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 2012-2013

CONTENTS:

Annual Report of JIFT Activities

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Annual Report of Activities

US-Japan Joint Institute for Fusion Theory

April 1, 2012–March 31, 2013

JIFT Steering Committee

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

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

March 31, 2013

TABLE OF CONTENTS

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 32 years of successful operation, JIFT has sponsored 189 long-term visits by exchange scientists, 115 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, and workshops 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 (2012-2013 PROGRAM)*

Almost all of the activities in the two categories—workshops and personal exchanges—that had been scheduled for the 2012-2013 JIFT program were carried out during the past year. Four workshops were successfully held, in addition to the JIFT Steering Committee meeting. In the category of personal exchanges, two Visiting Professors and seven Visiting Scientists made exchange visits.

Summary reports about JIFT activities for 2012-2013 are given below.

A. 2012-2013 Workshops

US to Japan:

JF-9 ***Integrated Modeling and Simulation in Toroidal Plasmas***
Organizers: Atsushi Fukuyama (Kyoto) and Vincent Chan (GA)
Location: Kyoto University, Kyoto
Dates: November 14-16, 2012
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 eighth in the series of JIFT workshops on integrated modeling. The workshop was attended by 25 participants. There were 19 oral presentations (5 from the US, 14 from Japan), which covered a wide range of subjects related to integrated modeling, such as MD, energetic particles, core and peripheral transport, RF waves, and code integration, with an emphasis on verification and validation.

Related publications:

- The agenda, abstracts, presentations, and photographs can be obtained from the workshop web site (http://bpsi.nucleng.kyoto-u.ac.jp/bpsi/usjws8/).

JF-10 ***Neoclassical and Turbulent Flow Generations and Associated Transport***
Organizers: T.-H. Watanabe (NIFS) and W. W. Wang (PPPL)
Location: Kyoto University, Uji, Kyoto
Dates: November 25-26, 2012
Summary:

The JIFT workshop on "Flows" was organized as the second round after that held in Long Branch, 2011, with the aim of promoting theoretical and simulation studies on neoclassical and turbulent flows associated with transport processes in magnetically confined fusion plasmas. The 22 oral presentations were given not only by theory and simulation researchers but also by experimentalists, joined from US, Japan and Korea. The topics covered transport theory, simulation, and experiments for tokamak and helical plasmas, where the gyrokinetic and drift kinetic simulations were also intensively discussed.

Japan to US:

JF-1 ***Innovative Methods in Plasma Particle Simulations***
Organizers: H. Ohtani (NIFS) and A. Arefiev (IFS)
Location: Providence, RI, USA
Dates: November 2-3, 2012
Summary:

Methods for simulating kinetic phenomena in plasmas have undergone significant advances since the early development of the particle-in-cell (PIC) method in the 1950s. The conventional PIC method is typically limited to simulating problems with high-frequency, small-scale phenomena because of the employed full-f formulation and explicit time-differencing. However, many modern-day plasma physics problems fall outside of that category, as they involve low-frequency, large-scale phenomena. Innovative methods that introduce techniques such as adaptive mesh refinement, implicit time-differencing, the Monte Carlo method, delta-f and gyrokinetic formulations, variational principles, etc., allow us to successfully tackle the challenges posed by multi-scale problems. The purpose of this workshop was to bring together US and Japanese researchers working on plasma kinetic simulations to exchange ideas and report recent research progress. This was the 5th workshop in the series of annual Joint Institute for Fusion Theory (JIFT) workshops focused on kinetic plasma simulations. The workshop was attended by 26 participants. There were 21 oral presentations (14 from the US, 7 from Japan). The workshop highlighted the development and applications of novel methods in the context of various plasma physics problems, including fusion, reconnection, and laser-plasma interactions. The workshop also included a discussion of using GPU in parallel algorithms to accelerate particle simulations.

Related publications:

- The agenda, abstracts, presentations, and photographs can be obtained from the workshop web site (http://w3fusion.ph.utexas.edu/~jift2012/).

JF-2 ***Theory and Simulation on Fast Ignition Target Design***
Organizers: Hideo Nagatomo (Osaka) and Pravesh Patel (LLNL)
Location: Marriott Napa Valley, California USA
Dates: November 5-8, 2012
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 25 oral presentations (18 from the US, 7 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 and simulations. The latest topics in this WS were the divergence angle of heating electron beam and its guiding using various magnetic field, and formation of high-density, low-temperature core plasma using low velocity implosion.

JF-17 ***JIFT Steering Committee Meeting***

Organizers: Ritoku Horiuchi (NIFS) and François Waelbroeck
Location: Providence, RI, USA
Dates: November 2, 2012
Summary:

Participants at the steering committee meeting reviewed the status of JIFT activities for 2012-13 and discussed recommendations for exchange activities during 2013-14.

B. 2012-2013 Exchange Visits

Japan to US:

JF-3 ***Gyrokinetic Turbulent Transport Simulation Study in Stellarator Plasmas***
Visiting Scientist: Masanori Nunami (NIFS)
Location: Princeton Plasma Physics Laboratory, Princeton, NJ, USA
Dates: Feburuary 24 - March 6, 2013 (11 days); paid by Japan
Research Summary:

Dr. Nunami has been collaborating for a few years with Dr. D. Mikkelsen at PPPL on the gyrokinetic simulation study in stellarators. In 2011, they performed benchmarks of linear gyrokinetic simulations for ion temperature gradient (ITG) mode in NCSX equilibria, and they confirmed that the results obtained from each code ("GKV-X" of Japan, and "GS2" of US) are quantitatively consistent. Based on the results, in this visit, they applied the benchmarks to high ion temperature LHD configuration. At first, they fixed the simulation parameters, e.g., radial location, temperature gradient, and magnetic shear. In GS2, to fix the radial location, it is needed to employ two or four flux-surfaces in equilibrium configuration data. Therefore, they generated new data for the equilibrium field which is applicable to GS2 code. Using the equilibrium data, they calculated growth rates, frequencies, and eigen-functions of the linear ITG mode by using each code, and compared results each other. The benchmarks were performed successfully, although there exists some issues that should be clarified, e.g., dependencies of simulation box size, and spatial resolutions. Furthermore, Dr. Nunami presented a seminar in Feb. 27 about the modeling of turbulent transport in helical plasmas based on the linear gyrokinetic calculations. He discussed with Dr. H. Mynick the application of the modeling to field optimization program in stellarators. They shared issues for the application that the model should be more reduced without linear gyrokinetic calculations. They also discussed the concrete plan to proceed the application up to the next year.

JF-4 ***Study on Fast Ignition by Photon-Pressure Accelerated Ion Beam with Next Generation Ultraintese Laser***
Exchange Scientist: Tomoyuki Johzaki (Hirosima Univeristy)
Location: University of Nevada, RENO, Reno, Nevada
Dates: May 3-11, 2013 (9 days); paid by Japan
Research Summary:

Dr. Johzaki has been collaborating for a number of years with Prof. Y. Sentoku at University of Nevada, Reno (UNR) on the simulation study for the relativistic laser plasma interaction related to the laser fusion. Dr. Johzaki has developed the Fokker-Planck codes for fast electron transport and fast ions, and then has analysed and optimized the processes of those fast particles generation and energy transport to the imploded core for the fast ignition laser fusion. Prof. Sentoku has developed PIC code including particle collision, ionization and radiation damping processes. In the past collaboration, they have developed the simulation model for the collision and ionization, and then have revealed the effects of collisional processes on the fast electron transport in the high Z Au cone. In these collaborative works, they came around the idea for enhancing the core heating efficiency, which is the core heating by ion beam generated by radiative pressure acceleration with circularly-polarized ultra-intense laser pulse. In the 2012 exchange program, first, they evaluated the ion beam and the laser conditions (e.g., ion energy, beam intensity for ignition) by simple model calculation for ion transport, and then the target and laser condition required for generating the suitable ion beam. Then, based on the obtained results, they carried out the 1D PIC simulations to evaluate the generated ion beam profiles (spectrum, beam divergence, and energy conversion efficiency of laser to ion beam), together with the electron beam profiles. They found that the fast ion beam having suitable energy (C^{6+} ion with ~400MeV) for core heating can be obtained with the circularly-polarized ultra-intense laser pulse with the intensity of 1.4x1022W/cm2 and the duration of 600fs. After 1 weak stay at University of Nevada, RENO, Dr. Johzaki will carry out the Fokker-Planck simulations using the obtained ion and electron beam profiles for evaluating the core heating efficiency. And those results will be compared with the conventional fast electron driven fast ignition scheme.

JF-7 ***Development of Kinetic Simulation Code on Graphics Processors***
Exchange Scientist: T. Tatsuno (University of Electro-Communications)
Location: IREAP, University of Maryland, College Park, Maryland, USA
Dates: Aug 21 - Sep 20, 2012 (31 days); paid by Japan
Research Summary:

This exchange activity was aimed at development of a new kinetic simulation code on graphics processors. University of Maryland is one of the leading institutes in the area of general-purpose computing on graphics processing units (GPGPU). They develop several codes such as a particle code based on the fast multipole method and a fluid code based on the pseudo-spectral scheme. In this activity, Dr Tatsuno (UEC) proposed the development of a kinetic code and collaborated with the group led by Dr Dorland (UMD). The proposed code is an Eulerian kinetic simulation code that uses a grid in velocity space rather than particles, so it may be based on the knowledge of the fluid code. Since kinetic codes require velocity integrations for obtaining real space quantities, it is necessary to get a number from a sum of a function over grid points (called reduction) at every time step. Such reduction requires care, as there is a dependence of calculations on previous results and they do not parallelize well by a simple coding. Fortunately there is a highly-tuned algorithm proposed by NVIDIA, which makes use of the shared memory, loop unrolling, and reduced amount of synchronization within the warp etc. They have successfully implemented it in the code. During his visit Dr Tatsuno also worked out the boundary condition related to the global flow shear used in the widely-used gyrokinetic code, GS2. He pointed out that the current algorithm might have a problem in the nonlinear runs, and proposed an alternative algorithm that resolves the issue. They are currently investigating if the old scheme gives incorrect results.

JF-8 ***Numerical investigation of Magnetic Reconnection under Guiding Field***
Exchange Professor: Hiroaki Ohtani (NIFS)
Location: IFS, University of Texas at Austin, Austin, Texas, USA
Dates: Februray 10 - March 10, 2013 (29 days); paid by University of Texas at Austin
Research Summary:

This exchange activity was carried by means of US budget support. Dr. Ohtani has been collaborating for a number of years with Prof. Horton at Texas on the magnetic reconnection. They recently started research on magnetic reconnection mediated by the whistler mode. In the experiments by Stenzel et al. of UCLA, the time-varying antenna field excited whistler modes with wave magnetic fields exceeding the ambient magnetic field. After the field-reversed configuration (FRC) was generated, two propagating field configurations resembling spheromaks were excited, and strong electron energization was observed, which was a fundamental process of magnetic reconnection or annihilation. During his visit in 2013, Dr.Ohtani examined an approach by particle simulation to this magnetic reconnection with whistler mode together with Prof.Horton and his student in order to investigate the rich and novel nonlinear behavior of the experiments. On the other hand, Dr.Ohtani discussed visualization of magnetically confined plasma by the virtual-reality (VR) system with the researchers of IFS. Since VR technology can analyze complex structures in a really three-dimensional space with a deep absorption into the VR world by the scientific visualization technology, it is a powerful and useful tool in an analysis of simulation data and development of experimental devices. The visualization software of LHD equilibrium plasmas demonstrates isosurface of plasma pressure, magnetic field streamlines, drift particle trajectories and Poincare map of magnetic field. They discussed what we visualize in the simulation results of plasmas.

US to Japan:

JF-11 ***Kinetic Stability of Alfvén Waves in High Beta Plasma Sheets***
Visiting Professor: Wendell Horton (IFS)
Location: National Institute for Fusion Studies
Dates: May, 2012; paid by US
Research Summary:

Models for the TESPEL experiments in LHD were formulated using three component FLR fluid equations for the electrons, hydrogen ions and the impurity ions species. Both cases of the active impurity concentration reacting back on the hydrogen drift waves and the passively convected limit with no reaction. The impurity elements were simulated using the IFS 3D pseudo-spectral drift wave codes. The work is performed under an agreement for collaboration with the group of Prof Shigeru Sudo. The problem shows promising correlations with the data when the small density peaks at the edge of electron density profiles are taken into account. This gives the growth rates a sensitive dependence on the sign and shape of the electron density profile in the region where the high Z-transport changes rapidly and suddenly from inward to outward. Attempts are made to correlate the drift wave turbulence simulations runs with PCI data from K. Tanaka from similar discharges. The PCI data does now show a ballooning to the outside of the torus and gives a strong fluctuation signal rotating in the electron diamagnetic direction that is consistent with the model being used for the turbulent transport of the impurities. Drift wave models for the rather complex data found by the phase-contrast-imagining for HDL were also developed in collaboration with Dr. K. Tanaka and his team. The discharge under study would be described in tokamak physics as an internal transport barrier. Thus, the modeling is important for providing a more global view of internal transport barriers for toroidal confinement systems. The discharge has magnetic turbulence from MHD-like modes about the q=2 or iota=0.5 surface at rho=0.7, and the magnetic fluctuations at m=4/n=2 are, at 2kHz, distinct from the drift wave turbulence. The magnetic signal drops to small amplitude at the time when the density and spectroscopic data are interpreted to signify, in tokamak terminology, the change from the ELMy H mode to the ELM-free H mode. At this same time the core electron density starts a secular growth doubling in value while the edge density stops its ELMy behavior and the edge density drops to half its earlier value. The PCI phase velocity with respect to the lab frame increases strongly from 5km/s to nearly 10km/s. This gives good new data for the conditions for the formation of the density internal transport barrier. In this case we use the ITG, which becomes unstable here in the negative eta_i region, and the drift waves propagating in the electron direction in region of positive eta_i and positive_e outside the "rabbit ears" or beyond the peak of the density profile. Finding and verifying the transport behavior of these plasmas without a toroidal current and with weak toroidal curvature is important for understanding the general nature of the transport behaviors in all toroidal magnetic confinement systems.

JF-12 ***Benchmark Studies of LHD Toroidal Alfven Eigenmode Structure and Stability***
Exchange Scientist: Donald A. Spong (ORNL)
Location: National Institute for Fusion Science, Toki, Japan
Dates: February 1-15, 2013 (two weeks); paid by US
Research Summary:

This exchange activity continued a comparison between three stellarator Alfven stability codes (MEGA, AE3D-K, and CKA-Euterpe); these were applied to TAE modes that have been observed in the LHD experiment. The visiting scientist is the developer of the AE3D-K code [1], which is a perturbative wave-particle energy transfer model. This approach relies on first calculating a stable TAE mode structure using the AE3D code [2] and then following a large number of particles in the presence of this mode and accumulating wave-particle energy transfers (using delta-f weight methods) from which the growth rate of the instability can be evaluated. There are two levels at which the code comparison is carried out. First, the stable eigenmode structure can now be calculated by either MEGA, AE3D, or CKA. During the exchange visit AE3D was modified to include finite plasma pressure effects. Also, several minor changes in the reduced MHD approximations used were factored in to make the AE3D equations more similar to those of CKA. All 3 codes find n = 1 eigenmodes dominated by m = 0, 1, and 2 poloidal components; each code still gives somewhat different mode structures. The mode frequencies are within about +/- 10% of the average of the codes, with AE3D and MEGA being closer to each other than to CKA. The stability calculation is based the model of an isotropic slowing-down distribution for the fast ions, with the injection energy varied to study finite particle orbit width effects. During the two weeks a number of corrections were made to the slowing-down model used in AE3D-K to be more consistent with MEGA. For the test eigenmodes (two modes from AE3D and an one from CKA are used) AE3D-K now gives growth rate results over a range of injection energies (E < 200 keV) for the AE3D 51.33 kHz mode that are close to those of MEGA. At energies above ~200 keV the MEGA growth rate level out while those of AE3D keep increasing. Work is underway to compare results from the other modes and better understand regimes where the codes differ in their results.

Related publications:

[1] D.A. Spong, B.N. Breizman, D.L. Brower, Ed D'Azevedo, C.B. Deng, A. Konies, Y. Todo, and K. Toi, "Energetic-Particle-Driven Instabilities in General Toroidal Configurations," Contributions to Plasma Physics Vol. 50, 708 (2010).

[2] D.A. Spong, E. D'Azevedo, and Y. Todo, "Clustered frequency analysis of shear Alfven modes in stellarators," Physics of Plasmas Vol. 17, 022106 (2010).

JF-13 ***Fully Kinetic Simulation of Radio Frequency Wave in Fusion Plasmas***
Exchange Scientist: Animesh Kuley (UCI)
Location: National Institute for Fusion Science, Toki, Japan
Dates: November, 2012; paid by China, US
Research Summary:

The GTC group is looking into a new nonlinear kinetic simulation model to study the radio frequency heating and current drive of fusion plasmas using the toroidal code GTC. In this model ions are considered as fully kinetic (FK) particles using Vlasov equation and the electrons are treated as drift kinetic (DK) particles using drift kinetic equation. This scheme is particularly suitable for plasma heating and current drive with wave frequencies lower than the electron cyclotron frequency, ranging from fast wave and ion cyclotron wave to lower hybrid wave. This model also can handle physics with realistic electron-to-ion mass ratio and nonlinear dynamics in the full torus simulation. The implementation of fully kinetic ions has been verified in the GTC simulation of ion plasma waves. The real frequency measured in GTC agrees very well with theoretical value for various ion temperatures. The ion Debye shielding potential from simulation also agrees with theoretical solution. Recently we benchmarked the antenna excitation of lower hybrid wave using the fully kinetic ion version of GTC. During my visit to Japan I presented our recent work in “US-Japan JIFT workshop on integrated modelling” from 14-16th November, 2012, at Kyoto University. After that, I also attended the “22nd International Toki conference” at Toki city from 19-22nd November, 2012. There was a poster presentation by me regarding the Fully kinetic ion implementation in our GTC code. During that conference I visited the NIFS, and discussed our recent work and future direction on the radio frequency heating and current drive using the GTC code with Prof. Watanabe.

JF-14 ***Magnetic Island Studies in Stellarators***
Exchange Scientist: Chris C. Hegna (U. Wisconsin)
Location: National Institute for Fusion Science, Toki, Japan
Dates: Delayed
Research Summary:

This visit has been scheduled in March 2013, but it was delayed due to Dr. Hegna’s personal reason.

JF-15 ***Quantum Chemical MD Simulations of W-C-H-He Systems***
Exchange Scientist: Predrag S. Krstic (ORNL)
Location: Nagoya University and Kyoto University, Japan
Dates: February 18 – March 01, 2013 (12 days); paid by USA
Research Summary:

I visited Japan in period 02/18-03/01/2013 under the auspices of the US-Japan Joint Institute for Fusion Theory (JIFT) exchange program. I was a plenary speaker at The Second International Symposium on Hierarchy and Holism in Natural Sciences (ISHH2013), 02/19-02/21 at the National Center of Sciences, Tokyo, talking On Bottom-Up, Multiscale Science For Tunning Interfaces At Nanoscale, co-organized by NIFS. After that I visited the Chemistry department Nagoya University, as a guest of Prof. Stephan Irle, where I gave 2 seminaries for the department, talking about plasma-surface interaction scientific challenges for fusion, covering carbon, lithiated carbon and tungsten surfaces, as well as nanoscience of biomolecules. With Prof. Irle’s group I have had a many-years fruitful collaboration on chemistry in carbon, beryllium, and oxygen mixtures under deuterium bombardment and this collaboration will continue and expand to the other fusion materials. We agreed on collaboration on the liquid lithium and tin divertor, chemical sputtering by hydrogen of functionalized beryllium surfaces, on carbon Nano-synthesis. A collaborative paper is in preparation. Finally, I had a two days visit of Kyoto University, Fukui Institute, where I was hosted by Professor Keiji Morokuma with whom I also have had multi-years collaboration on carbon materials, functionalized by lithium and oxygen and bombarded by deuterium, which recently resulted in a common Phys. Rev. Letter[1]. I had the fruitful discussions with Prof. Morokuma on issues of chemistry in functionalized materials, including nano-synthesis. I gave a talk for the Fukui Institute on the plasma-facing materials for fusion, as well as on the nanobiotechnology.

Related publications:

[1] PS Krstic, JP Allain, CN Taylor, J Dadras, S Maeda, K Morokuma, J Jakowski, A Allouche, CH Skinner, "Deuterium Uptake in Magnetic-Fusion Devices with Lithium-Conditioned Carbon Walls", Phys. Rev. Letters **110**, 105001 (2013).

JF-16 ***MHD Simulation and Analysis of ELM Dynamics***

Visiting Professor: Ping Zhu (University of Wisconsin-Madison)
Location: National Institute for Fusion Science, Toki, Japan
Dates: July 1-October 7, 2012 (three months); paid by NIFS
Research Summary:

Several collaborative projects on the MHD modeling of ELMs have been initiated at NIFS through the JIFT program. The first project, in collaboration with Dr. Mizuguchi, is based on a benchmark study between the MIPS code and the NIMROD code on the edge localized modes in a DIII-D like H-mode equilibrium. Both linear and nonlinear growth of the edge localized instabilities are compared in a weakly collisional, quasi-ideal MHD model. For sufficiently large spatial resolution, the mode growth rates and saturation level are expected to reach quantitative agreement. These nonlinear simulations are further used to examine the dynamics of the edge ballooning filaments. Magnetic field line tracing and Poincare plots are used to determine when and where magnetic reconnection may be involved in the filament evolution. The second project, in collaboration with Dr. Ishizawa, intends to identify the edge pedestal regimes where the kinetic ballooning or ion-temperature-gradient modes are dominant. The extended MHD model including the two-fluid Ohm's law and the gyro-viscosity is used to study the edge localized modes in a model circular tokamak equilibrium. Two-fluid MHD simulations using the NIMROD code have been able to find the plasma beta regime for the onset of kinetic ballooning modes in the edge. The third project, in collaboration with Dr. Suzuki, studies the 3D shaping effects on the stability of edge pedestal. The 3D shaped tokamak configuration is induced by plasma response to the resonant magnetic perturbation (RMP) imposed inside the wall. NIMROD simulations are able to obtain both linear and nonlinear plasma responses to RMP for tokamak equilibria that are stable to the edge localized instability. For an unstable tokamak equilibrium, the HINT2 code has been used to find the plasma response to RMP. NIMROD simulations are being developed to evaluate the stability of the RMP-induced 3D tokamak equilibrium obtained from the HINT2 solutions.

Related publications:

Part of the results were reported by Ping Zhu in the NIMROD Team meeting during the 2012 APS-DPP annual meeting. A poster based on the first collaboration was presented at the 22nd International Toki Conference: MHD simulation study on the evolution of filament structures on the edge-localized modes, Naoki Mizuguchi and Ping Zhu, 22nd International Toki Conference, Toki, Gifu, Japan, November 19-22, 2012, Poster P3-22.

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 (Kyoto)
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 (JAEA), T. Ozeki (JAEA)

*US Advisory Committee***:** P. Catto (MIT), 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 JIFT web site at http://peaches.ph.utexas.edu/jift/.

4. *PLANS FOR FUTURE ACTIVITIES (PROPOSED 2013-2014 PROGRAM)*

The topics and themes of the exchange activities that have been proposed for the next year (April 1, 2013–March 31, 2014) 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 (2013-2014) is listed below.

A. 2013-2014 Proposed Workshops

US to Japan:

New Aspects of Plasma Kinetic Simulation
Organizers: H. Ohtani (NIFS) and A. Arefiev (IFS)
Proposed Place/Time: NIFS, November 2013

Theory and Simulation on Fast Ignition Target Design
Organizers: H. Nagatomo (Osaka) and P. Patel (LLNL)
Proposed Place/Time: Wakayama, September 2013

Japan to US:

Present Status and Prospects of Theory and Simulation on 3D Physics in Toroidal Plasmas
Organizers: M. Yokoyama (NIFS) and C. Hegna (U. Wisc)
Proposed Place/Time: U.Wisc, June 2013

Recent Studies of Extended MHD and MHD Simulations
Organizers: H. Miura (NIFS) and L.E. Sugiyama (MIT)
Proposed Place/Time: Denver, November 2013

B. 2012-2013 Proposed Exchange Visits

Japan to US:

Study on Turbulent Transport in Magnetized Plasmas by Gyrokinetic Simulation

M. Nunami (NIFS), Visiting Professor
IFS Texas; November, 2013; paid by US

Survey on Integrated Modeling of Tokamak Disruptions
A. Matsuyama (JAEA), Visiting Scientist
GA; November, 2013; paid by JAEA

Small-scale effects on macroscopic instability in finite beta and low collisionality plasmas
A. Ito (NIFS), Visiting Scientist
MIT; January, 2014; paid by Japan

Extention of gyrokinetic simulation model and its application to toroidal plasmas
T.-H. Watanabe (NIFS), Visiting Scientist
PPPL, GA; December, 2013; paid by Japan

Simulation Study of Neoclassical Transport in Nonaxisymmetric Plasmas
S. Satake (NIFS), Visiting Scientist
U. Wisc; September, 2013; paid by Japan

Study on Fast Ignition by Photon-Pressure Accelerated Ion Beam with Next Generation Ultraintese Laser
T. Johzaki (Hiroshima), Visiting Scientist
University of Nevada Reno; November 2013; paid by Japan

Study of Coherent Structures in Boundary Layer Plasmas
H. Hasegawa (NIFS), Visiting Scientist
UCSD; 2012; paid by Japan

US to Japan:

Multi-scale Simulations for Particle Acceleration in Laser Plasma
A. Arefiev (IFS), Visiting Scientist
Osaka University; September, 2013; paid by US

Study of Turbulent Transport based on Gyrokinetic Simulation
C. S. Chang (PPPL), Visiting Scientist
NIFS; November 2013; paid by US

Numerical Analysis of Energetic Particle Transport by Alfvén Eigenmodes
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