
TO: Executive Secretaries of the US-Japan Fusion Research Collaboration
FROM: JIFT Steering Committee
DATE: March 24, 1997
SUBJECT: **JIFT Annual Report of Activities for 1996-97**

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US-Japan Joint Institute for Fusion Theory
Annual Report of Activities
April 1, 1996–March 31, 1997

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March 24, 1997

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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 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 16 years of successful operation, JIFT has sponsored 92 long-term visits by exchange scientists, 58 topical workshops, and 76 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 soon-to-be-completed 1996-97 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 the upcoming 1997-98 period 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 1996-97 JIFT program of activities and the proposed 1997-98 program of exchange activities.

2. Status of Current Activities

The complete schedule of this year's 1996-97 JIFT exchange activities is given in Attachment A.

Workshops:

All of the workshops that were scheduled in this year's JIFT program have been held.

- The workshop on *Plasma Turbulence and Transport in Toroidal Systems*, held October 29-31, 1996, at Kyoto University, in Kyoto (Japan), was attended by 2 US scientists and 14 Japanese scientists.
- The workshop on *Interactions of High Power Waves with Plasma and Matter* (subtitled "Visions for High Field Science"), held December 16-18, 1996, at the Institute for Laser Engineering, Osaka University, in Osaka (Japan), was attended by 10 US scientists and 22 Japanese scientists.
- The workshop on *Large Scale Simulation Study and Visualization*, held March 5-7, 1997, at the University of Colorado, in Boulder (USA), was attended by 14 US scientists and 7 Japanese scientists.
- The workshop on *Advanced Confinement Concept and Theory*, held October 14-17, 1996, at Columbia University, in New York City (USA), was attended by 7 Japanese scientists, approximately 20 US scientists, and 2 scientists from other countries (Spain and Russia).

The annual meeting of the JIFT Steering Committee was held November 11, 1996, in Denver, Colorado, during the Meeting of the Division of Plasma Physics, American Physical Society. In attendance were US steering committee members (J. Dawson, R. Hazeltine, W. Sadowski, J. Van Dam), Japanese steering committee members (T. Sato, M. Okamoto), and US advisors (A. Aydemir, V. Chan, B. Cohen, W. Horton, J. Johnson, J. Leboeuf, W. Tang, and P. Terry). Several US and Japanese observers were also present (G. Furnish, D. Nystrom, S. Parker, H. Sugama, N. Zabusky).

Exchange Visits:

Of the 11 scientific personnel exchanges that had been planned for the 1996-97 program, six of them have already taken place, two are currently underway, and three were withdrawn. The scientific visits that have occurred or are now occurring are as follows:

- *Dr. Donald Monticello* (PPPL) spent three months, May 1-July 31, 1996, as JIFT Visiting Professor at NIFS. During this time he also briefly visited JAERI and Kyoto University.
- *Dr. Chris Hegna* (University of Wisconsin) is currently spending three months, January 16-April 15, 1997, as an Exchange Scientist at NIFS.
- *Dr. John Reynders* (LANL) spent one month, June 2-28, 1996, as an Exchange Scientist at NIFS.
- *Dr. Yukiharu Ohsawa* (Nagoya University) spent two months, June 24-August 27, 1996, as JIFT Visiting Professor at IFS, during which time he also briefly visited UCLA.
- *Dr. Yasushi Todo* (NIFS) spent two weeks, December 4-19, 1996, as an Exchange Scientist at IFS.
- *Mr. Arimichi Takayama* (Kyoto University) spent two months, September 14-November 17, 1996, as an Exchange Scientist at University of California, Irvine.
- *Dr. Kunihiro Sato* (Himeji Institute of Technology) spent one month, October 15-November 15, 1996, as an Exchange Scientist at MIT.
- *Dr. Hisanori Takamaru* (NIFS) is about to spend one month, March 28-April 30, 1997, as an Exchange Scientist at UCLA.

Joint Computational Projects:

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

3. Technical Progress Highlights

The JIFT workshops held during 1996-97 were on topics of timely interest and had stimulating participation by both analytical and numerical theorists, as well as numbers of experimentalists on occasion.

- The workshop on *Large Scale Simulation Study and Visualization* attracted rather diverse participation, with talks on ICF, space/solar physics, object-oriented programming, tokamak turbulence, parallel computing, hydrodynamic turbulence, and scientific visualization. A highlight at this meeting was the number of talks that described new directions for the numerical simulation of plasmas. Some of these active areas and new directions are magnetic reconnection using 3D MHD and 2D PIC, the use of efficient object-oriented programming techniques on parallel machines, increased realism in gyrokinetic simulations, and more quantitative use of scientific visualization. (The entire schedule of talks may be viewed at the

following Web site: <<http://stripe.Colorado.edu/~parkerse/sched.html>>.)

- The workshop on *Advanced Confinement Concept and Theory* was very timely, meshing with strong programs in Japan and Europe on helical systems, as well as the resurgent US effort. The focus of the workshop was on innovative stellarator and other helical configurations that may lead to improved toroidal magnetic fusion concepts. The talks were in the four areas of operating experiments; experiments under construction; design activities; and stellarator physics, power plant, and program considerations. The talks will all be published in the journal *Plasma Physics Reports* (edited by Dr. V. Shafranov, who attended this workshop). The US co-organizer, Dr. A. Boozer, has submitted a written report about this workshop for publication in *Nuclear Fusion*.¹ Interestingly, he was able to obtain partial support for co-sponsoring this workshop from the Italian Academy for Advanced Studies, along with JIFT and Columbia University.
- The mini-workshop on *Plasma Turbulence and Transport in Toroidal Systems* was described by the US and Japanese co-organizers as extremely useful, especially as it involved strong participation by experimentalists from both NIFS and JAERI as well as theorists working on these problems. The workshop focused on enhancing mutual understanding between recent theoretical and experimental results about the physics of improved confinement and the identification of anomalous transport processes. In addition to descriptions of theoretical studies of transport problems, experimental results from JT-60U, JFT-2M, JIPPT II-U/CHS, and Heliotron-E were reported. Transport issues for ITER were also considered.
- The workshop on *Interactions of High Power Waves with Plasma and Matter* (subtitled "Visions for High Field Science") was very successful. It was jointly sponsored by JIFT, the ICF Forum, and the ILE Collaboration Program. A large number (ten) of US scientists attended this meeting. Topics such as intense electromagnetic wave-plasma interactions, short pulse laser-plasma interactions, laser acceleration, laser Compton scattering, nonlinear plasma dynamics, fast ignitor concept, and ultrashort pulsed lasers were covered. A one-page news article concerning this workshop was published in the January 24, 1997, issue of *Science* magazine.² Specially featured in that article were the new Japanese results on the acceleration of electrons to 100-300 MeV energies by short-pulse lasers.

The JIFT exchange visits during 1996-97 have also been productive, in terms of collaborations established, research accomplished, and papers written.

- JIFT visiting professor *Dr. Y. Ohsawa* pursued novel research on nonlinear magnetosonic waves and associated particle acceleration in plasmas with multiple ion species. He has found that magnetosonic waves behave quite differently when more than just one species of ion are present in a plasma. His work during this JIFT visit led to the publication of two IFS reports, one of which was subsequently published in a journal.³ At the IFS he presented two seminars. Talks concerning this research were also afterwards presented at several meetings,⁴⁻⁷ including the International Conference on Plasma Physics.
- *Dr. Yasushi Todo*, while at the IFS, continued his recent work on nonlinear numerical

simulation studies of TAE modes in the presence of energetic alpha particles. With the addition of additional physics features, he now expects to obtain both improved analysis of simulation results and also enhancement of his code. At an international workshop on the topic of energetic particle physics held last month in Japan, he reported on this work.

- *Mr. Arimichi Takayama* is the second person to visit the US under the new and successful JIFT initiative to occasionally sponsor some advanced graduate students. (The first of these graduate students, in the previous year's program, subsequently graduated and is now employed at NIFS; work done during his JIFT visit became part of his Ph.D. research.) This year, Mr. Takayama studied the nonlinear saturation of kinetic ballooning modes in tokamaks, under the guidance of Prof. L. Chen at UC Irvine.
- *Dr. Kunihiko Sato* worked on theory for outstanding problems in edge plasma physics, in collaboration with the edge plasma group at MIT. He derived an important condition that determines the potential distribution in the recycling region of the divertor.
- *Dr. Hisanori Takamaru* will visit UCLA and apply electrostatic particle simulation to study electron acceleration by an ion acoustic double layer.
- *Dr. Donald Monticello* presented five seminars and three lectures as JIFT visiting professor at NIFS. His research focused on modeling LHD, the new heliotron/torsatron device being constructed at the new Toki site, with his MHD code, including the effects of bootstrap current on the formation of magnetic islands. A two-page report about his visit was published in a recent issue of the monthly *NIFS Newsletter*.
- *Dr. Chris Hegna* is currently spending three months early this year at NIFS, working on tearing modes and nonlinear island formation in toroidal plasmas. Also, he is studying ballooning modes in helical systems in collaboration with Dr. N. Nakajima.
- During his visit at NIFS, *Dr. John Reynders* introduced a recent breakthrough in object-oriented simulation techniques, viz., expression templates, and applied it to develop high-performance particle simulation capabilities that were then utilized for efficiently running a large Monte-Carlo type of code on a parallel machine.

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.

- Several papers on transport issues were published this year, in connection with the JIFT workshop on transport and transport barriers that was held in the previous year and also in connection with an ongoing joint computational project on this topic. Two papers explored transport processes and entropy production in toroidal plasmas,^{8,9} with one taking into account the effect of plasma rotation. Other papers considered transport theory for self-organized criticality¹⁰ and application of the theory to analyze JT-60U experimental results.¹¹ A major talk on this work, dealing especially with the effects of weak or negative shear and also plasma rotation on self-organized critical gradient transport, was selected for presentation

at the international 1996 IAEA Fusion Energy Conference in Montreal, Canada.¹²

- A longstanding JIFT effort has been the benchmarking of stability predictions from various different MHD numerical codes that are applied to a common stellarator equilibrium configuration. This important work, which has been pursued over the last several years among Japanese, US, and Russian scientists, was finally published in a lengthy paper.¹³
- Two landmark papers on the subject of ballooning mode stability in helical configurations, written by last year's JIFT visiting professor during his visit to the IFS, were published this year.^{14,15} This work was also highlighted in a talk selected for presentation at the international 1996 IAEA Fusion Energy Conference in Montreal, Canada.¹⁶
- Last year's JIFT-sponsored advanced graduate student collaborated with University of Wisconsin scientists to study the evolution of toroidal flow during and after mode locking. Their paper on this research was published this year.¹⁷
- During his JIFT visit of last year's program, a Japanese exchange scientist had been selected to give a talk at the Sherwood Fusion Theory Conference about the properties of LHD configurations with multi-layer helical coils. The work was published this year.¹⁸

In the past, JIFT program activities have been periodically publicized to the wider international fusion community through the *JIFT Newsletter*, which contained longer descriptions of the workshops, exchange visits, etc. It is now planned to convert this newsletter from paper to electronic format, with the use of a JIFT home page on the World Wide Web.

4. Plans for Future Activities

The topics and themes of the exchange activities that have been proposed for the next year (April 1, 1997–March 31, 1998) 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. These proposed activities are 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 workshop on advanced confinement concepts held last year at Columbia University was such a success that there was consensus to propose a follow-up workshop, this time in Japan, with the same co-organizers (Dr. M. Okamoto and Dr. A. Boozer). In order to maximize participation and impact, efficient tie-ins will be arranged with the annual Toki Conference, which this year is to be combined with the semiannual IEA stellarator meeting, and also with the Japan-Australia collaboration program on helical systems. The focus in this year's JIFT workshop will be more narrowly on *theoretical studies for helical plasmas*, since the Toki/IEA meeting will cover experimental results. This workshop will be helpful to further strengthen the connections in stellarator theory expertise among US, Japanese, and other

world programs in this increasingly vital area.

- Likewise, the workshop on *turbulent transport in toroidal plasmas* that is being proposed for the coming year is also a follow-on to last year's "mini-workshop" on the same topic. It will be timed to coincide with the planned visit of Dr. G. Rewoldt to Japan.
- The steering committee members also had strong consensus to propose holding a workshop on fluid and magnetofluids, titled *dynamo phenomena and self-organization*, in order to exploit the interrelatedness of these two fields of research. Both areas and their connectivity have been a hallmark topic of JIFT activities in past years. This subject also permits a nice fit with the JIFT perspective to push the boundaries of fusion science applications, here into fluid dynamics and also space and astrophysical MHD.
- Another traditional area of JIFT emphasis has been the numerical simulation of plasmas. The continuation workshop on *nonlinear plasma simulation and visualization* that is proposed for next year has, in addition, a focus on cutting-edge visualization techniques in numerical simulations, which US and Japanese computational scientists are actively developing and which have been the subject of other recent JIFT exchange activities. It is hoped to connect this workshop with the biannual US conference on Numerical Simulation of Plasmas, whose local organizer (Dr. V. Decyk) will also be a co-organizer for the JIFT workshop.

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, Dr. S. Mahajan, is currently jointly authoring a book with a professor at Tokyo University. The latter project is planned for completion during his visit in Japan. Also, Dr. G. Rewoldt will visit NIFS as an exchange scientist.

From the Japanese side, four exchange scientists (paid by Japan) have been proposed, in addition to the visiting professor (paid by IFS).

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 1997-98 program are active continuations from the previous year, with some changes in personnel. (Note that four of the proposed 11 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 (NIFS) in Japan (who, incidentally,

also became deputy director-general of NIFS last year). 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:
1996-97 JIFT Program

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1996—March 31, 1997**

A. 1996-97 Workshops

US to Japan:

Plasma Turbulence and Transport in Toroidal Systems

Organizers: M. Wakatani (Kyoto), B. Carreras (ORNL)

Held: **October 29-31, 1996**; Kyoto University

Interactions of High Power Waves with Plasma and Matter

Organizers: K. Mima & Y. Kitagawa (ILE), T. Tajima (IFS)

Held: **December 16-18, 1996**; Institute for Laser Engineering, Osaka University

Japan to US:

Large Scale Simulation Study and Visualization

Organizers: S. Parker (PPPL), R. Horiuchi (NIFS)

Held: **March 5-7, 1997**; University of Colorado, Boulder

Advanced Confinement Concept and Theory

Organizers: A. Boozer (Columbia), M. Okamoto (NIFS)

Held: **October 14-17, 1996**; Columbia University, New York

JIFT Steering Committee Meeting

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

Held: **November 11, 1996**; Denver, Colorado

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1996—March 31, 1997**

B. 1996-97 Exchange Scientists

US to Japan:

3-D MHD Equilibrium in Tori

D. Monticello (PPPL): Visiting Professor, to NIFS—May 1—**July 31, 1996**
13 weeks, paid by Japan

Island Formation and Plasma Transport

C. Hegna (Wisconsin): Visiting Scientist, to NIFS—January 16—April 15, **1997**

Energy Confinement Simulation for Toroidal Plasmas

W. Dorland (IFS): Visiting Scientist, to NIFS, Kyoto, JAERI—**withdrawn**

Particle Code Simulation and Parallelization

J. Reynders (LANL): Visiting Scientist, to NIFS, JAERI—June 2—**28, 1996**

Effects of Error Fields on the Plasma Confinement

R. Fitzpatrick (IFS): Visiting Scientist, to NIFS, Kyoto, JAERI—**withdrawn**

Japan to US:

Theory and Simulation of Nonlinear Plasma Waves

Yukiharu Ohsawa (Nagoya): Visiting Professor, to IFS—June 24—**August 27, 1996**
10 weeks, paid by IFS

Nonlinear Simulation Study of the TAE Mode

Yasushi Todo (NIFS): Visiting Scientist, to IFS and PPPL—December 4—**19, 1996**

Study of Nonlinear Pressure-Driven Modes

Arimichi Takayama (Kyoto): Visiting Scientist, to UC Irvine—**Sept. 14—Nov. 17, 1996**

Potential Formation in an Open Field

Kunihiro Sato (Himeji Inst. Tech.): Visiting Scientist, to MIT—**Oct. 15—Nov. 15, 1996**

Electron Acceleration by Ion Acoustic Double Layer

Hisanori Takamaru (NIFS): Visiting Scientist, to UCLA—March 28—April 30, 1997

Simulation Study of Neoclassical Transport in the Edge Plasma

Sadayoshi Murakami (NIFS): Visiting Scientist, to IFS and PPPL—**withdrawn**

**US-Japan Joint Institute for Fusion Theory
Program for April 1, 1996—March 31, 1997**

C. 1996-97 Joint Computational Projects

- JC1** *MHD Stability in Advanced Tokamaks*
T. Ozeki, S. Tokuda, Y. Ishii, & M. Azumi (JAERI); J. Manickam (PPPL)—continued from 1995-96, but combines previous JC1 and JC20
- JC2** *Gyrokinetic Transport Simulation*
J. Dawson, V. Decyk, & R. Sydora (UCLA); W. Lee (PPPL); T. Sato & T. Kamimura (NIFS); H. Naitou (Yamaguchi)—continued from 1995-96
- JC4** *Plasma Rotation, Vortices, and Anomalous Transport*
W. Horton, A. Aydemir, R. Hazeltine, & K. Shaing (IFS); M. Okamoto & N. Nakajima (NIFS); M. Wakatani (Kyoto)—continued from 1995-96
- JC6** *Current Drive in Toroidal Systems*
M. Ono and W. Tang (PPPL); V. Chan (GA); T. Sato, M. Okamoto, & N. Nakajima (NIFS)—continued from 1995-96
- JC8** *3-D Codes and Island Formation*
J. Johnson (PPPL); P. Garabedian (NYU); C. Hegna (Wisconsin); T. Hayashi (NIFS); M. Wakatani & Y. Nakamura (Kyoto U.)—continued from 1995-96
- JC9** *New Simulation Algorithms for Massively Parallel Processing*
J. Dawson & V. Decyk (UCLA); W. Tang (PPPL); K. Watanabe, R. Horiuchi, & T. Sato (NIFS)—continued from 1995-96
- JC14** *Toroidal Simulations and Plasma Transport Modeling*
T. Tajima & W. Horton (IFS); Y. Kishimoto, S. Tokuda, & M. Azumi (JAERI)—continued from 1995-96
- JC15** *Atomic and Molecular Processes for Fusion*
T. Kato (NIFS); F. Koike (Kitazato); K. Sakimoto (Space Laboratory); D. Schultz (ORNL); R. More (LLNL); R. Clark (LANL)—continued from 1995-96
- JC19** *Numerical Study of High Energy Particle Effect on MHD Stability*
M. Azumi & T. Ozeki (JAERI); C. Z. Cheng (PPPL)—continued from 1995-96
- JC21** *Turbulent Transport Applications to Tokamaks and Helical Systems*
M. Wakatani & Y. Nakamura (Kyoto); H. Sugama (NIFS); B. Carreras (ORNL); W. Horton (IFS)
- JC22** *Tokamak Fluid Simulation on Massively Parallel Computers*
M. Azumi, G. Kurita, S. Tokuda, & Y. Ishii (JAERI); B. Carreras, D. Spong, J. Leboeuf, & V. Lynch (ORNL)
- JC23** *Study for Advanced Fusion Concepts*
T. Sato, R. Horiuchi, M. Okamoto (NIFS); M. Yamada, M. Ono (PPPL)

ATTACHMENT B:
Proposed 1997-98 JIFT Program

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1997 to March 31, 1998 Program**

A. 1997-98 Workshops

US to Japan:

- I 44** *Theoretical study for helical plasmas*
Organizers: M. Okamoto (NIFS) and A. Boozer (Columbia)
Toki; one week; 5 US delegates (prior to the Toki Conference)
Key Persons: T. Sato, M. Okamoto, A. Boozer
- I 45** *Turbulence and transport in toroidal plasmas*
Organizers: M. Wakatani (Kyoto) and G. Rewoldt (PPPL)
Mito; one week; 3 US delegates (January 1998)
Key Persons: T. Sato, M. Wakatani, G. Rewoldt
- I 46** *JIFT Steering Committee Meeting*
Organizers: T. Sato (NIFS) and R. Hazeltine (IFS)
Toki; one week; 4 US delegates (during the Toki Conference)
Key Persons: T. Sato, R. Hazeltine

Japan to US:

- J 48** *Dynamo phenomena and self-organization*
Organizers: W. Tang (PPPL) and S. Kida (NIFS)
Princeton; one week; 6 Japanese delegates (October 1997)
Key Persons: T. Sato, S. Kida, W. Tang
- J 49** *Nonlinear plasma simulation and visualization*
Organizers: R. Horiuchi (NIFS) and V. Decyk (UCLA)
UCLA; one week; 6 Japanese delegates (September 1997)
Key Persons: T. Sato, R. Horiuchi, V. Decyk

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1997 to March 31, 1998 Program**

B. 1997-98 Exchange Visits

From Japan to US:

JL 50 *Collisionless driven reconnection in fusion plasmas*
Ritoku Horiuchi (NIFS), Visiting Professor
IFS; 13 weeks; one person; paid by IFS—Key Persons: R. Horiuchi, J. Van Dam

JL 51 *Simulation study of plasma structure formation*
Seiji Ishiguro (Tohoku U.), Visiting Scientist
UCLA/IFS; 14 weeks; one person; paid by Japan
Key Persons: S. Ishiguro, J. Dawson

JL 52 *Simulation study of merging of compact torus plasmas*
Tomohiko Watanabe (NIFS), Visiting Scientist
PPPL/IFS; 13 weeks; one person; paid by Japan
Key Persons: T. Watanabe, W. Lee, J. Van Dam

JL 53 *Simulation study of neoclassical transport in the edge plasma*
Sadayoshi Murakami (NIFS), Visiting Scientist
PPPL/IFS; 13 weeks; one person; paid by Japan (pending)
Key Persons: S. Murakami, W. Tang

JL 54 *Numerical visualization of phenomena in MHD simulations*
Hideaki Miura (NIFS), Visiting Scientist
Rutgers Univ./IFS; 13 weeks; one person; paid by Japan (pending)
Key Persons: H. Miura, N. Zabusky

From US to Japan:

IL 51 *Nonlinear flows: stability and organization*
Swadesh Mahajan (IFS), Visiting Professor
NIFS; 14 weeks; one person; paid by Japan—Key Persons: T. Sato, S. Mahajan

IL 52 *Turbulence and transport in toroidal plasmas*
Greg Rewoldt (PPPL), Visiting Scientist
NIFS/JAERI; 5 weeks; one person; paid by US—Key Persons: T. Sato, G. Rewoldt

**US-Japan Joint Institute for Fusion Theory
Proposals for April 1, 1997 to March 31, 1998 Program**

C. 1997-98 Joint Computational Projects

- JC 1** *MHD Stability in Advanced Tokamaks*
S. Tokuda, Y. Ishii, M. Ozeki, and M. Azumi (JAERI); J. Manickam (PPPL); A. Aydemir (IFS); 1 week; 1 person to US; modified from 1996-97.
- JC 2** *Gyrokinetic Transport Simulation*
J. Dawson, V. Decyk, and R. Sydora (UCLA); W. Lee (PPPL); T. Sato and T. Kamimura (NIFS); H. Naitou (Yamaguchi U.); 2 weeks; 1 person to Japan; continued from 1996-97.
- JC 4** *Plasma Rotation, Vortices, and Anomalous Transport*
W. Horton, A. Aydemir, R. Hazeltine, and K. Shaing (IFS); T. Sato, M. Okamoto, and N. Nakajima (NIFS); M. Wakatani (Kyoto U.); 3 weeks; 1 person to Japan; continued from 1996-97.
- JC 6** *Current Drive in Toroidal Systems*
M. Ono and W. Tang (PPPL); V. Chan (GA); T. Sato, M. Okamoto, and N. Nakajima (NIFS); 3 months; 1 person to Japan; continued from 1996-97.
- JC 8** *3-D Codes and Island Formation*
J. Johnson and D. Monticello (PPPL); P. Garabedian (NYU); C. Hegna (Wisc.); T. Hayashi (NIFS); M. Wakatani and Y. Nakamura (Kyoto U.); 2 weeks; 1 person to US; continued from 1996-97.
- JC 9** *New Simulation Algorithms for Massively Parallel Processing*
J. Dawson and V. Decyk (UCLA); W. Tang (PPPL); K. Watanabe, R. Horiuchi, and T. Sato (NIFS); S. Ishiguro (Tohoku U.); K. Kusano (Hiroshima U.); 2 weeks; 1 person to US; continued from 1996-97.
- JC 14** *Toroidal Simulation and Plasma Transport Modeling*
T. Tajima and W. Horton (IFS); Y. Kishimoto and S. Tokuda (JAERI); 1 week; 1 person to US; continued from 1996-97.
- 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); 1 week; 1 person to US; continued from 1996-97.
- JC 21** *Turbulent Transport Applications to Tokamaks and Helical Systems*
B. Carreras (ORNL); W. Horton (IFS); M. Wakatani and Y. Nakamura (Kyoto); H. Sugama (NIFS); 1 week; 1 person to US; continued from 1996-97.
- JC 22** *Tokamak Simulation on Massively Parallel Computers*
B. Carreras, D. Spong, J.N. Leboeuf and V. Lynch (ORNL); J. Dawson and V. Decyk (UCLA); S. Tokuda, G. Kurita and Y. Ishii (JAERI); 1 week; 1 person to US; continued from 1996-97