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 2011-2012

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François Louis Waelbroeck
US Chairman, JIFT Steering Committee
Director, Institute for Fusion Studies
The University of Texas at Austin
Austin, Texas 78712, USA

Ritoku Horiuchi
JA Chairman, JIFT Steering Committee
Director, Numerical Simulation Research Project
National Institute for Fusion Science
Oroshi 322-6, Toki, Gifu 509-5292, Japan

Annual Report of Activities

US-Japan Joint Institute for Fusion Theory

April 1, 2011–March 31, 2012

JIFT Steering Committee

Co-Chairmen: R. Horiuchi and F. L. Waelbroeck

Co-Executive Secretaries: H. Sugama and A. Arefiev

May 2, 2012

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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 two types of exchange program activities—namely, workshops and exchange visitors.

Each year the JIFT program usually consists of four topical workshops (two in each country), six exchange scientists (three from each country). So far, during its 30 years of successful operation, JIFT has sponsored 180 long-term visits by exchange scientists, 111 topical workshops.

- 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 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 (2011-2012 PROGRAM)*

Almost all of the activities in the two categories—workshops and personal exchanges—that had been scheduled for the 2011-2012 JIFT program were carried out during the past year. Five workshops were successfully held, in addition to the JIFT Steering Committee meeting. In the category of personal exchanges, two Visiting Professors and six Visiting Scientists made exchange visits.

Summary reports about JIFT activities for 2011-2012 are given below.

A. 2011-2012 Workshops

US to Japan:

JF-9 ***The Next Stage in the Progress of Simulation Science in Plasma Physics***
Organizers: H. Ohtani (NIFS) and A. Arefiev (IFS)
Location: National Institute for Fusion Science, Toki
Dates: December 2-3, 2011
Summary:

This workshop focused on the recent progress of simulation techniques, modeling, data analysis methods and so on for large-scale computer simulations in plasma physics and fusion science. The workshop was attended by 28 participants. There were 19 oral presentations (7 from the US, 12 from Japan), which covered a range of subjects related to advanced simulation methods and modeling about gyrokinetic code, hybrid kinetic-MHD model, extended delta-f method, integrated modeling, full-f kinetic simulation, multi-scale simulation, adaptive mesh refinement for PIC simulation, application of GPGPU to PIC simulation, effective parallelization for PIC simulation, remote collaboration system by the internet and scientific visualization by VR system.

Related publications:

- Abstracts and presentation files by all of the speakers were posted on the web site (http://www-fps.nifs.ac.jp/ohtani/JIFT2011/).

JF-10 ***Theory and Simulation on Fast Ignition Target Design***
Organizers: Hideo Nagatomo (Osaka) and Pravesh Patel (LLNL)
Location: Ishikawa Ongakudo, Kanazawa
Dates: November 25, 2011
Summary:

The purpose of this workshop was to understand the detail physics in fast ignition, and advanced target design to increase the heating efficiency using theoretical and computational studies. There were 6 oral presentations (2 from the US, 4 from Japan). The presentations cover the formation of high density core, hot electron generation via relativistic laser plasma interaction, hot electron transport, energy deposition, and integrated physics. The latest topics in this WS were the hot electron beam guiding using various magnetic field, and formation of high density low temperature core plasma using low velocity implosion.

JF-11 ***Hierarchical Self-Organization of Turbulence and flows in Plasmas, Oceans and Atmospheres***
Organizers: Y. Kishimoto (Kyoto) and P. Diamond (UCSD)
Location: Kyoto University
Dates: October 24-26, 2011
Summary:

This workshop was organized as the second workshop followed by the first one held at UCSD on March 23-25, 2010 under the same title. Though the second one was originally planned on March 16-18, 2011, it was postponed to this time due to the effect of Japan major earthquake on March 11, 2011. The workshop was aimed to explore the physics understanding and controlling methodology regulating the turbulent transport and confinement in magnetically confined fusion plasmas by sharing common and interdisciplinary aspects with scientists working in atmospheric/ocean physics and also astrophysics where flow and turbulent dynamics also play an essential role. The workshop was held for three days in Kyoto University with 10 scientists from foreign countries (US, Korea, Spain) and 33 scientists (including 6 students) from Japan (Kyoto Univ., The Univ. of Tokyo, Kobe Univ., Kyushu Univ., Nagoya Univ. JAEA, NIFS). Total 29 talks (18 from Japan and 11 from foreign country) were given, which covered wide topic of theory and simulation, experiment and observation in turbulent transport and related structure formation in magnetically confined fusion plasmas, space/astrophysics plasmas, fluids, oceans/atmospheres etc. The physical origin of large scale structure such as zonal flows and vortices generated from micro-scale turbulence and their impacts on the self- organization and structure formation were intensively discussed. The universality and generality of the phenomena across different fields were highlighted. Specifically, Profs. A. Hasegawa and K. Mima, who originally derived so call Hasegawa-Mima equation which is a guiding principle of self-organization of turbulence, attended workshop and had intensive and valuable discussions. Prof. Diamond gave very excellent summary of the workshop emphasizing the crucial importance of the interdisciplinary cross in exploring fusion science.

The agenda, abstracts, presentations, and photographs can be obtained from the workshop web site http://www.center.iae.kyoto-u.ac.jp/kishi/workshop/index.html (with password).

JF-15 ***JIFT Steering Committee Meeting***
Organizers: Ritoku Horiuchi (NIFS) and François Waelbroeck
Location: Toki, Japan
Dates: December 3, 2011
Summary:

Participants at the steering committee meeting reviewed the status of JIFT activities for 2011-12 and discussed recommendations for exchange activities during 2012-13.

Japan to US:

JF-1 ***Turbulent and neoclassical flow generation and associated transport dynamics***
Organizers: W. X. Wang (PPPL) and T. H. Watanabe (JIFS)
Location: Long Branch, New Jersey
Dates: September 9-10, 2011

Research Summary:

A total of 27 participants attended the workshop including18 from the US, 8 from Japan, and 1 from China. The workshop featured 20 talks presented by scientists from the US (11 talks), Japan (8 talks), and China (1 talk). The presentations at the workshop reported latest progress covering a range of subjects related to theory, simulation and experiment research efforts for magnetic confinement fusion. Specifically, major topics of the presentations focused on the nonlinear physics of flow generation including zonal flows, toroidal flow and poloidal flow in toroidal plasmas including both tokamak and stellarator. A few presentations discussed extended issues associated with laboratory flows relevant to accretion disks, energetic particle transport and kinetic MHD simulations. There were very productive discussions during the 2-day workshop. In the summary session, we discussed about planning of next workshop and reached a preliminary agreement on a workshop to be held in fall-winter 2012 in Japan.

JF-2 ***Integrated Modeling and Simulation in Toroidal Plasmas***

Organizers: V. Chan (GA) and A. Fukuyama (Kyoto)
Location: General Atomics
Dates: March 12-14, 2012
Research Summary:

The purpose of this workshop was to promote the activities on integrated modeling of toroidal plasmas required for predicting the performance of burning plasmas, optimizing the operation scenario of experiments, and designing DEMO reactors. This was the seventh in the series of JIFT workshops on integrated modeling. Twenty-two participants attended the workshop. There were 14 oral presentations (7 from the US, 7 from Japan), which covered a wide range of subjects related to integrated modeling, such as integrated code development; transport, turbulence, rotation, heating and current drive; MHD activities; plasma edge; and scrape-off layer and divertor plasmas.

Related publications:
All of the presentations (which were broadcast over the internet) have been posted on the workshop web site http://bpsi.nucleng.kyoto-u.ac.jp/bpsi/en/.

B. 2011-2012 Exchange Visits

Japan to US:

JF-8 ***Interaction between magnetic islands and turbulence***

Exchange Scientist: Akihiro Ishizawa (NIFS)
Location: IFS Texas, USA
Dates: April 15 to June 8, 2011 (55 days); paid by University of Texas at Austin
Research Summary:

Dr. Ishizawa started collaboration with Profs. W. Horton, F. L. Waelbroeck, and R. Fitzpatrick during his visit at University of Texas at Austin. They studied the drag force acting on the magnetic island and the polarization current, which is responsible for the excitation of neo-classical tearing modes that limit the plasma beta of large tokamak experiments. They considered the situation in which a magnetic island does not move and there is flow around the island by transformation to the island fixed frame from the laboratory frame, where the magnetic island rotates in the poloidal direction due to diamagnetic effects. In order to carry out numerical simulations for this problem, Dr. Ishizawa extended his simulation code (1) to calculate quantities in the island fixed frame and (2) to accommodate the boundary condition to the fixed magnetic island. By using the improved simulation code, it is found that both of the drag force acting on magnetic island and polarization current are significantly enhanced in the presence of turbulence driven by ion-temperature-gradient instabilities. Dr. Ishizawa presented these results in a seminar at the IFS. Also, He presented this work as an invited talk [1] at the International Sherwood Fusion Theory Conference, which was held in Austin, Texas, May 2-4, 2011. During his visit, he also led three discussion sessions with Ph.D. graduate students supervised by Prof. Horton.

Related conference presentations:

[1] A. Ishizawa, N. Nakajima, F. L. Waelbroeck, R. Fitzpatrick, and W. Horton, “Interaction of Drift Wave Turbulence and Magnetic Islands”, International Sherwood Fusion Theory Conference, Austin, Texas, May 2-4, 2011.

[2] A. Ishizawa, F. L. Waelbroeck, R. Fitzpatrick, W. Horton, and N. Nakajima, "Effects of Micro-Turbulence on Excitation of NTM", Plasma Conference 2011, Kanazawa, Nov. 22-25, Invited talk.

Related publications:

[1] A. Ishizawa, F. L. Waelbroeck, R. Fitzpatrick, W. Horton, and N. Nakajima, "Magnetic island evolution in hot ion plasmas" submitted.

JF-5 ***Examination of Multi-Hierarchy Model Based on particle-MHD interlocking algorithm***

Visiting Scientist: Shunsuke Usami (NIFS)
Location: IFS University of Texas at Austin, Texas, USA
Dates: January 23- February 5, 2013 (14 days); paid by Japan
Research Summary:

Dr. Usami has been developing and been progressing a multi-hierarchy model. This model deals with macroscopic and microscopic physics self-consistently and simultaneously. Macroscopic behavior is expressed by MHD algorithm, while microscopic physics is described by particle-in-cell(PIC) algorithm. He has applied this multi-hierarchy model to magnetic reconnection process. Dr. Usami presented on his multi-hierarchy method and simulation results at APS DPP annual meetings, US-Japan Workshops, etc. Prof. Horton attended their meetings and workshops, where they discussed on multi-hierarchy model several times. When the multi-hierarchy model was made, its validation was examined. During Dr. Usami's visit in 2012, however, Prof. Horton and Dr. Usami examined interlocking method between MHD and PIC in the multi-hierarchy model more precisely and explored application to other nonlinear plasma phenomena. For examination, simulations of Alfven wave propagation were performed. If plasma behavior is much different between PIC and MHD algorithms, interlocking can not be employed. They investigated (1) two-fluid effect and (2) kinetic effect which generate difference between PIC and MHD algorithms. As another examination, simulations of plasma injection from PIC to MHD algorithms were performed. (Simulations of injection from MHD to PIC algorithms had been done.) This result would lead to hierarchy-interlocking in the downstream direction of magnetic reconnection. Furthermore, Prof. Horton suggested that the multi-hierarchy model could be applied to anisotropic pressure in the Earth magnetosphere; his suggestion was as follows. There are regions where pressure is quite anisotropic and ones where pressure is isotropic in the Earth magnetosphere, therefore, it would be suitable that MHD and PIC algorithms are used in isotropic and anisotropic regions, respectively.

Related publications:

[1] S. Usami, H. Ohtani, R. Horiuchi, and M. Den, "First Demonstration of Collisionless Driven Reconnection in a Multi-Hierarchy Simulation",
Plasma Fusion Res. 4 049 (2009)
[2] S. Usami, H. Ohtani, R. Horiuchi, and M. Den, "Simulation of Plasma Flow Injection with Multi-Hierarchy Model Aiming Magnetic Reconnection Studies"
Comm. Comput. Phys. 11, 1006-1021 (2012)
[3] S. Takahashi, H. Kawai, Y. Ohsawa, S. Usami, C. Chiu, and W. Horton, "The Effect of Parallel Electric Field in Shock Waves on the Acceleration of Relativistic Ions, Electrons, and Positrons", Phys. Plasmas 16, 112308 (2009)

JF-3 ***Stability analysis based on extended MHD models***

Exchange Scientist: Atsushi Ito (NIFS)
Location: Plasma Science and Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts
Dates: August 1-15, 2011 (15 days); paid by Japan
Research Summary:

In this activity, Dr. Ito worked with Dr. J. J. Ramos on small-scale effects like the finite Larmor radius and the Hall current on macroscopic plasma instability based on extended MHD models. They had previously worked on equilibria with flow in single-fluid and two-fluid MHD models and published two papers in collaboration. The fluid moment equations for magnetized plasmas derived by Dr. Ramos was used, as in the previous work. The stability analysis focuses on the contribution of the parallel heat flux in the gyroviscous tensor that cannot be neglected in low collisional magnetized plasma and was consistently implemented in Dr. Ramos's fluid formalism. A set of linear eigenmode equations were derived from the fluid moment equations in order to study the drift tearing instability. They continue collaboration for the linear eigenmode analysis to examine the effect of the parallel heat flux on the drift tearing instability.

JF-4 ***Quantum chemical molecular dynamics simulations of chemical sputtering on Li-C-H-O systems***
Exchange Scientist: Stephan Irle (Nagoya University)
Location: Oak Ridge National Laboratory, Oak Ridge, TN, U.S.A.
Dates: October 2-15, 2011 (13 days); paid by Japan
Research Summary:

In this visit to Dr. Predrag Krstic at the ORNL, I learned about the role of beryllium and tungsten in the design of JET and ITER, and why it is important to study the Be-C-0-H-He and W-Be-C-O-H-He systems in chemical hydrogen sputtering simulations of plasma wall interactions. At the meeting, we discussed the present status of DFTB parameters produced by my and Prof. Henryk Witek's group at the National Chiao Tung University in Hsinchu, Taiwan. We further discussed the necessary future simulations.

My future research strongly benefits from the support by Dr. Krstic, who has more than 20 years experience in the theoretical simulation of plasma wall interactions. I learned a lot from him and we discussed how to split up the required, high-dimensional simulation work that will require large amounts of supercomputer time both at Oak Ridge and in Japan at the Plasma Simulator in Toki, Gifu, as well as on the RIKEN K supercomputer in Kobe.

JF-7 ***Benchmark of RWM codes of MINERVA/RWMaC and MARS-F***
Visiting Scientist: Junya Shiraishi (JAEA)
Location: General Atomics, San Diego, California
Dates: January 9-25, 2012 (17 days); paid by Japan
Research Summary:

This exchange activity was carried out as a US-Japan fusion program during January 9-25, 2012, by means of other budget support. Dr. Shiraishi has been collaborating for several years with Dr. M.S. Chu and Dr. L.L. Lao at General Atomies on linear stability analysis of Resistive Wall Modes (RWMs) in tokamaks. They initiated a benchmarking effort between independently-developed RWM codes, MINERVA/RWMaC (JAEA) and MARS-F (GA) in 2011. To remove errors arising from numerical computation of MHD equilibrium, they started the benchmark by using Solov'ev equilibrium. They confirmed that these two codes give the same RWM growth rates for a wide range of wall diffusion time. In the present activity, they have advanced the benchmarking effort to use the numerical MHD equilibrium reconstructed from experiment measurements in the DIII-D tokamak and to include the plasma toroidal rotation. Assuming that the rotation does not change the MHD equilibrium and that the rotation is rigid, they have succeeded to obtain the same RWM growth rates for wide ranges of wall location and rotation frequencies. They have confirmed that the two codes show the same critical rotation speed for full stabilization of RWMs and the same location of the stability window. Through the present activity, they have found a new stabilizing effect: equilibrium change induced by toroidal rotation. Note that in preceding calculations, it is assumed that the rotation does not change the equilibrium but affects only the linear dynamics. It is found that the equilibrium change reduces the RWM growth rates. Moreover, the equilibrium change can open the stability window even if there is no window under the assumption that the rotation does not affect the equilibrium.

US to Japan:

JF-14 ***Particle-in-Cell Algorithms on Advanced Computer Architectures***
Exchange Scientist: V. Decyk (UCLA)
Location: NIFS
Dates: September 22-December 21, 2011 (three months); paid by Japan
Research Summary:

Dr. Decyk spent the fall as a JIFT Visiting Professor at the National Institute for Fusion Science (NIFS) in Toki, Gifu, Japan. His host was Seiji Ishiguro, the head of the Plasma Simulation group. His research topic was the development of algorithms for Particle-in-Cell (PIC) codes on multiple GPUs. Dr. Decyk views a cluster for GPUs as a prototype for future exascale Supercomputers. He gave a talk at NIFS entitled "Adaptable Particle-in-Cell Algorithms for a Single GPU". Later he gave a tutorial talk on "the mathematics behind Spectral PIC codes", which included some demonstrations. Several scientists at NIFS asked for (and received) a copy of the codes. Upon his departure, he gave a Director's seminar, entitled, "Preparing for the Next Generation Supercomputer." This was well attended, with some scientists traveling from as far a Tokyo to attend. Dr. Decyk gave invited presentations at two conferences. The first was presented at the Plasma Conference 2011 at

Kanazawa, Japan, and was entitled "Hierarchical Domain Decompositions for Particle-in-Cell Codes." The second was at the Toki Conference hosted by NIFS, and was entitled "Particle Simulations on GPU supercomputing systems." He also gave a presentation at the US-Japan Workshop on the Next Stage in the Progress of Simulation Science, held in NIFS, entitled "Development of Numerical Algorithms for the Next Generation of Supercomputers." During his time at NIFS, he had several opportunities to travel to Japanese Universities. He gave a presentation at Nagoya University, identical to his first presentation at NIFS. He also gave a seminar at Kyushu University entitled "Description of Darwin Spectral Particle-in-Cell codes." In addition, he visited Yamaguchi University in Ube and Chubu University near Nagoya. He had interesting scientific discussions at all these places. One observation that surprised him was that there were substantially fewer Ph.D. students and many more Master's students than was typical at US Research Universities.

Related publications:

Viktor K. Decyk and Tajendra V. Singh, "Hierarchical Domain Decompositions for Particle-in-Cell Codes," Proc. of the Plasma Conference 2011 (PLASMA 2011), Kanazawa, Japan, November, 2011, paper 25C03

JF-13 ***Thermal Transport Due to Electromagnetic Turbulence***

Visiting Professor: Wendell Horton
Location: National Institute for Fusion Studies
Dates: September 1-30, 2011 (four weeks); paid by US
Research Summary:

Dr. Horton collaborated with Dr. Miura on three-dimensional nonlinear MHD simulations in the opposing limits of large and small parallel thermal conductivity $\kappa_{//}$ They analyzed the results of simulations to understand the plasma pressure limit in the Large Helical Device (LHD). They developed analytic formulas for the dimensionless plasma β MHD ballooning mode stability and compared with the simulations. The helical coil fixes the ratio of the toroidal and poloidal magnetic fields so the main variable is the inward-outward shift of magnetic axis. The average beta limit formula derived is $\beta = a/2R_{axis}$, which appears to correlate with the beta limit of 5% observed in the experiments. The simulation dynamics at this high-pressure limit is complex and it remains uncertain if the simulations or the simple theoretical formula give the experimentally observed limit on pressure. In the case without a $\kappa_{//}$ corresponding to a nearly non-dissipative MHD, ballooning modes are strong with a pressure collapse occurring in the core region. In contrast, with a large $\kappa_{//}$, the pressure deformation is limited in the core region and the ballooning modes with moderate wave numbers are much weaker than in MHD. Since the core pressure collapse in low-β plasma will become an obstacle on the way to attaining higher-β plasma in experiments, deriving a deeper understanding of these instabilities and MHD turbulence is a high priority.

Related publications:

[1] H.Miura and N. Nakajima, "Influences of ballooning modes with moderate wavenumber on MHD equilibrium in LHD," *Nuclear Fusion*, vol. 50, no. 5, p. 054006, May 2010.

JF-12 ***Theoretical and Computational Study of Reversed-Shear Alfven Eigenmode***

Exchange Scientist: B. Breizman (IFS, Univ. Texas at Austin)
Location: NIFS
Dates: September 30-October 15, 2011 (two weeks); paid by US
Research Summary:

Dr. Boris Breizman visited NIFS under JIFT program from October 2 through October 14, 2011 to continue collaboration with Dr. Yasishi Todo on nonlinear simulation of the energetic particle driven Alfvén modes. He gave a talk on nonlinear physics of laser-irradiated micro-clusters at the NIFS plasma physics seminar on October 5 and a talk on energetic particle instabilities on October 12. There were three technical topics discussed with Dr. Todo during this visit: kinetic modeling of the electron response to low-frequency perturbations including geodesic acoustic modes, analysis of the nonlinearly-driven harmonics of Alfvén modes with the MEGA code (this will complement an ongoing effort to simulate second harmonic TAE signals with the AEGIS code at IFS), and realistic modeling of the TAE signals at the plasma edge in an attempt to interpret the magnetic probe data from JET and other devices. Dr. Breizman also had a discussion with Dr. Toi about nonlinear saturation and frequency sweeping mechanism for Alfvén modes in the stellarator experiments.

Related publications:

[1] Y. Todo, H.L. Berk and B.N. Breizman, "Simulation of Alfvén eigenmode bursts using a hybrid code for nonlinear magnetohydrodynamics and energetic particles**,**" Nucl. Fusion **52**, 033003 (2012).

[2] Y. Todo, H. L. Berk, and B. N. Breizman, "Saturation of toroidal Alfvén eigenmode due to enhanced damping of nonlinear sidebands," submitted to Nucl. Fusion

3. *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 a research scientist at the Institute for Fusion Studies (IFS) of The University of Texas at Austin. The Japanese co-chairman is the Leader of the Numerical Simulation Research Project at the National Institute for Fusion Science, and the Japanese co-executive secretary is the director of the Fusion Theory and Simulation Research Division in the Department of Helical Plasma Research 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	*Japanese Members*
F. Waelbroeck (IFS)—Co-Chairman	R. Horiuchi (NIFS) —Co-Chairman
A. Arefiev (IFS)—Co-Exec. Secretary	H. Sugama (NIFS)—Co-Exec. Secretary
D. Spong (ORNL)	A. Fukuyama (Tokyo)
J. Mandrekas (DOE)	H. Nagatomo (Osaka)

JIFT Advisors

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

*US Advisory Committee***:** A. Aydemir (IFS), P. Catto (MIT), B. Carreras (ORNL), 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. In April 2012, Prof. Masao Okamoto, the former Director of the Theory and Computer Simulation Center at NIFS, passed away. He had served for 12 years until 2006 as the Japanese executive secretary for the JIFT program and then four years as the Japanese chairman for JIFT. He was the organizer of numerous JIFT workshops and participated in many others. His great achievements and leading roles in various international fusion programs are deeply appreciated.

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

4. *PLANS FOR FUTURE ACTIVITIES (PROPOSED 2012-2013 PROGRAM)*

The topics and themes of the exchange activities that have been proposed for the next year (April 1, 2012–March 31, 2013) 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 (2012-2013) is listed below.

A. 2012-2013 Proposed Workshops

US to Japan:

Integrated Modeling and Simulation of Fusion Plasmas
Organizers: A. Fukuyama (Kyoto) and V. Chan (GA)
Proposed Place/Time: Kyoto/JAEA; December 2012

Kinetic turbulent transport
Organizers: T. Watanabe (NIFS) and Wang (PPPL)
Proposed Place/Time: NIFS

Japan to US:

Innovative methods in plasma simulation
Organizers: H. Ohtani (NIFS) and Arefiev (IFS)
Proposed Place/Time: Rhode Island, November 2012

Theory and Simulation on Fast Ignition Target Design
Organizers: H. Nagatomo (Osaka) and P. Patel (LLNL)
Proposed Place/Time: US

B. 2012-2013 Proposed Exchange Visits

Japan to US:

Particle simulation of magnetic reconnection / scientific visualization
H. Ohtani (NIFS), Visiting Professor
IFS Texas; October, 2012 (4 weeks); paid by US

Nonlinear Simulation of Energetic Particle Dynamics
Bierwage Andreas (JAEA)
UCI; January, 2013; paid by JAEA

MD simulation study of plasma-wall interaction
A. Ito (NIFS), Visiting Scientist
ORNL; August, 2012

Gyrokinetic simulation of turbulent transport in heliotron plasmas
M. Nunami (NIFS), Visiting Scientist
PPPL; November 2012

Study on Fast Ignition by Photon-Pressure Accelerated Ion Beam with Next Generation Ultraintese Laser
T. Johzaki (Osaka), Visiting Scientist
University of Nevada Reno; 2012

Development of kinetic simulation code on graphics processors
T. Tatsuno (UEC), Visiting Scientist
University of Maryland; September 2012

US to Japan:

ELM / ITG instabilities in the NIMROD extended MHD

P. Zhu (U. Wisconsin), Visiting Professor
NIFS; July-Septembe, 2012 (3 months); paid by Japan

Full torus kinetic simulation of radio frequency wave in fusion plasmas
Animesh Kuley (Irvine), Visiting Scientist
NIFS; November 2012

Studies of energetic particle driven instabilities in 3D equilibria and code benchmarks
Don Spong (ORNL), Visiting Scientist
NIFS; January2013; paid by US

Kinetic stability of Alfvén waves in high beta plasma sheets
W. Horton (IFS), Visiting Scientist
NIFS; May 2012; paid by US

Magnetic island studies in stellarators
C. Hegna (U. Wisc), Visiting Scientist
NIFS; March2013

Study of plasma-wall interaction and Deuterium retention
Predrag Krstic (ORNL), Visiting Scientist
Nagoya and Kyoto; January 2013; paid by US