
TO: Executive Secretaries of the US-Japan Fusion Research Collaboration
FROM: JIFT Steering Committee
DATE: March 8, 1999
SUBJECT: **JIFT Annual Report of Activities for 1998-99**

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US-Japan Joint Institute for Fusion Theory
Annual Report of Activities
April 1, 1998–March 31, 1999

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March 8, 1999

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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 various types of exchange program activities—namely, workshops, exchange visitors, and joint computational projects.

At present the JIFT program each year usually consists of approximately 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 18 years of successful operation, JIFT has sponsored 108 long-term visits by exchange scientists, 67 topical workshops, and 98 joint computational projects.

The *workshops* typically have an attendance of 25–35 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 a month or two in duration, whereas the Visiting Professors normally stay for at least three months.

The third category of JIFT exchange activities are *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.

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.

A number of general benefits have resulted over the years from the JIFT program. In particular, the following may be cited: JIFT has provided efficient communication channels for the latest theoretical research results, techniques, and directions; JIFT activities have attracted serious participation from allied fields such as fluid turbulence, statistical physics, computational science, and space plasma physics, which brings new scientific tools into the fusion program and enhances the stature of fusion physics; JIFT exchanges have contributed to efficient utilization of

international research facilities; and JIFT emphasis on large-scale computational studies has reaped significant mutual benefits from the supercomputer resources and code-building expertise of both countries.

The current status of the various activities in the 1998-1999 JIFT program is explained in Sec. 2 of this report. Highlights of specific technical accomplishments during the past year are given in Sec. 3. Plans for recommended activities during 1999-2000 are described in Sec. 4. A brief explanation of JIFT program administration is given in Sec. 5, followed by a bibliography of recent papers that were published under JIFT sponsorship and to which reference is made in the present report. Finally, Attachments A and B contain, respectively, the 1998-1999 JIFT program of activities and the proposed 1999-2000 program of exchange activities.

2. Status of Current Activities

The complete schedule of this year's 1998-1999 JIFT exchange activities is given in Attachment A.

Workshops:

All four workshops that were scheduled in this year's JIFT program have been held:

- The workshop on *Confinement Theory and Experiment in Toroidal Systems*, held October 26-28, 1998, at the National Institute for Fusion Theory, in Toki (Japan), was attended by 4 US scientists and 10 Japanese scientists.
- The workshop on *Simulation Techniques, Visualization, and Virtual Reality*, held December 10, 1998, at the National Institute for Fusion theory, in Toki (Japan), was attended by 7 US scientists and 13 Japanese scientists.
- The workshop on *Nonlinear and Nonequilibrium Plasma Phenomena*, held January 11-14, 1999, at the University of Texas, in Austin (USA), was attended by 51 US scientists and 5 Japanese scientists.
- The workshop on *Relativistic Plasma Physics and Its Application*, held November 23-25, 1998, at Lawrence Livermore National Laboratory, in Livermore (USA), was attended by 8 Japanese scientists and 25 US scientists.

The annual meeting of the JIFT Steering Committee was held November 16, 1998, in New Orleans, Louisiana, during the Annual Meeting of the Division of Plasma Physics, American Physical Society. In attendance were US steering committee members (J. Dawson, W. Sadowski, J. Van Dam), Japanese steering committee members (K. Mima), and US advisors (A. Aydemir, V. Chan, B. Cohen, W. Horton, and J. Leboeuf). Several US and Japanese observers were also present (R. Horiuchi, N. Nakajima, K. Nishihara, M. Crisp, S. Eckstrand).

Exchange Visits:

All of the nine scientific personnel exchanges that had been planned for the 1998-1999 program have occurred, as follows:

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- *Dr. Zensho Yoshida* (Tokyo University) visited the IFS February 16–25, 1999, and will return to spend an additional ten weeks during the summer of 1999, as the JIFT Visiting Professor at IFS.
 - *Dr. Hideo Sugama* (NIFS) spent three months, November 14, 1998–February 9, 1999, as an Exchange Scientist at PPPL.
 - *Dr. Hideaki Miura* (NIFS) spent three months, October 1–December 28, 1998, as an Exchange Scientist at MIT and Rutgers University.
 - *Dr. Mieko Toida* (Nagoya University) spent three months, July 17–September 12, 1998, as an Exchange Scientist at UCLA.
 - *Dr. Vincent Chan* (General Atomics) replaced *Dr. Prashant Valanju* (FRC Texas) as the JIFT Visiting Professor and spent three months, October 1–December 28, 1999, at NIFS.
 - *Dr. Boris Breizman* (IFS) replaced *Dr. Herbert Berk* (IFS) as an Exchange Scientist and spent one week, October 25–29, 1998, at JAERI.
 - *Dr. Gregory Rewoldt* (PPPL) spent three weeks, March 6-20, 1999, as an Exchange Scientist to NIFS, Kyoto University, and JAERI.
 - *Dr. Benjamin Carreras* (ORNL) spent one week, December 8–16, 1998, as an Exchange Scientist at NIFS and Kyoto University.
 - *Dr. Loren Steinhauer* (U. Washington) spent ten days, May 11–20, 1998, as an Exchange Scientist at Niigata University.

Joint Computational Projects:

Twelve JIFT joint computational projects on various topics were also active during the past year. Some of these projects involved limited travel.

3. Technical Progress Highlights

The four 1998-1999 JIFT **workshops** were on topics of timely interest and had stimulating participation by both analytical and numerical theorists, as well as by some experimentalists on occasion.

- The workshop on *Confinement Theory and Experiment in Toroidal Systems* was very timely, designed to take advantage of the newly inaugurated experimental campaign on the Large Helical Device at NIFS and also the work on novel helical confinement configurations that is being pursued in Japan and the US. The focus of the workshop was on innovative stellarator and other helical configurations that may lead to improved toroidal magnetic fusion concepts. This workshop was a follow-on to preceding JIFT workshops on similar topics.¹
- The workshop on *Simulation Techniques, Visualization, and Virtual Reality* covered a variety of talks, ranging from virtual reality technology to molecular dynamics of chain molecules, from Fokker-Planck simulations of tokamaks to a gyro-reduced MHD simulation code in

cylindrical geometry. A tour of the NIFS CompleXscope and the Virtual Reality Simulation Laboratory were included.

- The workshop on *Nonlinear and Nonequilibrium Plasma Phenomena* consisted of a day-and-a-half symposium that was devoted to celebrating the 70th birthday of Prof. J. Bryan Taylor, followed by the remainder of the workshop. Both the symposium and the workshop as a whole covered a broad range of topics, united under the general theme of being related to the research contributions made by J. B. Taylor. Papers were presented on the usefulness of large-scale advanced computing; on magnetic relaxation, reconnection, and dynamo physics; on aspects of plasma transport; on astrophysics; on topics and on fluids and nonlinear dynamics. The many participants included a number of European scientists, in addition to US and Japanese scientists.
- The workshop on *Relativistic Plasma Physics and Its Application* (subtitled “High Field Science ‘98”) was quite successful. It brought together results from five related areas: energy research, X-rays, laser acceleration, laser-matter interaction, and laser astrophysics. In the energy research area, the energy applications of inertial fusion were discussed, in particular the physics of fast ignition. Another topic was a broad perspective on achieving fusion through cluster plasmas² and even through pycnonuclear fusion. In X-rays and laser acceleration,³ a variety of experimental and interpretative theoretical results were reported. For example, in the previous JIFT workshop on this subject, it had been suggested that a relativistic laser can yield copious X-rays via Lamar radiation (or relativistic Thomson scattering).⁴ At the present workshop, the detection of this effect in an elegant experiment by Umstadter was reported. The petawatt laser has yielded high energy X-rays, positron formation, and nuclear transmutation. Detailed analysis, measurement, and understanding of laser propagation in a plasma and excitation of a laser wakefield are now possible. Sophisticated computational techniques for laser-matter interaction have been developed. Finally, laboratory astrophysical studies with intense lasers has established itself as a growing field of research.^{5,6} The papers presented at this workshop will be published in a book.⁷

The JIFT **exchange visits** during 1998-1999 have also been productive, in terms of collaborations established, research accomplished, and papers written.

- JIFT visiting professor *Dr. Z. Yoshida* pursued novel research on scale separation in two-fluid plasmas and its implications for dynamo theory, and also on Beltrami conditions in coupled vortex dynamics. His work during this JIFT visit led to the publication of two IFS reports.^{8,9} A related earlier JIFT collaboration on a new type of fluid description for plasmas led to the publication of a paper on double curl Beltrami flow–diamagnetic structures in *Physical Review Letters*.¹⁰
- *Dr. Hideaki Miura* investigated a numerical simulation of the four-field model for nonlinear dynamics of a tokamak plasma. This model consists of four equations that describe the nonlinear development of an MHD fluid with finite Larmor radius effects (i.e., two-fluid physics). The development of a simulation code for this model was initiated and is now underway. Another topic of research was the visualization of numerical data, in particular, the definition and visualization of vortex motion.¹¹

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- *Dr. Hideo Sugama* studied the temporal evolution of the toroidal ITG mode, especially its damped behavior. A kinetic integral equation including initial conditions was derived by Laplace transformation of the ion gyrokinetic equation, the electron Boltzmann relation, and the charge neutrality condition and used to investigate the initial value problem. The analytic continuation of the integral kernel was derived as a function of a complex frequency, which is useful for analytically and numerically evaluating the asymptotic damping behavior of perturbations. In the presence of a toroidal gradient-B and curvature drift, it was found that the temporal dependence of the density and potential perturbations consists of normal modes and a continuum mode, which exhibit exponential time dependence and power-law decay, respectively. This result is similar to that obtained with the use of a local approximation; however, when the ballooning structure of the perturbation along a magnetic field line is taken into account, the time dependence of the power-law decay of the continuum mode is given by t^{-2} , which is different from that of the local approximation. Numerical solutions were successfully obtained for the dispersion relation and the eigenfunctions of the normal modes, including the case of negative growth rates, which had not been studied previously. The critical condition between stability and instability can be clearly seen from these numerical results. During this time, two papers on other collaborations with US scientists were published.^{12,13}
 - *Dr. Mieko Toida* worked with Prof. John Dawson and Dr. Viktor Decyk at UCLA on simulation codes for studying nonlinear plasma behavior and instability. Also during this period a couple of papers that she co-authored with a previous JIFT visiting professor to the US were published.^{14,15}
 - *Dr. Vincent Chan* worked at NIFS as the JIFT visiting professor. He collaborated in a study of nonlinear stability of high beta spherical tokamak equilibria produced with the EFIT code. He also started a collaboration on including 3-D electric field effects in a Fokker-Planck Monte Carlo simulation.¹⁶ During his visit he participated in a number of US-Japan workshops (including two JIFT workshops), the biennial IAEA Fusion Conference (in Yokohama), and the International Toki Conference. He also presented a number of seminars at NIFS, JAERI, and Kyoto on the physics challenge of spherical torus, resistive wall modes, and feedback stabilization and runaway electron avalanche process.
 - *Dr. Benjamin Carreras* collaborated with scientists at Kyoto University to study profile changes due to resistive interchange and the effect on the stability of ideal interchange modes. The idea behind this work is that Mercier beta limits in helical systems are too restrictive because they do not take into account this interplay. The results from this collaboration were reported in a published paper¹⁷ and in an invited talk at the 1998 IAEA fusion energy conference.¹⁸ He also collaborated with JAERI scientists on massively parallel computer simulations.
 - *Dr. Boris Breizman* collaborated with JAERI scientists to interpret observations on the JT-60U tokamak of phenomena caused by a population of highly energetic particles—e.g., negative ion neutral beam particles or ICRF wave-heated particles.¹⁹
 - *Dr. Gregory Rewoldt* discussed with NIFS scientists the use of LHD experimental data for

use in linear microinstability calculations with the extended stellarator version of the FULL code. At JAERI he continued a collaboration in which JT-60U tokamak data for negative magnetic shear discharges, L-mode discharges, high poloidal beta discharges, and other discharges are being analyzed for linear microinstabilities. Several internal transport barrier shots were also analyzed. He also visited Kyoto for discussions with scientists concerning the Heliotron-J stellarator device currently under construction. At all three places he presented seminars on recent work.

Also, a number of papers were published this past year by scientists who had participated in various JIFT exchange activities (e.g., workshops or visits) during preceding years. Some of these activities led to collaborations that were subsequently continued by means of JIFT joint computational projects.^{20,21,22,23,24}

4. Plans for Future Activities

The topics and themes of the exchange activities that have been proposed for the next year (April 1, 1999–March 31, 2000) are consistent with the traditional emphasis of JIFT on fundamental theoretical plasma physics issues, but at the same time have direct relevance to the fusion science programmatic interests of both countries. This schedule of proposed activities is listed in Attachment B.

Workshops:

Several of the various workshops being proposed for the next year have tie-ins with other activities and travel, in order to reduce expenses and maximize participation.

- The proposed workshop on *Confinement Theory and Experiments in Toroidal Systems* is designed to take advantage of the newly inaugurated experimental campaign on the Large Helical Device at NIFS and also the work on novel helical confinement configurations that is being pursued in Japan and the US. Its objective is to stimulate proposals for possible experiments that could check theories, and vice versa. This workshop will be helpful to further strengthen the connections in helical system theory expertise among US, Japanese, and other world programs in this increasingly vital area. It is a follow-on to several earlier JIFT workshops on the same topic in recent years.
- Likewise, the workshop on *High Field Science* that is being proposed for the coming year is also a follow-on to last year's workshop on relativistic laser-plasma interactions. Thus it is the latest continuation of the popular series of JIFT workshops on this subject that have been successfully organized for the last several years. The topic of the proposed workshop for next year involves a good cross-fertilization among magnetic confinement, RF heating, laser-plasma interaction, ultra-high-density plasma physics, and laser simulation of plasma astrophysics phenomena.
- The JIFT visiting professor to Japan this year proposed (and also offered to organize) a workshop on *High Beta Plasma Confinement Studies*. This is an excellent cross-cutting topic for tokamaks, helical systems, spherical tori, and other alternative confinement configurations,

all of which pursue high beta plasma research.

- Another traditional area of JIFT emphasis has been the numerical simulation of plasmas, which dovetails nicely with the very strong emphasis in Japan on sophisticated large-scale computations and also with the strategic simulation initiative in the US. The continuation workshop on *Simulation Science and Methodology* that is proposed for next year has, in addition, a focus on cutting-edge visualization techniques, which US and Japanese computational scientists are actively developing and which have been the subject of other recent JIFT exchange activities. It is scheduled to be held jointly with the 1999 Numerical Tokamak Turbulence Project workshop, during the Transport Task Force annual meeting. This concatenation of meetings will allow scientists who are interested in simulation science and transport, turbulence, and advanced simulation and visualization methods to participate in the activities of several research groups in one place at the same time. More information about this workshop can be found at <www.psf.mit.edu/ttf/portland-meeting.html>.

Exchange Visits:

The long-term (i.e., one month minimum) visits have in the past been quite effective to establish productive research collaborations that often last for years afterwards.

So far, only two exchange scientists from the US are listed on the proposed JIFT schedule for the coming year. The proposed visiting professor for next year, Dr. Prashant Valanju, had also been the scheduled visiting professor for this year. However, he was unable to go to Japan this year, and therefore someone else (Dr. Vincent Chan) was substituted for him on short notice. His visit has now been rescheduled for next year's JIFT program. Also, in the same manner, Dr. Herbert Berk will visit NIFS as an exchange scientist. In effect his visit was rescheduled from this year, when he was unable to travel to Japan.

From the Japanese side, three exchange scientists (paid by Japan) have been proposed, in addition to the visiting professor (who is paid by the IFS). Dr. Hideo Sugama, the proposed JIFT Visiting Professor, had previously spent several months at the IFS as a JIFT exchange scientist and therefore has well-established collaborative relationships with US scientists.

Joint Computational Projects:

The joint computational projects, which comprise the third part of the JIFT program, usually arise as outgrowths of earlier workshops or scientific exchanges. Their number is periodically pruned, after their usefulness has been realized. Most of the items being proposed for the 1999-2000 program are active continuations from the previous year, with some changes in personnel. (Note that five of the proposed twelve joint computational projects for the coming year involve JAERI scientists as participants.)

5. Program Administration

JIFT has a Steering Committee of eight members, four from each country, with two co-chairmen. The co-chairman on the Japanese side is the director of the Theory and Computer

Simulation Center at the National Institute for Fusion Science. The co-chairman on the US side is the director of the Institute for Fusion Studies (IFS) of The University of Texas at Austin. Two other members of the Steering Committee, who are called co-executive secretaries, are responsible for the ongoing daily oversight of the progress of JIFT activities. Furthermore, on the Japanese side there is one official Advisor, who is from the Japan Atomic Energy Research Institute; and on the US side there is an Advisory Committee comprised of several members. The names of the persons on the Steering Committee and the names of the Advisors are listed below:

JIFT Steering Committee

US Members

R. Hazeltine (IFS)—Co-Chairman
J. Van Dam (IFS)—Co-Exec. Secretary
W. Sadowski (DOE)
J. Dawson (UCLA)

Japanese Members

T. Sato (NIFS)—Co-Chairman
M. Okamoto (NIFS)—Co-Exec. Secretary
M. Wakatani (Kyoto)
K. Mima (Osaka)

JIFT Advisors

Japanese Advisor: Y. Kishimoto (JAERI)

US Advisory Committee: A. Aydemir (IFS), P. Catto (MIT), B. Carreras (ORNL), V. Chan (GA), B. Cohen (LLNL), J. Johnson (PPPL), W. Horton (IFS), J. Leboeuf (ORNL), T. Tajima (IFS), W. Tang (PPPL), and P. Terry (UWM)

The Steering Committee attempts to schedule workshops in such a way as to dovetail with other meetings, to involve participation at workshops by interested experimentalists, and to invite 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 behaviour and control, heating and current drive, and new approaches and diagnostics.

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ATTACHMENT A:
1998-1999 JIFT Program

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1998—March 31, 1999**

A. 1998-99 Workshops

US to Japan:

Confinement Theory and Experiment in Toroidal Systems

Organizers: M. Okamoto (NIFS), V. Chan (GA)

Held: October 26-28, 1998, Toki (after IAEA Conference)

Participants: 4 US, 10 Jpn

Simulation Technique, Visualization, and Virtual Reality

Organizers: R. Horiuchi (NIFS), O. Yuri (GA)

Held: December 8-11, 1998, Toki (in conjunction with Intl. Toki Conference)

Japan to US:

Nonlinear and Non-Equilibrium Plasma Phenomena

Organizers: J. Van Dam (IFS), T. Sato (NIFS)

Held: January 11-14, 1999, Austin (included JBT 70th Birthday Symposium)

Relativistic Plasma Physics and Its Application

Organizers: T. Tajima (IFS), K. Mima (ILE Osaka)

Held: November 23-25, 1998, Livermore

JIFT Steering Committee Meeting

Organizers: T. Sato (NIFS), R. Hazeltine (IFS)

Held: November 16, 1998, New Orleans (during APS Meeting)

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1998—March 31, 1999**

B. 1998-99 Exchange Visits

From Japan to US:

Self-Organization of Strongly Diamagnetic Configurations

Zensho Yoshida (Tokyo), Visiting Professor

IFS; 14 weeks; one person

Visited IFS February 15-24 and once more in summer 1999

Gyrokinetic Analysis of Microinstabilities

Hideo Sugama (NIFS), Visiting Scientist

November 11, 1998–February 4, 1999; PPPL

MHD Simulation of Fusion Plasmas

Hideaki Miura (NIFS), Visiting Scientist

October 1–December 28, 1998; MIT, Rutgers

Simulation of Nonlinearity and Instability in Plasma

M Toida (Nagoya), Visiting Scientist

July 17–September 12, 1998; UCLA

From US to Japan:

Physics of Helical Plasmas and New Concepts

Prashant Valanju (Texas), Visiting Professor

REPLACED BY: Vincent Chan (GA), Visiting Professor

NIFS, JAERI

October–December 1999

Microinstabilities and Data Analysis for Toroidal Plasma

Greg Rewoldt (PPPL), Visiting Scientist

NIFS, Kyoto, JAERI

To be scheduled

Analysis of Burst Modes in CHS and Kinetic Effects on MHD

Herb Berk (IFS), Visiting Scientist

REPLACED BY: Boris Breizman (IFS), Visiting Scientist

October 25-29; JAERI

MHD and Turbulence Studies

Ben Carreras (ORNL), Visiting Scientist

December 8-16, 1998; NIFS, Kyoto

Confinement Theory for FRC Plasmas

Loren Steinhauer (Washington), Visiting Scientist

May 11-20, 1998; Niigata

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1998—March 31, 1999**

C. 1998-99 Joint Computational Projects

- JC 1** *MHD Stability in Advanced Tokamaks*
S. Tokuda, Y. Ishii, M. Ozeki (JAERI); J. Manickam (PPPL); A. Aydemir (IFS);
modified from 1997-98.
- JC 2** *Gyrokinetic Transport Simulation*
J. Dawson, V. Decyk, and R. Sydora (UCLA); W. Lee (PPPL); T. Sato and T. Takayama
(NIFS); H. Naitou (Yamaguchi); continued from 1997-98.
- JC 4** *Plasma Rotation, Vortices, and Anomalous Transport*
W. Horton, A. Aydemir (IFS); B. Carreras (ORNL); M. Okamoto, N. Nakajima (NIFS);
M. Wakatani (Kyoto); continued from 1997-98.
- JC 8** *3-D Codes and Island Formation*
D. Monticello (PPPL); A. Boozer (Columbia); C. Hegna (Wisc.); T. Hayashi, R. Kanno
(NIFS); Y. Nakamura (Kyoto U.); continued from 1997-98.
- JC 9** *New Simulation Algorithms for Massively Parallel Processing*
J. Dawson and V. Decyk (UCLA); W. Tang (PPPL); T. Sato, K. Watanabe (NIFS); S.
Ishiguro (Tohoku); continued from 1997-98.
- JC 14** *Toroidal Simulation and Plasma Transport Modeling*
T. Tajima and W. Horton (IFS); Y. Kishimoto and M. Azumi (JAERI); continued from
1997-98.
- JC 19** *Numerical Study of High Energy Particle Effect on MHD Stability*
C. Z. Cheng (PPPL); J. Van Dam (IFS); M. Azumi and T. Ozeki (JAERI); continued
from 1997-98.
- JC 21** *Turbulent Transport Applications to Tokamaks and Helical Systems*
B. Carreras (ORNL); W. Horton (IFS); M. Wakatani, Y. Nakamura (Kyoto); H. Sugama
(NIFS); continued from 1997-98.
- JC 22** *Tokamak Simulation on Massively Parallel Computers*
B. Carreras, D. Spong, J.N. Leboeuf (ORNL); J. Dawson, V. Decyk (UCLA); S. Tokuda,
G. Kurita, Y. Ishii (JAERI); continued from 1996-97

MHD and Transport Phenomena in Toroidal Systems

W. Tang, G. Rewoldt, C.Z. Cheng (PPPL); M. Okamoto, H. Sugama, N. Nakajima
(NIFS)

Kinetic Effects on MHD Phenomena

H. Berk, J. Van Dam, B. Breizman (IFS); M. Okamoto, N. Nakajima, K. Ichiguchi
(NIFS)

Two-Fluid Model for Plasma Simulation

B. Coppi, T. Takaya, L. Sugiyama (MIT); T. Sato, H. Miura, M. Tanaka (NIFS)

ATTACHMENT B:
Proposed 1999-2000 JIFT Program

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1999 to March 31, 2000 Program**

A. 1999-2000 Workshops

US to Japan:

- J** __ *Confinement Theory and Experiment in Toroidal Systems*
Organizers: M. Okamoto (NIFS); V. Chan (GA)
Proposed Place/Time: Toki; concurrent with International Toki Conf.
- J** __ *High Field Science*
Organizers: K. Mima (ILE Osaka); T. Tajima (IFS)
Proposed Place/Time: Osaka; 1999
- J** __ *JIFT Steering Committee Meeting*
Organizers: T. Sato (NIFS) and R. Hazeltine (IFS)
Proposed Place/Time: Toki; during 1999 International Toki Conference

Japan to US:

- I** __ *High-Beta Plasma Confinement Studies*
Organizers: V. Chan (GA); M. Wakatani (Kyoto); M. Okamoto (NIFS)
Proposed Place/Time: GA, San Diego; September 1999
- I** __ *Simulation Science and Methodology*
Organizers: R. Horiuchi (NIFS); B. Cohen (LLNL)
Proposed Place/Time: jointly with Numerical Tokamak Turbulence Project workshop,
during the Transport Task Force meeting.

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1999 to March 31, 2000 Program**

B. 1999-2000 Exchange Visits

From Japan to US:

- JL** ___ *Microinstabilities and Plasma Transport*
Hideo Sugama (NIFS), Visiting Professor (paid by US)
IFS
- JL** ___ *Three-Dimensional MHD Stability of Heliotron Plasmas*
Katsuji Ichiguchi (NIFS), Visiting Scientist (paid by Japan)
Wisconsin, IFS
- JL** ___ *Theory for Interactions between Ultra-High Power Laser and Plasmas*
Toshihiro Taguchi (ILE Osaka), Visiting Scientist (paid by Japan)
- JL** ___ *Effects of High-Energy Ions in Heliotron/Torsatron Systems*
Noriyoshi Nakajima (NIFS), Visiting Scientist (paid by Japan)

From US to Japan:

- IL** ___ *Physics of Helical Plasmas and New Concepts*
Prashant Valanju (FRC Texas), Visiting Professor (paid by Japan)
- IL** ___ *Study of Kinetic Effects on MHD Phenomena*
Herbert Berk (IFS), Visiting Scientist (paid by US)

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1999 to March 31, 2000 Program**

C. 1999-2000 Joint Computational Projects

- JC 1** *MHD Stability in Advanced Tokamaks*
S. Tokuda, Y. Ishii, M. Ozeki (JAERI); J. Manickam (PPPL); A. Aydemir (IFS); cont. from 1998-99.
- JC 2** *Gyrokinetic Transport Simulation*
J. Dawson, V. Decyk, and R. Sydora (UCLA); W. Lee (PPPL); T. Sato and Y. Takayama (NIFS); H. Naitou (Yamaguchi U.); continued from 1998-99.
- JC 4** *Plasma Rotation, Vortices, and Anomalous Transport*
W. Horton, A. Aydemir, and K. Shaing (IFS); B. Carreras (ORNL); M. Okamoto and S. Murakami (NIFS); M. Wakatani (Kyoto U.); continued from 1998-99.
- JC 8** *3-D Codes and Island Formation*
A. Boozer (Columbia); D. Monticello (PPPL); C. Hegna (Wisc.); T. Hayashi and R. Kanno (NIFS); Y. Nakamura (Kyoto U.); continued from 1998-99.
- JC 9** *New Simulation Algorithms for Massively Parallel Processing*
J. Dawson and V. Decyk (UCLA); W. Tang (PPPL); K. Watanabe, R. Horiuchi, and S. Ishiguro (NIFS); continued from 1998-99.
- JC 14** *Toroidal Simulation and Plasma Transport Modeling*
T. Tajima and W. Horton (IFS); Y. Kishimoto and M. Azumi (JAERI); M. Takamaru (NIFS); continued from 1998-99.
- JC 19** *Numerical Study of High Energy Particle Effect on MHD Stability*
C. Z. Cheng (PPPL); J. Van Dam (IFS); T. Ozeki and M. Azumi (JAERI); Y. Todo (NIFS); continued from 1998-99.
- JC 21** *Turbulent Transport Applications to Tokamaks and Helical Systems*
B. Carreras (ORNL); W. Horton (IFS); M. Wakatani and Y. Nakamura (Kyoto); M. Yokoyama (NIFS); cont. from 1998-99.

- JC 22** *Tokamak Simulation on Massively Parallel Computers*
B. Carreras, D. Spong, J.N. Leboeuf (ORNL); J. Dawson and V. Decyk (UCLA); S. Tokuda and G. Kurita (JAERI); T. Watanabe (NIFS); continued from 1998-99.
- JC __** *MHD and Transport Phenomena in Toroidal Systems*
W. Tang, G. Rewoldt, C. Z. Cheng (PPPL); S. Kida, H. Sugama, R. Ishizaki (NIFS); continued from 1998-99.
- JC __** *Kinetic Effects on MHD Phenomena*
J. Van Dam, H. Berk (IFS); M. Okamoto, N. Nakajima, and K. Ichiguchi (NIFS); continued from 1998-99.
- JC __** *Two-Fluid Model for Plasma Simulation*
B. Coppi, T. Takaya, L. Sugiyama (MIT); T. Sato, H. Miura, M. Tanaka (NIFS); continued from 1998-99.