

TO: Executive Secretaries of the US-Japan Fusion Research Collaboration
FROM: Steering Committee, US-Japan Joint Institute for Fusion Theory (JIFT)
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SUBJECT: JIFT Annual Report of Activities for 2008-2009

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Annual Report of JIFT Activities



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Annual Report of Activities

US-Japan Joint Institute for Fusion Theory

April 1, 2008–March 31, 2009

JIFT Steering Committee

Co-Chairmen: R. Horiuchi and J. W. Van Dam

Co-Executive Secretaries: H. Sugama and F. L. Waelbroeck

May 16, 2009

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1. INTRODUCTION

The Joint Institute for Fusion Theory (JIFT) is one of the three programs through which the US-Japan Fusion Research Collaboration is organized. The other two programs are the Fusion Physics Planning Committee (FPPC) and the Fusion Technology Planning Committee (FTPC).

The distinctive objectives of the JIFT program are (1) to advance the theoretical understanding of plasmas, with special emphasis on stability, equilibrium, heating, and transport in magnetic fusion systems; and (2) to develop fundamental theoretical and computational tools and concepts for understanding nonlinear plasma phenomena. Both objectives are pursued through collaborations between U.S. and Japanese scientists by means of three types of exchange program activities—namely, workshops, exchange visitors, and joint computational projects.

Each year the JIFT program usually consists of four topical workshops (two in each country), six exchange scientists (three from each country), and a fluctuating number of joint computational projects (on the order of a dozen). So far, during its 27 years of successful operation, JIFT has sponsored 158 long-term visits by exchange scientists, 98 topical workshops, and 210 joint computational projects.

- The *workshops* typically have an attendance of 15–30 participants, of whom usually three to seven scientists (depending on the particular workshop) travel to the workshop from the non-host country. Scientists from countries other than the U.S. and Japan are also often invited to participate in JIFT workshops, either as observers or multi-laterals.
- Of the approximately three *exchange visitors* in each direction every year, one (called the “JIFT Visiting Professor”) is supported by the host country, while the others (called “Exchange Scientists”) are supported by the sending country. The visits of the Exchange Scientists usually last from several weeks to two or three months in duration, whereas the Visiting Professors normally stay for three months.
- The third category of JIFT exchange activities consists of *joint computational projects*. In general these are continuing collaborations on various problems of current interest, which initially develop out of interactions at workshops and through individual exchange visits. By mutual agreement of Japan and the US, this category of JIFT activities is terminated after Japanese Fiscal Year 2008; more details about this decision are provided in Section 4 of this report.

The topics and also the participating scientists for the JIFT exchange visits, workshops, and joint computational projects are selected so as to have a balanced representation of critical issues in magnetic fusion research, including both fundamental problems as well as questions of near-term significance, and also to take into account the specific capabilities and interests of both countries. The Japanese and US members of the JIFT Steering Committee agree together on the appropriateness of proposed topics before recommending them.

2. SUMMARY OF COMPLETED ACTIVITIES (2008-2009 PROGRAM)

Almost all of the activities in the three categories—workshops, personal exchanges, and joint computational projects—that had been scheduled for the 2008-2009 JIFT program were carried out during the past year. Three of the workshops were successfully held, in addition to the JIFT Steering Committee meeting. In the category of personal exchanges, two Visiting Professors and five Visiting Scientists made exchange visits. The JIFT joint computational projects were also active. Summary reports about JIFT activities for 2008-2009 are given below.

A. 2008-2009 Workshops

US to Japan:

JF1-9 Energetic Particle Physics in Toroidal Plasmas

Organizers: Y. Todo (NIFS) and G. Y. Fu (PPPL)

Location: Toki, Japan

Dates: December 15-17, 2008

Summary:

Recent progress in theoretical and experimental studies concerning energetic particle physics was discussed in this workshop. The participants were 5 scientists from US and 25 from Japan. Subjects such as ICRF heating, neutron diagnostics, Alfvén eigenmodes, energetic-particle transport and loss, and energetic-particle-driven geodesic acoustic modes (GAM) and zonal flows (ZF) were covered in 16 talks. Recent results of energetic-particle transport and loss, which is an important issue for fusion plasmas, were presented by six scientists. Numerical analysis of Alfvén eigenmodes and comparisons with experimental measurements were discussed in three talks. Simulation of ICRF heating, theory of ICRF-driven rotation of tokamak plasmas, and development of a neutron flux array were reported by three scientists. Recently, the topic of geodesic acoustic mode (GAM) and zonal flow has received much attention for energetic particle physics in fusion research. This trend was reflected in this workshop by four presentations that focused on energetic particle-driven GAM and zonal flow.

Related publications:

All of the presentation materials were posted on the web site at <http://www.dss.nifs.ac.jp/todo/US-Japan2008>.

Japan to US:

JF1-1 Progress of Multi-Scale Simulation Models

Organizers: Alex Arefiev (IFS) and Hiroaki Ohtani (NIFS)

Location: Dallas, TX

Dates: November 21-22, 2008

Summary:

Talks were presented by 10 scientists from the US and 9 from Japan. The 19 presentations at the workshop covered a range of subjects related to models, methods and issues for multi-scale simulations. The presentations covered the smoothed particle hydrodynamics (SPT) method with an electromagnetic field, variational symplectic integrator, interlocked simulation model between particle simulation and MHD simulation, integrated simulations for ICRF and ICRH, multi-scale interaction and turbulent transport between micro-turbulence and macro-MHD by MHD simulation, gyrokinetic particle-in-cell simulations, laser-plasma interaction simulations, magnetic nozzle modeling, and particle-in-cell simulations for collisionless reconnection.

Related publications:

Abstracts and presentations for all of the talks were posted on the web site <http://peaches.ph.utexas.edu/ifs/jift2008-simulationmodels.html>.

JF1-3 Theory and Simulation on Ultra-Intense Laser Plasmas

Organizers: Gennady Shvets (U. Texas) and Kunioki Mima (Osaka U).

Location: U. Texas at Austin, USA

Dates: November 23-24, 2008,

Summary:

Participants at the workshops included six Japanese scientists, 19 US scientists (representing 12 institutions), and one scientist from Portugal (working at UCLA). The workshop was organized into six sections: (1) laser-plasma interactions for inertial confinement fusion applications and proton acceleration; (2) Fast Ignitor: new experiments, hydrodynamic models, and hot electron models; (3) relativistic electron and ion beams and novel radiation sources; (4) laser-plasma accelerators for high energy physics applications; (5) novel modeling tools for laser-plasma and beam-plasma interactions; (6) simulations of beam-plasma interactions for Fast Ignition and astrophysics; and (7) new concepts. Along with a short discussion period for each of the 22 presentations, there were two extended discussion sessions. One discussion session, led by Dr. Bedros Afeyan, was on the question of how to improve theoretical and computational models to meet the needs of the booming field of high-energy-density laboratory physics. The second discussion session, led by Dr. Igor Kaganovich, which ended the workshop, was focused on challenges in developing new computational and theoretical tools needed for modeling Fast Ignitor physics. The workshop included a tour of the Texas Petawatt Laser Facility.

Related publications:

The talks at the workshop are to be posted on the workshop web site <http://peaches.ph.utexas.edu/ifs/jift2008-intenselaser.html>.



Participants at the JIFT Workshop on Theory and Simulation on Ultra-Intense Laser Plasmas (November 2008, University of Texas at Austin).

JF1- JIFT Steering Committee Meeting

Organizers James W. Van Dam (IFS) and Ritoku Horiuchi (NIFS)

Location: Dallas, TX

Dates: November 16-21, 2008

Summary:

Participants at the steering committee meeting reviewed the status of JIFT activities for 2008-2009 and discussed recommendations for exchange activities during 2009-2010.

B. 2008-2009 Exchange Visits

Japan to US:

JF1-6 *Response of Flowing Plasmas to Externally Given Magnetic Perturbation*

Visiting Professor: Masaru Furukawa (University of Tokyo)

Location: IFS, University of Texas at Austin (USA)

Dates: July 29 - August 23, 2008 (26 days); paid by USA

Summary:

Dr. Furukawa first visited the IFS (Univ. Texas at Austin) in 2006 as a JIFT exchange scientist. During that visit he began collaborative research with Dr. L.-J. Zheng of the IFS. Since that visit, these two colleagues continued to carry out collaborative projects on the subject of error field penetration and amplification, especially in rotating tokamak plasmas. Dr. Zheng subsequently visited the University of Tokyo in 2007 under the JIFT exchange program, and they jointly developed a theoretical model on this topic. In 2008 Dr. Furukawa again visited the IFS, this time as a JIFT visiting professor. During this visit, he and Dr. Zheng studied this topic numerically in order to remove a limitation on the theoretical model. They also developed a new technique to efficiently study resistive MHD phenomena such as magnetic islands by numerically matching solutions in the ideal MHD region and the resistive MHD region. This technique removes several essential as well as practical difficulties in the conventional asymptotic matching technique for resistive MHD stability studies. This technique has been already successfully applied to linear resistive MHD stability problems.

Related publications:

- M. Furukawa and L.-J. Zheng, "Suppression of error-field-induced magnetic islands by Alfvén resonance effect in rotating plasmas", 22th IAEA Fusion Energy Conference (Geneva, Switzerland, Oct. 13-18, 2008) paper TH/P9-13, accepted for publication in Nuclear Fusion.
- M. Furukawa, S. Tokuda, and L.-J. Zheng, "Tearing mode stability analysis via a new numerical matching technique for resistive MHD," 50th Annual Meeting of the Division of Plasma Physics, American Physical Society (Dallas, Texas, Nov.17-21, 2008), presentation CP6.00073.

JF1-7 *Simulation Study of Energetic Particle Transport in Quasi-Helical Symmetric Plasma*

Visiting Scientist : Sadayoshi Murakami (Kyoto U.)

Location: University of Wisconsin (USA)

Dates: July 10 - August 6, 2008 (one month); paid by Japan

Summary:

After Dr. S. Murakami visited the HSX group at Wisconsin University in May 2007, he continued a collaboration with them about kinetic modeling of energetic particles in the quasi-helically symmetric plasma of the HSX device. During his follow-up visit in 2008, they improved the simulation model and study the energetic particle behavior during electron cyclotron heating and ion cyclotron heating in a quasi-helically symmetric plasma. As a result, they were able to clarify the magnetic configuration and radial electric field dependencies on the supra-thermal electron transport in a plasma with ECH, and the reduced efficiency of ICRF minority heating in the realistic quasi-helically magnetic configuration.

JF1-8 *Simulation Study of Neoclassical Transport in Non-Axisymmetric Plasmas Based on the δf Method*

Visiting Scientist: Shinsuke Satake (NIFS)

Location: Princeton Plasma Physics Laboratory (USA)

Dates: Oct. 22, 2008 - Dec. 22, 2008 (two months); paid by Japan

Summary:

Dr. S. Satake visited PPPL for collaborative research with Dr. W. X. Wang about advanced neoclassical transport simulation. They studied the numerical method that is necessary to calculate neoclassical transport in a non-axisymmetric magnetic field configuration. Dr. Satake has been developing a δf Monte Carlo simulation code to simulate neoclassical transport phenomena in non-axisymmetric configurations. During his stay in PPPL, he worked with Dr. Wang on how to apply this code to evaluate the neoclassical toroidal viscosity (NTV) in tokamaks with a weakly non-axisymmetric magnetic perturbation. This issue is important for evaluating the toroidal plasma rotation damping in tokamaks with external perturbation coils that are applied to suppress ELMs. With advice from Dr. Allan Boozer, they formulated how to evaluate neoclassical toroidal viscosity by means of the δf method while the radial electric field evolution is solved self-consistently. They plan to continue this collaborative study for the purpose of analyzing neoclassical toroidal viscosity in ELM-control experiments that are being conducted on NSTX and other devices.

JF1-4 *Development of Gyrokinetic PIC Code for Extended MHD Simulation*

Visiting Scientist: Hiroshi Naitou (Yamaguchi U.)

Location: Princeton Plasma Physics Laboratory (USA)

Dates: September 15- September 30, 2008: paid by Japan

Summary:

During his JIFT visit to PPPL, Dr. H. Naitou made progress on a collaborative research project with Dr. W.W. Lee. The ultimate goal of the project is to develop an advanced version of the gyrokinetic PIC (particle-in-cell) code that is specialized for global and kinetic MHD simulations. For this purpose, it is necessary to incorporate a new sophisticated algorithm into the present version of the Gpic-MHD code in order to overcome the difficulty of approaching the large spatial scale and high-temperature operating regime in tokamaks. They revisited the split-weight-scheme with new perspective and derived the basic equations suitable for the MHD simulation. The resultant equations include the vortex equation and the Ohm's law along the magnetic field; hence there is an option to advance field quantities by these equations, instead of calculating the field quantities by the gyrokinetic Poisson's equation and the Ampere's law as it is usually done in conventional gyrokinetic codes.

Related publications:

Inclusion of the new algorithm to the Gpic-MHD code is ongoing, and results will be submitted for journal publication in the near future.

JF1-5 *Physics Analysis of Fast Electron Generation and Transport Relevant to Fast Ignition Laser Fusion*

Visiting Scientist: Tomoyuki Johzaki (Osaka U.)

Location: University of Nevada at Reno, NV

Dates: Japan pending

Summary:

This exchange activity had been scheduled for November-December 2008 (two weeks), paid by Japan. However, it has not yet been carried out.

US to Japan:

JF1-10 *Theoretical and Computational Study of Alfvén Eigenmodes*

Visiting Scientist: Guoyong Fu (PPPL)

Location: National Institute for Fusion Science (Japan)

Dates: December 15-19, 2008 (5 days); paid by US

Summary:

Dr. Fu visited the National Institute for Fusion Studies during December 15-19, 2008. His visit was hosted by Dr. Yasushi Todo. The purpose of the visit was to exchange new research ideas about energetic particle physics in fusion plasmas and to formulate plans for code benchmarking. During the five-day visit, Dr. Fu had extensive discussions with Dr. Todo. In particular, a code benchmark case was selected to compare the stability of an $n=1$ TAE with the M3D-K code and the MEGA code. Dr. Fu also had discussions with Dr. Toi about his recent data from the Large Helical Device about fast beam ion-driven Alfvén eigenmodes and the Geodesic Acoustic Mode.

JF1-11 *Energetic Particle Instabilities*

Visiting Scientist: James Van Dam (IFS, U. Texas)

Location: National Institute for Fusion Studies (Japan)

Dates: September 1-September 5, 2008 (five days); paid by US

Summary:

Dr. Van Dam visited the National Institute for Fusion Science for one week (September 1-5). He worked on a theory to explain spontaneous rotation that has been observed in toroidal confinement systems with only external cyclotron-frequency wave heating. The explanation is based on an adaptation of theory normally used to describe the physics of energetic particles. He had discussions with Dr. Yasushi Todo (NIFS), who is expert in simulations of energetic particles, and with Dr. Sadoyoshi Murakami (Kyoto), who is expert in simulations of RF wave heating, about how to computationally confirm the theoretical predictions. Dr. Murakami subsequently visited the University of Texas in March 2009 to pursue this collaboration.

JF1-12 *Turbulent Transport Theory and Simulations for Magnetically Confined Plasmas*

Visiting Professor: Wendell Horton (IFS)

Location: National Institute for Fusion Science (Japan)

Dates: May 7-August 7, 2008 (three months); paid by Japan

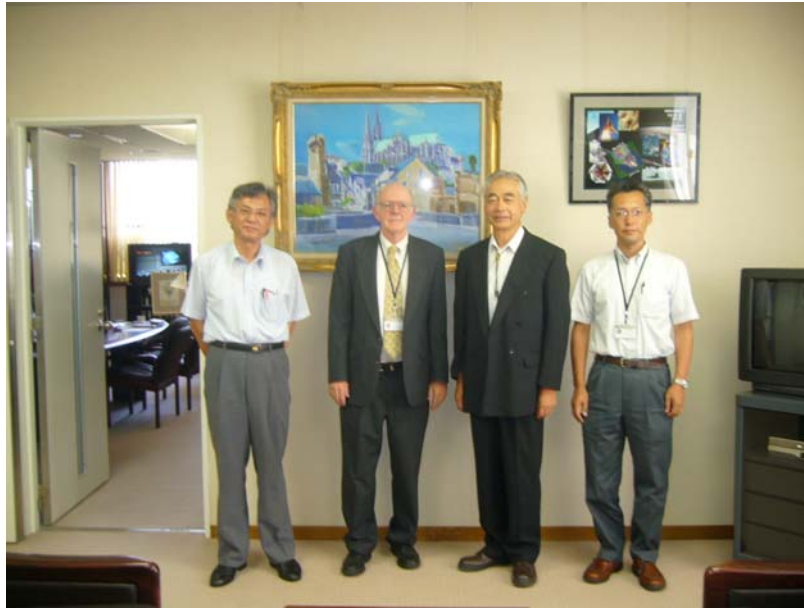
Summary:

During Dr. Horton's visit, he worked with a large number of NIFS scientists on many subjects related to turbulent transport and coherent vortex structures in non-uniform magnetized plasmas. Also he participated in a major simulation project to benchmark the gyrokinetic Vlasov code GKV on a variety of large massively parallel computers. The benchmark results run on the Franklin supercomputer (19320 cores) and the Ranger cluster at the University of Texas (62976 cores) machine were published. Dr. Horton also carried out research with Dr. Uzawa, Dr. T.-H. Watanabe, and Dr. H. Sugama on a coupled model for the toroidal ion temperature gradient mode and zonal flow. They investigated confinement in magnetic plasma confinement systems and also carried out an application to atmospheric turbulence. These results were presented at the 2008 APS Division of Plasma Physics Meeting and will be submitted for publication. In addition, ETG simulations with coherent vortices and zonal flow were performed with Dr. Nakata, Dr. H. Sugama, and Dr. T.-H. Watanabe, and these results were also presented at the 2008 APS-DPP Meeting. Interesting theoretical and simulation studies of the nonlinear dynamics of "dust devil" temperature gradient-driven vortices, observed in terrestrial desert atmospheres and on Mars, were carried out with Dr. H. Miura and presented at the 2008 APS-DPP Meeting. Dr.

Horton also carried out studies of kinetic theory with chaotic orbits for magnetic reconnection with Dr. H. Ohtani and Dr. R. Horiuchi, and the chaos theory was presented as an oral contributed talk at the 2008 APS-DPP Meeting. Dr. Horton also worked with Dr. Kenji Tanaka on calculating density fluctuations inferred from Phase Contrast Imaging data in LHD. He also worked with Dr. Isao Katanuma (Tsukuba University) on rotating plasma instabilities in the Gamma-10 tandem mirror. Dr. Horton collaborated with Dr. Kishimoto, Dr. Li, and Dr. Benkadda (France) on studies of ETG turbulent transport. He worked with Dr. Yukiharu Ohsawa (Nagoya University) on the role of the parallel electric field in nonlinear magnetosonic waves and the corresponding slow shock fronts. With Dr. Sudo, he worked on a model for the creation of a local E_r barrier field created by the deposition and ionization of high-speed fueling pellets injected into LHD. He visited the Institute for Laser Engineering (Osaka University) and gave a talk about an experiment at the University of Texas that is designed to simulate coronal mass ejections and their affect on the Earth's magnetosphere. Dr. Horton gave two general lectures on drift waves and turbulent transport, which were aimed at Ph. D students and younger career researchers. He also gave a talk to the LHD experimental group about the nature of the ETG turbulence in the Tore Supra and the TCV tokamaks.

Related publications:

- W. Horton, J.-H. Kim, E. Asp, T. Hoang, T.-H. Watanabe, and H. Sugama, "Drift Wave Turbulence," in *Turbulent Transport in Fusion Plasmas*, First ITER International Summer School, Aix-en-Provence, France, July 16-20, 2007, edited by Sadruddin Benkadda (AIP Conference Proceedings, Vol. 1013, New York, 2008).
- T. Cho, V. P. Pasthukov, W. Horton, T. Mumakura, M. Hirata, J. Kohagura, N. V. Chudin, and J. Pratt, "Active Control of Internal Transport Barrier Formation Due to Off-Axis Electron-Cyclotron Heating in Gamma 10 Experiments," *Phys. Plasmas* **15**, 056120 (2008).
- T.-H. Watanabe, Y. Todo, and W. Horton, "Benchmark Tests of Fusion Plasma Simulation Codes for Studying Microturbulence and Energetic-Particle Dynamics," *Plasma and Fusion Research* **3**, 061 (2008).
- K. Uzawa, T. H. Watanabe, H. Sugama, N. Nakajima, and W. Horton, "Zonal Flows from Parametric Decays in ITG Turbulence and the Internal Gravity Wave Paradigm," 50th Annual Meeting of the Division of Plasma Physics, American Physical Society (Dallas, Texas, Nov.17-21, 2008), presentation TP6.00126.
- M. Nakata, T. H. Watanabe, and W. Horton, "Gyrokinetic Analysis of Vortex Structures and Distribution Functions in Slab ETG Turbulence," 50th Annual Meeting of the Division of Plasma Physics, American Physical Society (Dallas, Texas, Nov.17-21, 2008), presentation TP6.00141.
- H. Ohtani, W. Horton, T. Petrosky, and R. Horiuchi, "Role of Chaotic Orbits of Meandering Particles in Magnetic Reconnection," 50th Annual Meeting of the Division of Plasma Physics, American Physical Society (Dallas, Texas, Nov.17-21, 2008), presentation GP6.00036.
- W. Horton and H. Miura, "Dust Devil Dynamics," 50th Annual Meeting of the Division of Plasma Physics, American Physical Society (Dallas, Texas, Nov.17-21, 2008), presentation NP6.00020.



Photograph of JIFT visiting professor W. Horton (second from left) with Dr. N. Nakajima, Director-General O. Motojima, and Dr. T. H. Watanabe.

C. 2008-2009 Joint Computational Projects

The following 14 JIFT joint computational projects on various topics were also active during the past year.

- JF2-1** *Analysis of Plasma Rotation and Error Field Effects on Resistive Wall Modes in Tokamaks*
M. Furukawa and Z. Yoshida (Tokyo);
L.J. Zheng and J. Van Dam (IFS)
Continued from 2007-2008
- JF2-2** *Particle Simulation in Open Systems*
S. Ishiguro, R. Horiuchi, H. Ohtani (NIFS);
V. K. Decyk (UCLA)
Continued from 2007-2008
- JF2-3** *Development of a Numerical Analysis Method of the Drift Kinetic Equation by Monte Carlo Method*
S. Murakami (Kyoto U.);
V. S. Chan, M. Choi, L. Lao (GA)
Continued from 2007-2008
- JF2-4** *Zonal Magnetic Field and Zonal Flow Formation in Alfvén Eigenmode Nonlinear Evolution*
Y. Todo (NIFS);
H. L. Berk, B. N. Breizman, J. W. Van Dam (IFS)
Continued from 2007-2008 (with a slight name change)
- JF2-5** *Drift Mode Analysis for the Large Helical Device*
N. Nakajima (NIFS);
G. Rewoldt (PPPL)
Continued from 2007-2008
- JF2-6** *Gyrokinetic Transport Simulation*
V. Decyk (UCLA); W. Lee (PPPL);

T. Takayama (NIFS); H. Naitou (Yamaguchi)
Continued from 2007-2008

JF2-7 *Plasma Rotation, Vortices, and Anomalous Transport*

W. Horton, A. Aydemir (IFS);
H. Sugama (NIFS); S. Murakami (Kyoto)
Continued from 2007-2008

JF2-8 *Benchmark Test of the GKV code for Kinetic Plasma Turbulence*

T.H. Watanabe, H. Sugama, Nakata (NIFS);
W. Horton (IFS)
Continued from 2007-2008 (with some personnel change and slight name change)

JF2-9 *Simulation Study of Neoclassical Transport Based on the Delta-f Method*

S. Satake (NIFS);
W. Wang (PPPL)
New in 2008-2009

JF2-10 *MHD Stability in Advanced Tokamaks*

S.Tokuda, T. Ozeki (JAEA), Y. Tomita (NIFS);
J. Manickam (PPPL); A. Aydemir (IFS)
Continued from 2007-2008

JF2-11 *New Simulation Algorithms for Massively Parallel Processing*

V. Decyk (UCLA); W. Tang (PPPL);
R. Horiuchi, S. Ishiguro (NIFS); K. Watanabe(ES)
Continued from 2007-2008

JF2-12 *Toroidal Simulation and Plasma Transport Modeling*

W. Horton (IFS);
Y. Kishimoto (Kyoto); Y. Idomura (JAEA); H. Takamaru (Chubu)
Continued from 2007-2008

JF2-13 *Numerical Study of High Energy Particle Effect on MHD Stability*

J. Van Dam, H. L. Berk, B. N. Breizman (IFS); G. Y. Fu (PPPL); D. A. Spong (ORNL)
Y. Ishii, T. Ozeki (JAEA); Y. Todo (NIFS)
Continued from 2007-2008

JF2-14 *Turbulent Transport Applications to Tokamaks and Helical Systems*

B. Carreras (BACV Solutions); W. Horton (IFS);
Y. Nakamura (Kyoto); M. Yokoyama (NIFS)
Continued from 2007-2008

3. OTHER JIFT-RELATED PUBLICATIONS

Several papers on work that was done in connection with JIFT exchange activities were published in a recent NIFS report edited by Dr. K. Ichiguchi. For the sake of reference, we list them below:

- Atsushi Ito, Jesus. J. Ramos, and Noriyoshi Nakajima, "High-beta axisymmetric equilibria with flow in reduced single-fluid and two-fluid models," submitted to Plasma and Fusion Research [also contained in NIFS Report NIFS-PROC-75, "Proceedings of Workshop of NIFS Cooperative Programs 2007 'Progress of MHD Theory and Related Topics'" (January 8, 2009), edited by K. Ichiguchi, pp. 15-24]

- Ishizawa and P. H. Diamond, “A model of interaction between magnetic island and drift wave turbulence,” contained in NIFS Report NIFS-PROC-75, “Proceedings of Workshop of NIFS Cooperative Programs 2007 ‘Progress of MHD Theory and Related Topics’” (January 8, 2009), edited by K. Ichiguchi, pp. 31-34.
- K. Ichiguchi and B. A. Carreras, “Mercier Stability Improvement in Nonlinear Development of Heliotron Plasma,” contained in NIFS Report NIFS-PROC-75, “Proceedings of Workshop of NIFS Cooperative Programs 2007 ‘Progress of MHD Theory and Related Topics’” (January 8, 2009), edited by K. Ichiguchi, pp. 35-41.
- Paper by M. Furukawa and L. J. Zheng (in Japanese), contained in NIFS Report NIFS-PROC-75, “Proceedings of Workshop of NIFS Cooperative Programs 2007 ‘Progress of MHD Theory and Related Topics’” (January 8, 2009), edited by K. Ichiguchi, pp. 66-75.
- Noriyoshi Nakajima, Satoru Sakakibara, Kiyomasa Watanabe, Stuart Hudson, and Chris Hegna, “Analysis of MHD stability in high-beta plasmas in LHD,” contained in NIFS Report NIFS-PROC-75, “Proceedings of Workshop of NIFS Cooperative Programs 2007 ‘Progress of MHD Theory and Related Topics’” (January 8, 2009), edited by K. Ichiguchi, pp. 95-98.

Several other JIFT-related publications are the following:

- H. Sugama, T. H. Watanabe, and W. Horton, “Collisionless kinetic-fluid model of zonal flows in toroidal plasmas,” *Phys. Plasmas* **14** (2), 022502 (2007).
- S. M. Mahajan and H. Miura, “Linear superposition of nonlinear wave,” *J. Phys. Plasmas* **10**, 1-8 (2008).
- D. A. Spong, Y. Todo, M. Osakabe, L. Berry, B. N. Breizman, D. L. Brower, C. B. Deng, A. Konies, E. D’Azevedo, “Energetic particle physics issues for three-dimensional toroidal configurations,” submitted to *Nucl. Fusion* (2009).

4. PROGRAM ADMINISTRATION

JIFT has a Steering Committee consisting of eight members, four from each country. Two of these members are the Japanese and US co-chairmen. Two other members of the Steering Committee, the US and Japanese co-executive secretaries, are responsible for the ongoing daily oversight of the progress of JIFT activities. The co-chairman and co-executive secretary on the US side are, respectively, the director and associate director of the Institute for Fusion Studies (IFS) of The University of Texas at Austin. The Japanese co-chairman is the executive director of the Department of Simulation Science at the National Institute for Fusion Science, and the Japanese co-executive secretary is the director of the LHD and Magnetic Confinement Simulation Division in the Department of Simulation Science at the National Institute for Fusion Science. Furthermore, on the Japanese side there is an Advisory Committee comprised of several members representing a spectrum of Japanese universities and the Japan Atomic Energy Agency; and on the US side there is an Advisory Committee comprised of several members representing a spectrum of US universities and national laboratories. The names of the persons on the Steering Committee and the names of the Advisors are listed below.

JIFT Steering Committee

US Members

J. Van Dam (IFS)—Co-Chairman
F. Waelbroeck (IFS)—Co-Exec. Secretary
J. Leboeuf (UCLA)
M. Crisp (DOE)

Japanese Members

R. Horiuchi (NIFS)—Co-Chairman
H. Sugama (NIFS)—Co-Exec. Secretary
Z. Yoshida (Tokyo)
A. Fukuyama (Kyoto)

JIFT Advisors

Japanese Advisory Committee: N. Nakajima (NIFS), S. Ishiguro (NIFS), Y. Kishimoto (Kyoto), H. Naito (Yamaguchi), M. Yagi (Kyusyu), T. Ozeki (JAEA)

US Advisory Committee: A. Aydemir (IFS), P. Catto (MIT), B. Carreras (BACV Solutions), V. Chan (GA), B. Cohen (LLNL), W. Horton (IFS), W. Tang (PPPL), and P. Terry (UWM)

The JIFT Steering Committee attempts to schedule workshops in such a way as to dovetail with other meetings. It also encourages participation at workshops by interested experimentalists and invites relevant available scientists from other countries to attend workshops.

As the principal program for fundamental theoretical exchanges in the US-Japan Fusion Research Collaboration, JIFT operates alongside the Fusion Physics Planning Committee (FPPC) and the Fusion Technology Planning Committee (FTPC). In particular, the JIFT activities are coordinated with the four FPPC areas of activity, viz., core plasma phenomena, edge behavior and control, heating and current drive, and new approaches and diagnostics.

Note that information about the JIFT program, including annual schedules of exchange activities, can be found on the US JIFT web site at <http://peaches.ph.utexas.edu/jift/> on the US side. A corresponding Japanese JIFT web site at <http://dss.nifs.ac.jp/JIFT/> was set up in 2008, with information such as previous JIFT annual reports and JIFT meetings in Japan.

After discussions between the US and Japanese JIFT partners, it was decided at the annual meeting of the JIFT Steering Committee held at Dallas (Nov. 19, 2008) to terminate the Joint Computational Projects category of JIFT exchange activities at the end of Japanese Fiscal Year 2008 in accordance with the expiration of the Annex II document on a Data Link and Data link projects for fusion. The Joint Computational Projects program was instituted in 1985 to take advantage of the dedicated data link between the MFE Computer Center at LLNL (now called NERSC and located at LBNL) and the computer center of the Institute of Plasma Physics in Nagoya. In the early days of the US-Japan fusion collaboration, this JIFT data link was about the only of its kind, allowing data sets to be transferred back and forth and even allowing remote usage of computational facilities in one country by physicists in the other. The decision to terminate the Joint Computational Projects was based on the present situation in which the regular Internet now provides a sufficiently fast communication tool for scientists who wish to access their institution's computers remotely and exchange data through low- and medium-bandwidth lines.

5. PLANS FOR FUTURE ACTIVITIES (PROPOSED 2009-2010 PROGRAM)

The topics and themes of the exchange activities that have been proposed for JFY 2009 (April 1, 2009–March 31, 2010) are consistent with the traditional emphasis of JIFT on fundamental theoretical plasma physics issues. At the same time the proposed activities have direct relevance to the fusion science programmatic interests of both countries. The schedule of proposed activities for the coming year (2009-2010) is listed below.

A. 2009-2010 Proposed Workshops

US to Japan:

Advanced Simulation Methods in Plasmas

Organizers: H. Ohtani (NIFS) and A. Arefiev (IFS)

Proposed Place/Time: NIFS; December 14-16, 2008

Theory and Simulation on Ultra-Intense Laser Plasmas

Organizers: H. Nagatomo (Osaka) and G. Shvets (IFS)

Proposed Place/Time: Hamamatsu; March 8-10, 2010

JIFT Steering Committee Meeting

Organizers: R. Horiuchi (NIFS) and James Van Dam (IFS)

Proposed Place/Time: NIFS December 10, 2009

Japan to US:

Hierarchical Self-Organization of Flows and Turbulence in Plasmas, Oceans and Atmospheres

Organizers: P. Diamond (UCSD) and Y. Kishimoto (Kyoto)

Proposed Place/Time: UCSD; December 6-11, 2009

Integrated Modeling and Simulation in Toroidal Plasmas
Organizers: P. Bonoli (MIT) and A. Fukuyama (Kyoto)
Proposed Place/Time: MIT; February 24-26, 2010

B. 2008-2009 Proposed Exchange Visits

Japan to US:

Theoretical and Numerical Studies of the Parallel Electric Field in Shock Waves
Y. Ohsawa (Nagoya), Visiting Professor
IFS Texas; August 2009 (18 days); paid by US

Structure Formations in Electric and Velocity Fields by Dust in Swirling Vortices
H. Miura (NIFS), Visiting Scientist
IFS; November 2009 (three weeks); paid by Japan

Simulation Study on Core Heating Process in Fast Ignition Laser Fusion
T. Johzaki (Osaka U), Visiting Scientist
University of Nevada, Reno; November 2009 (16 days); paid by Japan

Systematic Statistical Analysis of Numerical Turbulence in Magnetized Plasmas
O. Yamagishi (NIFS), Visiting Scientist
IFS; January-March 2010 (three months); paid by Japan

US to Japan:

Heat Transport and Pressure Gradient in Chaotic Field Of LHD
Stuart R. Hudson (PPPL), Visiting Professor
NIFS; June-August 2009 (three months); paid by Japan

Investigations of Electron Trapping in Relativistic Plasma Bubbles
Gennady Shvets (IFS), Visiting Scientist
Osaka; January-February 2010 (two months); paid by US

Investigation of Multi-scale Simulation Models in Plasma Physics
Alex Arefiev (IFS), Visiting Scientist
NIFS; November-December 2009 (25 days); paid by US

Simulation Study of Toroidal Flow Generation by ICRF Heating
Linjin Zheng (IFS), Visiting Scientist
Kyoto; May-June 2009 (33 days); paid by US

Note that the Joint Computational Projects category of JIFT activities was terminated as of the end of JFY 2008.