charges to be given to STAC and MAC for their meetings in the fall. Furthermore, the ITER Members agreed to hold an extraordinary Council meeting in Cadarache on July 27 and 28. According to the press release, at this meeting all delegations are expected to be in a position to complete discussions on the next steps of the ITER Project.

Representatives at the sixth meeting of the ITER Council in Suzhou, China
(photo courtesy of ITER Organization)

International Tokamak Physics Activity (ITPA)

With the recent rotation of leadership for the USBPO Topical Groups, we have even more firmly established links to the ITPA Topical Groups. Currently, for eight of the ten USBPO Topical Groups, either the Leader or the Deputy Leader (or both) is also a US member of an ITPA Topical Group. All in all, 13 of the 20 Leaders and Deputy Leaders of the USBPO Topical Groups are ITPA members.

This year, there have been two changes in US membership for ITPA. Dave Gates stepped down from the ITPA Topical Group on Integrated Operation Scenarios and was replaced by Stefan Gerhardt. (Dave remains as the Leader of the USBPO Topical Group on Operations and Control).) Andris Dimits stepped down from the ITPA Topical Group on Transport and Confinement and was replaced by Bill Nevins. We thank David and Andris for their past services, and thank Stefan and Bill for their willingness to become involved.

The annual meeting of the ITPA Coordinating Committee was held June 28 and 29 in Cadarache, France. Erol Oktay, Ron Stambaugh, and I attended this meeting as US members of the Coordinating Committee, with Ron continuing his service as its Chair. The first day of the meeting began with a presentation by Director-General Ikeda about the status of ITER and the ITER baseline and a presentation by David Campbell (ITER) about ITER-related research needs and issues. Then, the chairs of the seven ITPA Topical Groups gave individual reports about R&D activities in their areas. (Currently, three of the Topical Group chairs are US scientists: Rejean Boivin for Diagnostics, Stan Kaye for Transport and Confinement, and Bruce Lipschultz for Divertor and Scrape-Off Layer.) It was clear from these reports that a significant amount of research work has been accomplished by the ITPA Topical Groups during the past year. Many of the Topical Groups have structured themselves in terms of internal working groups focused on high-priority ITER physics issues. The morning of the second day of the meeting was devoted to reports from the seven ITER Members—China, Europe, India, Japan, Korea, Russian Federation, and United States—about the status and plans of their respective fusion programs, including descriptions of the domestic mechanisms for supporting the ITPA and responding to ITER research needs. The remainder of the meeting was used to discuss several action items:

- *ITPA databases*—It was proposed that the ITPA databases be migrated to the ITER Organization IT web site. This matter is under further study by the ITPA Coordinating Committee.
- *ITPA web site*—The ITPA web site, which had been maintained at the Max-Planck Institute for Plasma Physics in Garching, Germany, is now almost completely moved to the ITER Organization data system. The Coordinating Committee discussed a draft description of the open-access and access-restricted parts of the new web site.
- *Working Group on Particle Confinement and Fueling in ITER*—Particle transport from the scrape-off layer to the plasma core and related fueling issues for high-confinement operation is an important issue for ITER. In order to make more rapid progress on this subject, the Coordinating Committee approved a proposal to set up a new cross-ITPA working group to coordinate the research efforts within the various topical groups (especially Pedestal, Transport, and DivSOL) that are individually addressing specific aspects of particle transport.
- *Schedule of Coordinating Committee meetings*—The Coordinating Committee approved combining its annual meeting with the IEA/ITPA Joint Experiments Planning Meeting and the IEA Implementing Agreement Executive Committee Meeting and holding this combined meeting in December in Cadarache. The IEA Executive Committee still needs to approve this proposal.

Participants at the 2010 annual meeting of the ITPA Coordinating Committee in Cadarache (photo courtesy of ITER Organization)

- *ITPA Topical Group Meetings in October*—All of the ITPA Topical Groups plan to hold meetings the week after the IAEA Fusion Energy Conference, six in Korea and one in

Japan. The Coordinating Committee discussed local arrangements for the six topical group meetings in Korea, which will be hosted by Seoul National University and Hanyang University.

- *ITER auspices for ITPA*—For the past two years, ITPA has operated under the auspices of the ITER Organization, which has provided administrative and scientific support. At this meeting, ITPA accepted the invitation from ITER to continue this arrangement for another two years.

4th ITER International Summer School

"Fusion is the Future, and the future is in your hands"
Professor Juan Sanchez, Vice President for Research
The University of Texas at Austin
to the young participants at the School

The ITER International Summer School (IISS), which educates young scientists about the physics and technology issues related to the ITER Project, was held this year in the US for the first time. Previous Schools had been held in France (2007 and 2009) and Japan (2008). The University of Texas at Austin hosted the 2010 School on its campus, May 31-June 4.

A total of 133 participants from around the world, representing 48 institutions in 17 countries, attended the School. This included graduate students, postgraduate students, young researchers, more advanced scientists—and even three advanced high school students from a science magnet school in Portland, Oregon. Approximately two-thirds of the participants were from the US and one-third from international institutions.

The theme of this year's School was *Magnetohydrodynamics and Plasma Control in Magnetic Fusion Devices*. Due to the considerable challenge of achieving conditions necessary for fusion reactions, control systems are expected to play a central role in sustaining the reactions and allowing the goals of the ITER experiments to be achieved. Twenty scientific experts from seven countries and the ITER Organization presented lectures on various aspects of this theme. The program and the lecture presentations are posted on the School's web page (http://w3fusion.ph.utexas.edu/ifs/iiss2010/). Write-ups of the lectures will be published in the peer-reviewed, electronically accessible journal *Fusion Science and Technology*.

Participants at the 4th ITER International Summer School in Austin, Texas

For the first time, the School offered a hands-on computer lab workshop where students were allowed to design a plasma control system using commercial computational design tools. Other highlights of the School were the afternoon poster session at which student participants described their research; the Opening Session with written remarks from ITER Director-General Kaname Ikeda; the informal reception on Monday evening and the Texas barbeque banquet on Wednesday evening; and the Closing Ceremony, at which all participants received a diploma certificate for having attended the School.

Some photographs from the School are shown below. Many more are posted on the School's web site (http://w3fusion.ph.utexas.edu/ifs/iiss2010/photos.html).

Lecture room for the Summer School

Hands-on Computer lab session led by Professor Gianmaria de Tommasi (standing)

At the banquet. Left: Dr. James Truchard, CEO and President, National Instruments Corp. Right: Professor Juan Sanchez, Vice President of Research, The University of Texas at Austin

The Institute for Fusion Studies was the local organizer for the School. Sponsors included the US Burning Plasma Organization, US Department of Energy, National Instruments Corporation, Embassy of France in the US, CEA Euratom, Université de Provence, The University of Texas at Austin, and the ITER Organization.

An article about the School, written by the US ITER Project Office, was published in the June 11 issue of the *ITER Newsline* (http://www.iter.org/newsline/135/).

Next year's ITER International Summer School will be held June 6-10, 2011, in Aix en Provence, France, on the theme of *Energetic Particles in Magnetic Confinement Systems*.

Video about ITER Plasma Control System

One of the participants at the 2010 ITER International Summer School was Dr. Axel Winter, who holds a Monaco ITER Fellow position at the ITER Organization. He is shown discussing the plasma control system for ITER in a recent video interview published in *ITER Newsline* (http://www.iter.org/newsline/135/290).

The Energetic Particles Topical Group seeks to facilitate U.S. efforts to understand and predict the behavior of high-energy particles in existing and future fusion devices (leaders are Don Spong and Eric Fredrickson). This month's research highlight from Wenlu Zhang and colleagues describes gyrokinetic simulations of the impact of microturbulence on energetic particle transport and initial comparisons with experimental data.

Gyrokinetic Simulations and Experimental Evidence of Energetic Particle Transport by Microturbulence

W. Zhang (University of Science and Technology of China and University of California-Irvine), Z. Lin, W. Heidbrink, L. Chen, I. Holod, D. Pace, and Y. Xiao (University of California-Irvine)

The confinement of energetic particles is a critical issue for ITER because ignition relies on self-heating by the energetic α-particles. In this work, the diffusion of energetic particles by microscopic ion temperature gradient (ITG) turbulence is studied in large-scale simulations using the global gyrokinetic toroidal code (GTC). The radial particle diffusivity D is found to decrease drastically for high-energy particles due to the averaging effects of the large gyroradius and drift-orbit width, and the fast wave-particle decorrelation. Consistent with gyrokinetic theory, GTC simulations find that D scales with energy as $D \propto E^{-1}$ for energetic passing particle transport (Fig. 1b) due to drift-orbit averaging and wave-particle decorrelation of parallel resonance, and $D \propto E^{-2}$ for trapped-particle transport (Fig. 1c) due to gyroaveraging, banana-orbit averaging and wave-particle decorrelation of drift-bounce resonance. The energy scale in Fig. 1 is normalized to the electron temperature, T_e. In the high-energy regime, passing particles dominate the turbulence transport over trapped particles by two orders of magnitudes. Therefore, for particles with an isotropic velocity distribution, transport diffusivity scaling for high energy is close to $1/E$ (Fig. 1a).

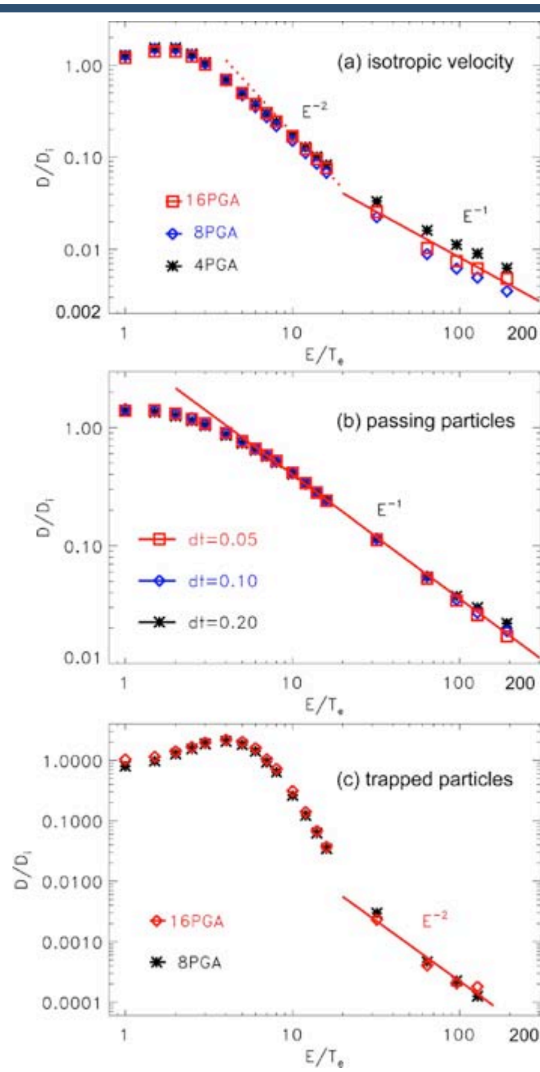

Figure 1. Dependence of energetic to thermal particle diffusivities D/D_i on particle energy E/T_e for (a) an isotropic velocity distribution, (b) purely passing particles ($v_\perp = 0$), and (c) deeply trapped particles ($v_\parallel = 0$).

The gyrokinetic simulation and theory may have important implications for burning plasmas including ITER. GTC simulations suggest that the transport of energetic α-particles ($E >> 10T_e$) is negligible and the transport of low energy α-particles ($E \leq 10T_e$) is relatively strong, which are good for α-particle confinement and helium ash removal, respectively. These gyrokinetic simulations and theory also verifiy the conventional concept that energetic-particle transport is reduced by gyroaveraging, drift-orbit averaging, and wave-particle decorrelation.

In order to develop the predictive capability for assessing the effects of energetic particles on the performance of the burning plasmas, extensive validation of the GTC code has been performed using experimental data from existing tokamaks. As an initial step, results from GTC simulations have been used successfully to explain the transport of fast ions during neutral-beam injection experiments in the DIII-D tokamak for discharges dominated by ITG turbulence. The dependence of the ratio of the fast-ion to thermal-ion diffusivities, D/D_i, on E/T_e is indicated in Fig. 2; here the ratio is multiplied by the thermal diffusivity profile inferred from power balance. This procedure is applied to each of the DIII-D discharges in a neutral-beam power scan, and the theory-based spatially-dependent diffusion coefficients are then employed in NUBEAM simulations of the beam-ion distribution function. For the neutrons and the neutral-beam current drive (NBCD) measurements, the discrepancy between classical theory (neglecting fast ion transport by microturbulence, Fig. 2 upper panel) and experimental data is eliminated when fast ion transport by microturbulence is considered (Fig. 2 lower panel). For the fast-ion D_α (FIDA) signal, the predicted spectra and radial profiles still differ from experiment but the discrepancy is reduced. Thus, the expected transport by microturbulence is the correct order of magnitude to explain the observations.

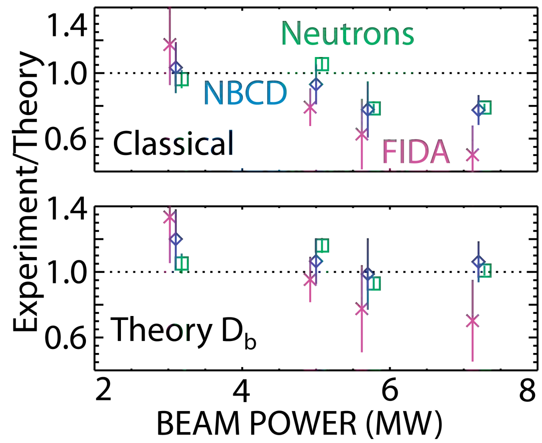

Figure 2. Measured neutron rate (squares), total beam-driven current (diamonds), and FIDA radiance [from E_λ = 20 – 60KeV at p ≅ 0.5(x)] all divided by the classical predictions (upper panel) and including theory-based microturbulence (lower panel).

References

W. Zhang, *et al.,* Phys. Rev. Lett. **101** (2008) 095001; Phys. Plasmas **17** (2010) 055902.
W.W. Heidbrink, *et al.,* Phys. Rev. Lett. **103** (2009) 175001; Plasma Phys. Contr. Fusion **51** (2009) 125001.

REPORTS

Summary of the 18th ITPA Diagnostics Topical Group Meeting in Oak Ridge, TN

R. L. Boivin (General Atomics)

The Eighteenth Meeting of the ITPA Topical Group (TG) on Diagnostics was held at ORNL from May 11 through 14, 2010. The meeting was combined with a Progress Meeting on ITER relevant diagnostic developments in the US, which took place on May 11th.

Good progress has been made in the following tasks designated as high priority (HP):

1. *Development of methods of measuring the energy and density distribution of escaping α-particles.*

After much dedicated effort, the elements required for the evaluation of the basic feasibility of the techniques for measuring alpha losses are now available. The relevant orbit codes have been developed and can be applied to the ITER geometry and internal magnetic structure. The efficiency of applicable scintillators (or equivalent detectors) has been documented for ion and/or gamma flux signal and for background radiation (neutrons and gammas). This measured efficiency coupled with a known first wall geometry, can now yield a quantitative evaluation of the expected Signal to Noise (SNR) ratio for the proposed methods. We are planning next to systemically study the expected response (signal levels) of the different proposed schemes and their respective SNR, within the ITER environment. In parallel activities, we are continuing to evaluate activation techniques from which losses can be derived, but which do not yield the required time resolution.

2. *Assessment of the neutron calibration strategy and calibration source strength needed.*

The Neutron Working Group has reported much progress regarding the neutron calibration strategy. Since the needed dynamic range in neutron detection is rather large, and since limited strength calibration sources are available, cross-calibrations between detectors are necessary. This can be done with dedicated plasma discharges, and supported by appropriate MCNP calculations. While taking into account reasonably available neutron generator yields and source strengths, it is presently proposed to have 2 neutron calibrations, of 2 and 8 weeks duration respectively, not including the usually significant set-up time. Efforts are continuing in devising ways to optimize the number of calibration steps and to reduce the time necessary to complete it, while meeting the required accuracy. Options are being developed which may include additional or more sensitive detectors, additional calibration sources or slight changes to detector configuration.

3. *Determination of the life-time of plasma facing mirrors used in optical systems.*

The First Mirror Working Group presented the newest developments in the area of diagnostic mirrors Activities of the group are focused on work plan (WP) of coordinated R&D on diagnostic mirrors, which had been developed in prior meetings. Significant progress was reported on several tasks of the WP, in particular on predictive modeling of mirror performance in ITER, research and testing of candidate mirror materials and coatings under ITER-relevant conditions and on mitigation of impurity deposition. Notably, significant results were recently obtained in mirror cleaning techniques, in particular using laser irradiation. Significant improvement of optical reflectivity of treated mirrors was reported. However, in some cases the laser cleaning resulted in additional damage to the mirror surface. A clear understanding of laser cleaning is thus required and planned.

Following the added results in mirror exposures (JET, DIII-D, Textor, LHD), coupled to the resumption of efforts in modeling, it is now imperative to shift focus into developing and testing mitigation techniques of material deposition onto first mirrors. These mitigation schemes would include preventive techniques such as local gas puffing, and proper baffling, and corrective techniques such as laser cleaning, or plasma cleaning. Much discussion followed in regards to priority of the proposed tasks and action items assigned to the Working Group in that direction.

In addition, single crystal molybdenum mirrors demonstrate an excellent performance under erosion-dominated conditions in all tokamak experiments. Mirrors withstood the fluence of eroding particles corresponding to about ~1500 ITER discharges without noticeable degradation of their reflectivity. The availability of such mirrors has recently increased significantly following new developments with industrial partners.

4. Assessment of techniques for measurement of hot dust

An evaluation of the requirements on the presence of dust on hot surfaces (i.e., hot dust) has been completed. It was found that a maximum of ~18kg of hot dust can be tolerated within the vacuum vessel. Separately, if one accounts for the total amount of dust that could be found within the vacuum vessel, it is estimated that up to ~40kg of dust could be uniformly distributed on hot surfaces, which would represent a factor of 2 above the safe limit shown above. With these estimations and constraints we are now ready to derive the relevant measurement requirements, and these will be reviewed at the next meeting. They will be the basis for the TG recommendations to the IO for inclusion in the full measurement requirements table.

Initial concepts for the development of a technique for measuring hot dust were also presented. The main proposal consists in measuring the chemical reactivity inside the tokamak with a controlled injection of water (steam) during a bake. This technique presents the advantage of being a global measurement, consistent with the expected measurement requirement. This technique can be complemented by qualitative study of IR emissivity of key surfaces.

Recent technological developments in digital holographic techniques (CO2) were also shown. This technique offers new opportunities in measuring erosion rates in-situ in ITER.

5. The assessment of impacts of in-vessel wall reflections on diagnostics

Many of the optical diagnostics will have to work against the background of stray light coming from the plasma and, because the ITER plasma is much larger than existing tokamak plasmas, this problem will be more severe than that experienced thus far. The problem needs to be evaluated through a process of modeling and measurements on existing machines, and measurements of the reflectivity of relevant materials. Commercial packages have been evaluated and many appear suitable for the task. They will require a full 3D rendition of the internal components of ITER, with the proper reflections coefficients. As a test, and using a much simplified optical model, this approach has been used to model the effects of reflected DNB emission on the active spectroscopic measurements. Depending on details of the blanket surface, the reflected edge CXRS signals from the beam could significantly pollute the core signals for upper port viewing systems. The situation appears less severe for the equatorial systems. The software is readily available and permits the quick importation of 3D CATIA models as well as scans of Bidirectional Reflectance Distribution Function (BRDF) effects. Such packages would be a powerful tool for simulating and qualifying diagnostic performance on many existing devices. They are also being used successfully to simulate plasma radiation loads on invessel components.

Extensive R&D efforts are ongoing at W7-X to quantify and study the effects of stray microwave radiations onto diagnostics and other invessel components. The research plans were presented alongside with initial results, indicating the importance of understanding these effects in W7-X, and likely in ITER as well.

6. Assessment of the measurement requirements for plasma initiation and identification of potential gaps in planned measurement techniques

The early phase of plasma formation and control may require additional or special measurements different than during the flat top phase. No significant progress was reported at this meeting. However, initial details of measurement requirements for the "Plasma Control System" were shown and discussed with respect to the standard (diagnostic) measurement requirements.

Future Meetings

The next (19th) meeting is planned for Japan (organized by JAEA), on 18-22 October 2010, following the IAEA conference in Korea. The provisional location of the 20th meeting in the Spring of 2011 is at the FOM Institute, in The Netherlands.

Summary of the 18th ITPA Pedestal Topical Group Meeting in Naka, Japan

Condensation of the Summary of Report by H. Wilson (University of York)

The eighteenth ITPA Pedestal Group meeting took place during April 21-23, 2010 in Naka, Japan. Although attendance was hampered by Icelandic volcanic activity, the meeting was extremely successful due to the superb efforts of the Japanese hosts and the flexibility and commitment of the participants. The vast majority of European members and some US members (caught in Europe) were unable to travel to Naka because of flight restrictions, but were prepared to work unsociable hours in order to maximise their participation by videoconference, with several members joining at 2:00 am, and several others staying with us beyond midnight. The result was a very productive and successful meeting despite the travel difficulties for a significant number of participants. The meeting was organized into three sections: (1) status of ELM mitigation strategies for ITER, (2) new results for devices and models, and (3) status of joint experiments and other reports.

1. *Status of ELM mitigation strategies for ITER*

The session began with an overview of ITER needs relating to ELM control (Loarte), which is essential for ITER to achieved its missions. Adequate mitigation is required for the whole discharge duration, i.e., from start-up to shut-down, which have different plasma characteristics. This overview served as a topical map for the remainder of the session where a series of review talks summarized the status of the ELM issues raised. A review was presented of the theoretical understanding of ELMs, range from large (type I) to small ELMs, that stressed the need to analyze the detailed plasma response for the various regimes and external controls (Wilson). The effect of resonant magnetic perturbations (RMPs) on various devices was surveyed, and though important differences are reported, there is some growing understanding (Fenstermacher). The present plan for RMP coils for ELM control on ITER was summarized, including the coil currents needed to obtain the same Chirikov stochasticity parameter as is effective for mitigation in DIII-D (but not other devices). RMPs can also trigger ELMs, a strategy known as pacemaking, and detail understanding/control of the spatial spectrum of the RMP is believed important in determining if the coils produce ELM mitigation or pacemaking. Other RMP-related issues reported on are toroidal asymmetries of the resulting heating load to the divertor, density pump-out in the pedestal region, and how to recover the density without triggering ELMs.

ELM pacemaking by two non-RMP methods was also discussed, with pellet pacemaking remaining a baseline option for ITER. Pellet technique requires a substantial extrapolation from existing devices, especially further increasing the frequency to reduce ELM size to an acceptable sized for ITER (Lang). Results from JET indicate that pellets injected from the inner midplane of the torus are more effective though may be technologically more difficult. Control of plasma density with a high frequency of pellets is also an issue. Another pacemaking control method is vertical plasma displacement of the magnetic equilibrium that can trigger ELMs (Saibene). Here the vertical magnetic field can be rapidly changed to trigger ELMs in a number of tokamaks. Work continues to understand the trigger mechanism as changes in the static stability diagram for peeling/ballooning modes in the pedestal does not seem sufficient.

Another control method is to use the ITER ECRH system to provide heating and current drive in the edge region close to the pedestal top to control the pressure and current profiles, but more work is needed for extrapolation to ITER (Horton). Here the largest change in the edge current is likely through the bootstrap current. Experiments have been tried on ASDEX-U and JT60-U with mixed results. Such edge modification may produce ELM regimes other than type I that could have favourable characteristics. The experimental understanding of more benign small or no-ELM regimes owing to different operating conditions/parameters was reviewed in detail (Oyama). These regimes include type II, III, V, and grassy ELM behavior, and EDA, I-mode, and QH ELM-free modes. The scaling of these regimes is typically empirical, reflecting that detailed physics understanding is yet to be developed (with QH being an exception).

2. New results for devices and models

A number of recent experimental and theory/simulations results related both to the H-mode pedestal and ELMs were presented (here identified by the device or institution). For experiments, an enhanced H-mode pedestal is found in NSTX following a large ELM, with the enhancement apparently due to increased pedestal temperature. More detail was given on the Alcator C-Mod I-Mode, an improved confinement mode for energy but not particles. This ELM-free mode does not show excessive impurity accumulation. The mode is usually obtained with the ion gradient-B drift direction opposite that of the standard H-mode. For DIII-D, it was shown that the ELM-free QH mode can be obtained for cases with near-zero net toroidal torque, which is of direct relevance to ITER owing to its low torque input. It has been discovered that the QH mode can be induced by non-resonant external magnetic perturbations (rather than resonant method used for type-I ELM control). Results were also given on the impact of magnetic perturbations from a simulated Test-Blanket-Module (TBM) in DIII-D, which showed little effect on operation for the expected perturbation level. JT60-U researchers reported data showing evolution of the radial electric field in an ELM-free mode similar to the VH-mode studied on DIII-D.

For ELMs and control techniques, NSTX data on the splitting of the divertor heat flux deposition was shown to depend on both plasma conditions and current in the n=3 external control coil (n is the toroidal mode number); results were generally consistent with magnetic field-line tracing. Extensive MAST data was presented on the impact of its RMP coils: density pumpout appears for both even and odd parity of the external RMP, and the RMP has a varied effect on the L-H transition depending on when it is applied. Details of radial ELM propagation have been studied for MAST and ASDEX-U that impacts the final heat-flux deposition patterns and MAST is installing two cameras for a dynamic stereoscopic view of the ELM propagation. Transport barrier formation and ELM activity in LHD was presented that may help understand 3D effects. News results of pellet pacing in DIII-D for low magnetic-field side injection were reported that yield a 5-fold increase in ELM frequency. Plans for use of room-temperature solid-state pellets for injection into ASDEX-U were discussed.

Progress in theory and simulation included an update on extensions to the EPED model that predicts both the height and width of the pedestal. The current version of the model (EPED1.6), which calculates both the peeling-ballooning and kinetic ballooning constraints directly, and has no free parameters, has been successfully tested against DIII-D, C-Mod and JET observations. Predictions for ITER are encouraging, yielding a temperature at the pedestal top of 4.1keV for a typical ITER density profile ($n_{ped} = 7\times10^{19} m^{-3}$). Analysis of plasma screening of the RMP field was presented by two groups using fluid models that include diamagnetic effects (University of Marseille and The University of Texas). Results indicate that the RMP can penetrate when the sum of **E**x**B** and diamagnetic flow is near zero. A close connection is predicted between the RMP density pumpout and braking of the plasma rotation. Simulation from the kinetic XGC0 code indicates that magnetic trapping of electrons may help explain the much lower radial electron thermal transport from the stochastic RMP compared to the uniform B-field Rechester-

Rosenbluth prediction. More detailed coupled simulations of the ELM crash and pedestal recovery with XGC0 was also reported.

3. *Status and plans for joint experiments and other reports*

Owing to the extensive discussions on the topics above, very brief mid-year status reports were provided for each of the group's joint experiments. These will be reported and discussed more fully at our next meeting. Also, a summary was given of the ideas presented at the recent (April) US BPO brainstorming session on alternate methods for ELM control.

The next ITPA Pedestal meeting, hosted by S. Seo, will be held at Seoul National University, South Korea from October 18-20, 2010.

Announcements

Submit BPO-related announcements for next month's eNews to Tom Rognlien at trognlien@llnl.gov .

Upcoming Burning Plasma Events

2010 Events

Aug 30-Sept 3
Theory of Fusion Plasmas Joint Varenna-Lausanne International Workshop
abstracts due June 18
Varenna, Italy

Sept 6-8
Integrated Modeling Expert Group Meeting
Cadarache, France

Sept 7-10
3rd EFDA Transport Topical Group Meeting combined with the
15th EU-US Transport Task Force Meeting
registration/abstract deadline is July 15
Cordoba, Spain

Sept 27-Oct 1
26th Symposium on Fusion Technology (SOFT2010)
Porto, Portugal

Oct 11-16
23rd IAEA Fusion Energy Conference
Daejeon, Korea

Week of Oct 18-20
ITPA Energetic Particles Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-20
ITPA Transport and Confinement Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-21
ITPA Divertor and SOL Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-21
ITPA Integrated Operation Scenarios Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-21
ITPA MHD Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-20
ITPA Pedestal and Edge Physics Topical Group Meeting (in conjunction with IAEA FEC)
S. Korea

Week of Oct 18-22
ITPA Diagnostics Topical Group Meeting (in conjunction with IAEA FEC)
Japan

Oct 24-29
9th International Conference on Tritium Science and Technology
Nara, Japan

Nov 7-11
19th Topical Meeting on the Technology of Fusion Energy (TOFE 2010)
(embedded with 2010 ANS Winter Meeting)
Las Vegas, Nevada USA

Nov 8-12
52nd Annual Meeting of the APS Division of Plasma Physics
abstracts due 5pm EDT July 16
Chicago, Illinois USA

Nov 15-17, 2010 NEW
15th Workshop on MHD Stability and Control: "US-Japan Workshop on 3D Magnetic Field Effects in MHD Control"
Madison, WI USA

Dec 1-2, 2010
Fusion Power Associates Meeting
Washington, DC USA

Dec 15
IEA-ITPA Joint Experiments Planning Meeting
Videoconference

2011 Events

Spring
ITPA Transport & Confinement Topical Group Meeting (following US/EU TIF)
San Diego, California USA

May 15-19, 2011
15th International Conference on Emerging Nuclear Energy Systems (ICENES)
San Francisco, CA USA

June 26-30, 2011
38th IEEE International Conference on Plasma Science (ICOPS) and the 24th Symposium on Fusion Engineering (SOFE)
Chicago, IL USA

Oct 16-21
15th International Conference on Fusion Reactor Materials (ICFRM-15)
Charleston, SC USA

Directories of Other Plasma Events

IEEE Directory of Plasma Conferences
Fusion Ignition Research Experiment (FIRE) Physics Meetings

Please contact the administrator with additions and corrections.