USBPO U.S. BURNING PLASMA ORGANIZATION

eNews

August 29, 2011 (Issue 58)

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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. Comments on articles in the newsletter may be sent to the Editor (Tom Rognlien) or Assistant Editor (Rita Wilkinson). Thank you for your interest in Burning Plasma research in the U.S.!

Director's Corner by Jim Van Dam

USBPO Topical Group Leadership Rotation

The terms for the USBPO Topical Group leadership positions are staggered so that half (5) of the leadership terms expire each year. The Council endorsed our proposal that the current Deputy Leaders will be promoted to become the new Leaders of these five Topical Groups. Then we followed the Bylaws in selecting new Deputy Leaders, viz., "The candidates for these positions will be developed on the basis of nominations by the membership of the respective Topical Group, discussion with the Research Committee members, and community input as appropriate."

We are happy to announce the five new Leaders and Deputy Leaders. The chart below summarizes the outgoing, continuing, and new leadership for these five Topical Groups:

USBPO Topical Group	Outgoing Leader	New Leader (former Deputy Leader)	New Deputy Leader
Energetic Particles	Don Spong (ORNL)	Eric Fredrickson (PPPL)	David Pace (ORISE)
Fusion Engineering Science	Richard Nygren (SNL)	Larry Baylor (ORNL)	Russ Doerner (UCSD)
Operations and Control	David Gates (PPPL)	Mike Walker (GA)	Egeman Kolemen (PPPL)
Pedestal and Divertor/SOL	Tom Rognlien (LLNL)	Tony Leonard (GA)	Rajesh Maingi (ORNL)
Plasma-Wave Interactions	Steve Wukitch (MIT)	Gary Taylor (PPPL)	David Green (ORNL)

I'd like to express sincere gratitude to the outgoing Topical Group leaders—Don Spong, Richard Nygren, David Gates, Tom Rognlien, and Steve Wukitch. They have provided very positive leadership for the science areas of their respective topical groups, which are truly the "working core" of the USBPO. We have definitely appreciated their many contributions.

We are very grateful for the willingness of the former Deputy Leaders to now become the Leaders of these groups and also for the positive interest expressed by those who now assume responsibilities as new Deputy Leaders.

The next videoconference meeting of the Research Committee, composed of the Leaders and Deputy Leaders of the ten Topical Groups, will be Tuesday, August 30. The departing, continuing, and new members will all attend this annual "passing of the torch" meeting.

Change of Editor for *eNews*

Tom Rognlien (LLNL)
outgoing Editor of eNews

This is the last issue of *eNews* that will be published by our current editor, Tom Rognlien. He took over as Editor with the October 2009 issue and has done an excellent job. He initiated the "Research Highlights" section in the newsletter, which has been quite popular. He has also regularly solicited and published summaries of ITPA topical group meetings, which amount to 14 each year, quite a bit of effort. I have always valued his insightful suggestions concerning my "Director's Corner" column. The *eNews* list of subscribers has expanded significantly during his tenure, from 450 subscribers two years ago, to the current high of 543 subscribers from 115 institutions around the world. This year he will complete four years with the USBPO Pedestal and Divertor SOL Topical Group, two as deputy leader and, most recently, two as leader. But he won't be leaving the USBPO leadership, because he was just elected to a three-year position on the USBPO Council. We are sincerely grateful to Tom for his dedicated and outstanding work as Editor, thanks to which the *eNews* has attained new levels of information content, quality, and circulation.

I'm happy to announce that Dylan Brennan, Leader of the USBPO Modeling and Simulation Topical Group, has agreed to take over as the new editor of *eNews*, starting with the September issue. We look forward to his fine service in this important position.

USBPO Report on International Collaborations

In 2008, the USBPO Council set up a committee to explore opportunities for US scientists to conduct research on international facilities. Mike Zarnstorff, at that time the Vice Chair of the USBPO Council, chaired this committee. After some delays, the report was finally completed, and Mike described it at the recent meeting of the Fusion Energy Sciences Advisory Committee. To give closure to the activity, the USBPO Council plans to review the written report and write a letter with comments. Because at its recent meeting (July 28), the Fusion Energy Sciences Advisory Committee was charged to explore opportunities and modes of operation for international collaborations, this report will serve as a timely source of information. We thank Mike and the other committee members for their diligence in completing the report. The report is posted on the USBPO web site.

USBPO Web Seminar Series

The fourth in the series of remote web-based seminars sponsored by the USBPO was held on July 26. The speakers were Amanda Hubbard and Chuck Kessel reviewing the most recent meeting of the ITPA Integrated Operation Scenarios Topical Group, and Rejean Boivin reviewing the most recent meeting of the ITPA Diagnostics Topical Group. They presented excellent summaries. We know that 46 computers were connected via the ReadyTalk network, although we don't know how many participants per connection. (Chuck Greenfield tells me that General Atomics, for example, tends to average ten participants at its connection.) Still, overall, we can say that the number of remote participants for this series of "webinars" has steadily increased with each seminar. Chuck Greenfield deserves our thanks for organizing the series. Please contact him if you have suggestions for seminars in the future.

ITER Developments

The ITER *Newsline* has published a report by Director-General Motojima about the current state of Japanese industry in the aftermath of the earthquake and tsunami. In July, he led a delegation to Japan that included representatives from the ITER Organization and the Korean and US Domestic Agencies. The delegation visited several Japanese industrial companies involved with the manufacturing of ITER's toroidal field magnets and superconducting strands for the central solenoid—components that are currently the most critical for adhering to the construction schedule for ITER.

Delegation viewing a mockup of a section of TF coil case at Toshiba, Keihin Product Operations, Yokohama, Japan (photo courtesy of ITER Organization)

Congratulations to ITER Deputy Director-General Rem Haange, who received the 2011 Fusion Technology award at the 24th Symposium on Fusion Engineering (SOFE) in Chicago in June.

The Integrated Modeling Expert Group (IMEG) of ITER will hold its next meeting October 25-27 in Cadarache. Lang Lao, one of the two US technical members of IMEG (along with Don Batchelor), is currently the Chair of IMEG.

Fall Meetings of ITPA Topical Groups

The schedule for the upcoming meetings of the seven ITPA Topical Groups is as follows:

Topical Group	Date	Location
Energetic Particles	12-13 September 2011	Austin, Texas, USA
MHD	4-7 October	Padova, Italy
Transport & Confinement	5-7 October	Cadarache, France
Pedestal and Edge Physics	5-7 October	York, UK
Diagnostics	17-20 October	China
Integrated Operation Scenarios	18-21 October	Kyoto, Japan
Divertor and SOL	December 2011 or January 2012	Juelich, Germany

Update on USBPO Activities at APS-DPP Meeting in Salt Lake City

This year the USBPO has again organized a contributed oral session (NO4) "Research in Support of ITER." It will be held on Wednesday, November 16, 9:30 a.m.–12:30 p.m., in Ballroom E, with Chuck Greenfield as session chair.

By the way, another contributed oral session (TO4: "ITER and MFE Physics") also has several ITER-related talks. It will be held on Thursday morning, 9:30 a.m.–12:30 p.m., in Ballroom E. Also, a poster session with ITER-related contributions is GP9, to be held Tuesday morning.

On Tuesday evening, 7:30-9:30 p.m., there will be a USBPO Town Meeting on ITER Status. The featured speakers will be the following:

- Joseph Snipes, Senior Scientific Officer, Plasma Operations Group Leader, Directorate of Plasma Operation, of the ITER Organization, will describe the latest developments with ITER and also discuss control systems.
- David Rasmussen, WBS Team Leader for Pellet Injector, ECH & ICH Systems at the US ITER Project Office, will describe the status of heating systems for ITER.

- Rejean Boivin, international leader of the ITPA Diagnostics Topical Group and diagnostics head for DIII-D at General Atomics, will describe the status of diagnostics for ITER and open areas for burning plasma diagnostic development.
- The new Director of the US Burning Plasma Organization will review US contributions and scientific opportunities for ITER R&D.

The US Burning Plasma Organization is the sponsor for the Town Meeting, to be moderated by Michael Bell, Vice-Chair of the USBPO Council.

First-Person Accounts of the ITER International Summer School

At my request, several of the US participants at the 5th ITER International Summer School (June 20-25, Aix en Provence, France) shared their impressions of the School. I hope you enjoy reading these personal accounts.

By the way, one of the accounts refers to entertainment in Aix. On the second day of the ITER Summer School, June 21, the city of *Aix en Provence* hosted "Music in the Streets" as part of the national *Fete de la Musique* to celebrate the summer solstice. Bands and singers were positioned in various outdoor locations throughout the "old town" (*Vieille Ville*) area of Aix. From personal experience, I can affirm that the streets were packed with people and the music was great.

1. Eric Bass (ORISE postdoctoral researcher at General Atomics)

The IISS afforded a great opportunity to fill in some gaps in my understanding of energetic particle physics in burning plasmas. I think the school struck a good balance between pedagogy and presentation of cutting edge research. I have worked as a post-doc in this field for three years, and I certainly benefited from both types of lectures. While I was already acquainted with most concepts presented, nearly every lecture offered at least one insight or revelation I lacked before (sometimes from reflection after the fact). The ability to ask questions during the talks was particularly helpful in clearing up some persistent points of confusion. Few meetings have taught me as much as this year's IISS.

Importantly, the meeting connected me to my young colleagues, many of whom I did not even know before. I was impressed by the general level of knowledge and enthusiasm among the School's students. While I've always believed in the goal of fusion energy, I realize now that I lacked the certainty that it would ever be realized. That changed at this meeting, during the trip to the ITER site. Seeing ground finally broken, the sheer scale of the project, standing among such capable young scientists, I felt a surety ignite in me: We are going to change the world! I know that my generation will be the one to give fusion energy to the world, and I have never been more proud to be a part of that incredible effort.

2. Alexander Tronchin-James (graduate student, Engineering Physics, University of California, San Diego; now an LLNL postdoctoral researcher working at PPPL)

Alex James

The ITER School was an excellent learning experience and a great opportunity to meet some of the other younger people at different labs around the world. Before attending, I was hardly aware of the depth of work that has gone into understanding power loss in burning plasmas including Alfven eigenmode physics, but the workshop did a great job of appraising us of the long history and even some of the most recent advances in this topic. As an experimentalist, I found the tours of Tore-Supra and ITER a bit isolated, but it was interesting to see the heights (and depths!) that ITER has achieved so far and to see the models and control room of Tore-Supra. If I could have changed one thing about the week, it would have been to make the lectures a bit more "hands on" since I tend to lose track with so much new material unless I have a working grasp on the critical aspects.

I sincerely appreciate the opportunity to participate, and I look forward to any future opportunities to work with the USBPO.

3. Joshua King (graduate student, Nuclear Engineering, University of California, Berkeley)

Attending the 5th International ITER Summer School was a very rewarding experience and added breadth to my knowledge of ITER-relevant physics topics. Many of the talks were appropriately tutorial with the talks by Nathaniel Fisch and James Van Dam standing out as superior. One point mentioned during our lunch with Dr. Van Dam was an idea of asking exceptional lecturers to cover more than one topic rather than each lecturer discussing a single topic. While this puts an additional burden on some lecturers, I imagine it could significantly increase the amount of material that is absorbed.

On a personal note, visiting the ITER site was a life goal of mine and I am so grateful for this chance. Furthermore, the city of Aix en Provence was beautiful and offered a great deal of entertainment. This summer school was amazing opportunity, and I want to express my deepest gratitude to the USBPO for allowing me to attend.

4. Chris Muscatello (graduate student, Physics, University of California, Irvine)

My experience at IISS this summer was by far a positive one. Despite the below-par housing accommodations (which, on the upside, had a beautiful view), the organization of the talks and breadth of material presented gave attendees of all levels of experience a chance to learn something. Personally, I have to say this was the first time that I've attended this kind of event (whether it be a school, workshop, or conference) and left feeling like I have fewer outstanding questions than answers; this is just what I expect from a "school." Talks at large conferences like APS oftentimes don't provide sufficient background to put the material in context. I think the IISS could have improved on this even more by perhaps shortening the length of the talks and allowing for more of a discussion session at the end of each one.

These international forums are excellent for networking with people who you may not have had the chance to meet otherwise. It was interesting to learn that others are working on projects quite parallel to mine all over the world. It's a neat experience to share ideas with those outside of my home institution; it brings an entirely different perspective and way of thinking.

Lastly, I would like to extend my gratitude to the DOE for providing these 8 scholarships. I think I speak for most of us when I say that I would not have been able to attend if the majority of this trip was not subsidized. It's promising for the future of science that the US Government understands the importance of making the international science community a more accessible arena for students and young researchers.

5. Jason Sears (postdoctoral researcher, Los Alamos National Laboratory)

The IISS was a unique survey of the theory, computation/simulation and experimental work on the interaction of Alfvén eigenmodes with energetic particles. The intensity of lectures and ad hoc conversations was much greater than is achieved at the annual conferences. As a result I have several new paths of inquiry to pursue prompted by particular talks that were among the many informative presentations of the school:

- Dr. Nazikian identified the need for damping rate measurements that isolate the contribution of each damping mechanism, especially at high toroidal mode number. I have measured damping rates of stable Alfvén eigenmodes in Alcator C-Mod for both low and high toroidal wave numbers (n) using an external antenna. The damping mechanisms appear to contribute differently to low and high-n modes, as the mode radial extent compared to the continuum width and the ion gyroradius transitions from large to small. These measurements could be extended to the damping components of unstable, nonlinear, and overlapping modes, for which we seek predictions of the coupled evolution of the mode and the fast particle distribution.
- In addition, I have observed unstable chirping, stuttering modes to be initiated during perturbation of the plasma by an external antenna. These modes are not observed in their stable state,

indicating that they are either localized too deep in the core, or exist only in the presence of a modified fast ion distribution. Professor Berk suggested that these modes might be driven by phase-space diffusion of a hole/clump pair that is triggered to grow by the external resonant excitation. Matt Lilley discussed this mechanism for the 1-D case in his talk. Aaron Bader has achieved recent measurements, presented in his poster, of the fast ion distribution in C-Mod that could confirm the connection to my observations.

Also, I organized a lunch meeting of the US students and postdocs with Dr. Van Dam to discuss their career outlook in fusion. Several students praised the National Undergraduate Fellowship (NUF) Program in Plasma Physics and Fusion Energy Sciences (NUF) with launching their interest in fusion, and they supported strong school outreach efforts such as at APS to reach students at even younger ages. Many of the participants were concerned about attrition of our peers immediately after graduate school; they suggested that available postdoc and full-time positions would increase with greater funding and cited uncertainty within ITER and a programmatic emphasis on engineering (rather than plasma physics) as an impediment for recent plasma physics graduates.

On A Personal Note

This will be my final Director's Corner column for the USBPO *eNews* before I head off to a new position at the USDOE Office of Fusion Energy Sciences. Once more, with sincere gratitude, I'd like to acknowledge the truly excellent support—not only for the publication of *eNews*, but also for the USBPO web page, video meetings, conference organization, and detailed administrative oversight—that has been provided by our USBPO Administrator, Rita Wilkinson, and our Communications Coordinator, Jim DeKock. Personally, I have enjoyed communicating with the worldwide audience of *eNews* and, now and then, receiving your feedback and comments. Thank you for your interest in and support of burning plasma science.

USBPO Topical Group Highlights

(The BPO MHD and Macroscopic Plasma Physics Topical Group works to inform the BPO community of ongoing experimental and theoretical research efforts in this area [leaders are Ted Strait and François Waelbroeck]. This month's highlight from members of this topical group summarizes numerical simulations to understand the role of an energetic ion population from neutral beam injection on the MHD stability of the DIII-D tokamak. BPO members are welcome to propose future Research Highlight articles to the editor.)

Kinetic effects of energetic particles on an m/n=2/1 resistive MHD instability in a DIII-D discharge

D.P. Brennan *(University of Tulsa),* ***C.C. Kim*** *(University of Washington), and* ***R.J. La Haye*** *(General Atomics)*

The presence of energetic particles from neutral beam injection and other heating methods is well known to have a significant effect on the linear stability and nonlinear evolution of magnetohydrodynamic (MHD) modes in magnetic confinement fusion experiments. The effects of energetic particles on the linear m/n=1/1 mode have been thoroughly investigated, though significant work remains to accurately predict the mode behavior in ITER; here m and n are the poloidal and toroidal mode numbers, respectively. In contrast, the effects that energetic particles have on the resistive MHD mode for $q > 1$, where q is the magnetic safety factor, have only recently begun to be explored, in particular for realistic geometry and equilibrium configurations. Analytic approaches for simplified geometries and equilibrium states have yet to capture the full scope of physical effects that are dominant in experimentally relevant cases. Considering that the free energy available to, and hence the growth rates of, resistive $m > 1$ modes are in general far smaller than that of ideal (zero resistivity) modes, this invites an intuitive perspective that the effects a given population of energetic particles have on resistive

MHD modes can be proportionally more significant than those on faster growing ideal MHD modes. In present-day experiments, attempts to access high normalized plasma $\beta_N=\beta/(I/aB_\phi)$ typically leads to the onset of an m/n=2/1 resistive MHD instability, leading to termination of the discharge. Here β is the ratio of plasma to magnetic pressure, I is the plasma discharge current, a is the minor radius, and B_ϕ is the toroidal magnetic field strength. It is therefore important to understand these effects in advance of upcoming burning plasma experiments where energetic particle effects are expected to be significant.

The focus in this research highlight is energetic particle effects on the linear n=1 resistive MHD mode in DIII-D tokamak discharges with low central shear profiles, where q_{min} is modestly larger than unity and nearly flat in the core. The near-steady-state stage, or "flattop", of such discharges is characterized by a low-level of benign mode activity, which is associated with current drive sustaining the q profile. These discharges are interesting and useful for numerous fusion science studies, but have moderate $\beta_N \sim 2.5$ values; increasing β_N even slightly typically causes the onset of an m/n = 2/1 mode, leading to termination of the discharge.

In our analysis, we compute the linear stability of the n=1 mode using a δf particle-in-cell (PIC) model for the energetic ion distribution coupled to the nonlinear 3-D resistive MHD code NIMROD [1,2], as well as the stability code PEST-III [3] for ideal MHD stability. Using experimental equilibrium reconstructions during the flattop stage as a basis, we generate a series of neighboring equilibria by varying q_{min} and β_N. The non-ideal MHD stability of the n=1 mode is then calculated for each equilibrium, with Lunquist number $S = \tau_R/\tau_A \sim 10^7$-$10^8$ (the ratio of the plasma resistive time to the Alfven time, τ_R/τ_A) depending on Spitzer resistivity η where $\tau_R \propto 1/\eta$, fixed Prandtl number $P_r = \mu_0\nu/\eta = 100$ (ν is kinetic viscosity), and fixed $\beta_{frac} = \beta_h/\beta = 0.16$ (β_h is energetic particle contribution to β) representative of DIII-D conditions. The computational particle distribution models the slowing-down ion distribution from injected 50 keV neutral beams in the experiment [2]. The interaction between the energetic particles and the mode drives a real frequency and changes the linear stability.

Accurate calculations using only the MHD model (without energetic particles) show the usual stability boundary as q_{min} is decreased as shown in Fig. 1a. In particular, at low $q_{min}\sim1$ the stability

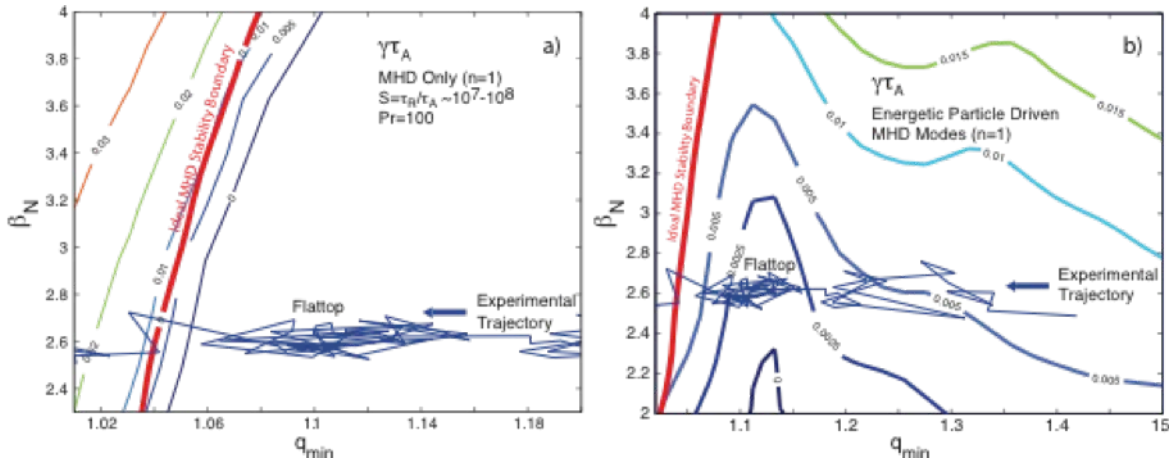

Fig. 1. The computed stability of the n=1 mode in a low q_{min}, low central q shear DIII-D discharge, showing a) the non-ideal MHD-only boundary calculated by NIMROD extending beyond the ideal MHD boundary calculated by PEST-III, and b) the stability of the n=1 mode including the energetic particles for an extended β_N, q_{min} range indicating the mode is destabilized well into the high q_{min} regime. The experimental trajectory during flattop resides in either a stable (for MHD only) or low growth rate region, while with the energetic particles, increasing β_N even slightly leads to significant instability.

boundary tends to be nearly orthogonal to ∇q, with the boundary location increasing in q_{min} as β_N increases as expected. Normalized growth rates above $\gamma\tau_A \sim 0.01$ indicate a transition to ideal instability, and the ideal unstable boundary calculated by PEST-III approximately follows this contour calculated by

NIMROD, while the non-ideal unstable cases extend into the ideal stable regime. However, this extension is not far enough to encompass the flattop region of experimental trajectory. Thus, a significant stable region above the experimental trajectory exists, as shown in Fig. 1a, where during the flattop phase of the discharge the motion of the trajectory is isolated near q_{min}~1.1 and β_N ~ 2.6. Other studies of the stability of the 2/1 mode in DIII-D equilibria have shown similar results [4]. What is not shown is that increasing β_N even small amounts (~0.2) in such discharges can lead to the onset of an n=1 resistive instability [5]. The contrary facts that the MHD stability boundary suggests a significant stable region at higher β_N, and yet the experiment consistently shows onset of an n=1 resistive mode in these regions, has stood as a puzzle for several years.

However, when we include the energetic particles, the n=1 mode is destabilized in these regions as shown in Fig. 1b. The particles interact with the mode, modifying the eigenfunction, destabilizing it, and driving a real frequency. The most important aspects of the contours of the normalized growth rate $\gamma\tau_A$ are that the experimental trajectory at flattop is near the stability boundary, and that a gradient to increasing growth rates is now in the increasing β_N direction, while the boundary at lower q_{min} remains.

Note that the n=1 mode has different physical characteristics in different regions within q_{min}, β_N space, as shown in Fig. 2. Unstable modes with q_{min} below ~1.2 are localized near the magnetic axis, while above q_{min}~1.2 the eigenfunction extends to outer radii. Cases below q_{min}~1.08 have growth rates that are damped as compared to the MHD only result, while above q_{min}~1.1 the mode is driven unstable. It is also important to note that the experimental data indicates a nonlinearly saturated low-level n=1 structure peaks near the magnetic axis, which may correspond to this driven mode. Also, to vary the q profile, the toroidal field is scaled in a computationally convenient manner (for the expert: by adding a constant to F^2 in the Grad-Shafranov equation where $F=RB_\phi$, while retaining the poloidal equilibrium). Thus, at large q_{min}, the equilibria lose their relevance to experiment where the experimental profiles would differ significantly from these projected equilibria.

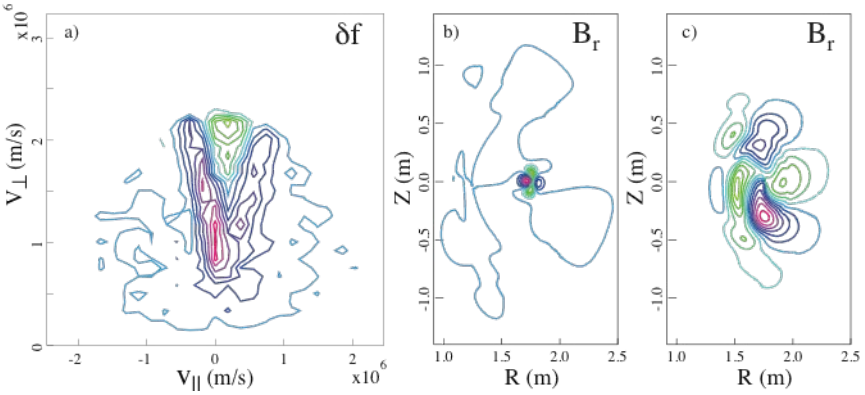

Fig. 2. Contours of the n=1 projection of the perturbed energetic ion distribution δf at β_N=2.5 q_{min}=1.05 are shown in a), indicating a structure in $v_{||}$ that is slightly asymmetric toward negative $v_{||}$. The corresponding B_r contours are shown in b), which are localized near the magnetic axis. The δf interaction with the mode in the core region is dominated by particles with negative $v_{||}$. The B_r for comparable β_N=2.3 but higher q_{min}=1.36 is shown in c), indicating a much broader eigenfunction that is modified by a significant real frequency.

Detailed comparison between these results and the experiment, including structure and real frequency, will appear in a subsequent publication. The summary result is that energetic particles may be responsible for the 2/1 mode onset in these low q_{min}>1 discharges, while MHD-only results do not capture this boundary. All the while, the familiar picture of damping to the n=1 mode for q_{min}<1 remains intact.

This result could have significant implications for burning plasma experiments such as ITER, where energetic particles are expected to play a significant role. Future studies will include particle distributions modeled after those expected in ITER, where alpha particle heating will dominate.

References

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Announcements

Submit BPO-related announcements for next month's eNews to Dylan Brennan.

Upcoming Burning Plasma Events

2011 Events

Fall 2011
ITPA Diagnostics Topical Group Meeting
CHINA

Sep 5-6, 2011
6th IAEA Technical Meeting on Theory of Plasma Instabilities
Austin, Texas USA

Sep 7-10, 2011
12th IAEA Technical Meeting on Energetic Particles in Magnetic Confinement Systems
Austin, Texas USA

Sep 12-13, 2011
7th Meeting of the ITPA Energetic Particles Topical Group
Austin, Texas USA

Sep 11-16, 2011
10th International Symposium on Fusion Nuclear Technology
Portland, Oregon USA

Sep 14-16, 2011
BOUT++ Workshop
LLNL, Livermore, California USA

Sep 19-21, 2011
13th International Workshop on Plasma Edge Theory in Fusion Devices
South Lake Tahoe, California USA

Oct 4-7, 2011
ITPA MHD Topical Group Meeting
Padova, ITALY

Oct 5-7, 2011
ITPA Transport & Confinement Topical Group Meeting
Cadarache, FRANCE

Oct 5-7, 2011
ITPA Pedestal and Edge Topical Group Meeting
York, UK

Oct 10-12, 2011
13th International Workshop on H-mode Physics and Transport Barriers
Oxford, UK

Oct 16-21, 2011
15th International Conference on Fusion Reactor Materials (ICFRM-15)
Charleston, South Carolina USA

Oct 17-20, 2011
ITPA Diagnostics Topical Group Meeting
CHINA

Oct 18-21, 2011
ITPA Integrated Operational Scenarios Topical Group
Kyoto University, JAPAN

Oct 18-21, 2011
ITPA Integrated Operation Scenarios Topical Group Meeting
Kyoto, JAPAN

Nov 14-18, 2011
53rd APS Division of Plasma Physics Annual Meeting
Salt Lake City, Utah USA

Dec 12-15, 2011
ITPA CC & CTP-ITPA Joint Experiments Meeting
Cadarache, FRANCE

Dec 2011 or Jan 2012
ITPA Divertor and SOL (PSI Selection Committee) Topical Group Meeting
Jüelich, GERMANY

Directories of Other Plasma Events

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

Please contact the administrator with additions and corrections.