

The Burning Issues:
U.S. Burning Plasma Organization e-News
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from Ray Fonck, USBPO Director

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Dear Burning Plasma Aficionado:

This note is being sent to give you a short update on U.S. Burning Plasma Organization activities.

These news notes will also be posted on the BPO website at <http://burningplasma.org/news.html>

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

1) TOPICAL GROUP STATUS UPDATE: Oct – Nov 2006 Activities

NOTE: The following provides short summaries of activities pursued by each of the USBPO Topical Groups in the recent Oct.-Nov. period that included the IAEA, ITPA, and APS/DPP meetings. More information can be found in each of the Topical Group Bulletin Boards on the USBPO web site.

MHD, Macroscopic Plasma Physics

The MHD topical group met recently at APS in Philadelphia to discuss the status and plans for the integrated study of ELM, RWM, and error field control coils for ITER. The outcome of the IAEA and ITPA meetings was discussed, individual presentations on ELM, RWM, and error field modeling were given, and a draft task plan for the group was discussed.

Confinement and Transport

The Confinement and Transport Topical Group met after the ITER town meeting at APS. It was determined that we would work on assembling a task group to look at impacts of ITER neutral beam parameters on rotation and confinement, and on verification and validation.

Paul Terry met with the TTF Steering Committee and the TTF executive committee for discussions on the role of the BPO in the fusion program and the relationship between the BPO and the TTF. Researchers in the USBPO generally are also participants in the TTF, and the TTF meetings offer opportunities for participants of both activities to collaborate and integrate burning plasma transport research into the fusion research community. The TTF and the USBPO are interested in addressing longer-term questions of importance for burning plasmas, and it is recognized that the TTF already has structures in place to support such work. Near term needs are most appropriately addressed by task groups set up by the USBPO. Some relevant focused activities to be pursued prior to the next TTF meeting include angular momentum transport and codification of verification and validation.

Boundary

Approximately 30 people attended an initial video e-conference on October 24, 2006, to discuss ITER Issue Cards and how the Boundary Group can influence and work on items of interest. Possible research tasks for the BPO were also discussed.

Presently, the BPO Issue Card list includes the boundary-related topics of ELM mitigation, disruption mitigation, tritium retention and H/D/T control, cryopumping capacity and pedestal and L-H transition optimization.

The Boundary Group had a short "get-acquainted" meeting of about 12 members following the ITER Town Meeting at the APS-DPP meeting in Philadelphia.

A second Boundary Group video e-conference was held on Monday, November 20 to discuss formation of a few task groups.

Plasma-Wave Interactions

A BPO Wave-Plasma Interaction meeting was held after the ITER Town Meeting at the 48th APS in Philadelphia. Those present were in favor of having a BPO session on the afternoon immediately following the upcoming RF conference in May 2007. The group was mostly part of the ICRF/LH community and as such, tended to gravitate toward two possible BPO tasks: ICRF/LH coupling issues, including experimental observations, numerical modeling, and antenna design aspects and numerical simulation of standard core ICRF and potential LHCD-supported scenarios for ITER

The latter was also a focus at the recent SSO ITPA meeting in Chengdu. It was agreed that Rick Goulding would be the point contact for specific information about ITER RF details. In addition, it was felt the U.S. would want, in general, to develop an understanding of RF coupling and core physics issues, particularly if the U.S. is to construct proto-type fusion devices in the future.

Energetic Particles

An ITER Issue Card on diagnostics that will impact alpha physics had been considered and put forward by the Energetic Particles group. At the ITPA meeting in Chengdu, this Issue Card was considered and refined by the MHD group. After further discussion between the MHD and Diagnostics ITPA organizations, this Issue Card has now been forwarded to the ITER

organization. It contains specific recommendations for measurements of the alpha-particle source, confined alphas, lost alphas, and coherent instabilities driven by energetic particles.

Integrated Scenarios

The Integrated Scenarios group met on Wednesday afternoon of the APS-DPP meeting. The main focus of the meeting was a strawman plan (posted in the Integrated Scenarios forum) for a USBPO Task addressing the question of whether there is a credible ITER startup scenario that produces a target plasma capable of achieving an advanced scenario (hybrid and/or steady-state). The ITPA Steady-State Operations group has identified this as an important area, and possibly the focus of a joint experiment. If this happens, we (the BPO) will coordinate US participation. Either way, we expect to form a cross-disciplinary BPO "Task Group" drawn from several different Topical Groups in the very near future. This, along with a task addressing internal coils in ITER, will be one of the first BPO tasks, and can be used as test cases for future tasks.

Fusion Engineering Science

Some members of the BPO Engineering Sciences Topical Group met in Albuquerque on November 14th to discuss an ITER Issue Card on in-vessel tritium inventory. There is concern that excessive tritium buildup due to co-deposition of tritium with carbon in a short time could interfere with ITER operation. Among the near-term actions discussed was creation of a task group to identify a strategy to address the issue of potential build-up of in-vessel tritium inventory. This effort should include: (1) an up-to-date review of experiments, (2) a summary of arguments for removing carbon from the initial stages of ITER D/T operation, and (3) evaluations of and further development of mitigation techniques that would support operation with carbon. The discussion also included tritium inventory related to Be, W and mixed materials.

Modeling and Simulation

A meeting of the Modeling and Simulation topical group took place on Tuesday afternoon of this year's APS-DPP meeting. There were three main topics of discussion: 1) charter and long term-objectives for our working group, 2) near-term tasks for the group, and 3) outstanding issues for the group regarding ITER physics tasks or ITER issue cards.

The charter and long-term goals for the group are heavily influenced by the presence of modeling in most of the other BPO Topical Groups (particularly the Integrated Scenarios group) and at least two relevant ITPA groups with overlapping missions. In fact most, if not all, members of the group are also carrying out simulations relevant to other groups. It was agreed that specific modeling was best carried out in the task groups with those specific interests, and the function of our group should be to support model developers and serve as a cross-topic information gathering and coordinating organization. Specific activities discussed include:

- Collecting and disseminating information from the different Topical Groups on what simulations are being performed, what codes are being used, and what the unfulfilled needs are for modeling capability.
- Organizing code/model benchmarking activities within the U.S. and serving as a focus for similar activities in ITPA.

- Serving as a forum to promote code interoperability, by for example negotiating conventions for code input and output formats.
- Evaluating and clarifying present and future needs for ITER modeling and promoting further model development.
- Attempting to establish a protocol for “certification” of models to be used in ITER design, planning and operation.

Conference calls will be held on specific topics to attempt to develop a roadmap over the next few months.

Near term projects discussed were to:

- Make a survey of the codes actually being used in ITER modeling and collect information about the physics models and numerical/computational methods being employed.
- Collect a set of ITER scenarios approved by the ITER organization to serve as test and benchmark cases for modelers. Several people are doing or planning ITER calculations, but there is no commonly agreed to set of profiles etc. to use.

ITER Physics Tasks and Issue Cards were discussed briefly, but none were determined to require near term action from the group.

Operations and Control

The Operations and Control Topical Group has continued to support CODAC architecture and conceptual development over the last several months. M. Walker spent one week at CEA-Cadarache in September working on CODAC design with the ITER Organization. Material was submitted to document completion of the 2006 ITER Physics Task on disruption halo width evolution. Several ITER issue cards were debated with the Topical Group membership and submitted. One ITER issue card is still under discussion. Discussions were held in October among several Topical Group members and representatives of various international programs at the 21st IAEA/FEC in Chengdu, China. Possible resource sharing and coordination of operations and control efforts ultimately contributing to ITER were identified.

Diagnostics

The first workshop on Diagnostic Development for Burning Plasmas will be held at General Atomics on February 6 thru 8th, 2007, and will be sponsored by the USBPO.

The development of diagnostic techniques for burning plasmas requires many renewed efforts in designing systems for new experiments such as ITER, and to mitigate effects encountered in such environments including high radiation and material deposition/erosion. These efforts should also include the development of new and/or alternative techniques to address specific questions and to optimize the diagnostic set in view of the next step such as DEMO.

The workshop will make use of remote participation as much as possible. The agenda will include a significant amount of time for discussion. A web site will be set up shortly for additional details.

2) STATUS UPDATE, ITER PHYSICS TASKS

As mentioned in the last e-News, Chuck Greenfield, Jon Menard, and Nermin Uckan are working with the ITER Central Team to further define the submitted tasks, as needed, to determine which tasks the U.S. community will be responsible for. The tasks are being negotiated using the priorities outlined on the USBPO bulletin board forum [U.S. Burning Plasma Organization Forum>Task Groups>ITER Physics Tasks 2006-2007](#), 14 High-Priority Tasks Submitted for Consideration.

A brief and informal kick-off meeting was held with Dave Campbell, the new assistant/deputy of the Fusion Science and Technology division under Dr. Chuyanov at the ITER Organization (IO), to discuss potential ITER physics design tasks and issues. The USBPO team described the BPO and its process for generating/prioritizing ITER physics tasks from US. It was recognized that the two highest priority BPO tasks (ELM/RWM/EF coils & plasma startup) would likely be issues for the upcoming ITER design review.

3) ITER TOWN MEETING

A Town Meeting on ITER Progress was held at the recent APS-DPP meeting in Philadelphia. Talks were presented on: 1) "Status of ITER" by N. Holtkamp; 2) "U.S. ITER Project, Providing a Facility for Burning Plasma Research" by N. Sauthoff; and 3) "U.S. Burning Plasma Program Development" by R. Fonck. Copies of these talks can be obtained from the USBPO web site at <http://burningplasma.org/reference.html>

4) USBPO COMMUNICATION TOOLS

The USBPO has been deploying tools to facilitate joint research and planning activities for organization members. These include e-mail list servers, teleconferencing, videoconferencing, and bulletin boards. New services are being deployed as suggestions from members identify what works (and what does not work) for each group. Following requests from members, some new capabilities planned for the near-term include: RSS feeds and push e-mail notices to provide members with updates from the web site and bulletin boards without having to check there; wiki capabilities to develop group discussions and documentation on web sites; and community calendar support to keep members aware of Topical Group meetings and activities.

If you have ideas and suggestions for improving the USBPO communications, please send them to Jim DeKock (dekock@burningplasma.org), and we'll follow them up.

