GA–A24952

DIII–D YEAR 2005 EXPERIMENT PLAN

by
DIII–D RESEARCH TEAM

FEBRUARY 2005

DISCLAIMER

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GENERAL ATOMICS PROJECT 30200
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FOREWORD

This document presents the planned experimental activities for the DIII–D National Tokamak Facility for the fiscal year 2005. This plan is part of a five-year cooperative agreement between General Atomics and the Department of Energy. The Experiment Plan advances on the objectives described in the DIII–D Tokamak Long Range Plan (GA–A23607). The Experiment Plan is developed yearly by the DIII–D Research Council and approved by DOE. DIII–D research progress is reviewed quarterly against this plan. The 2005 plan calls for 14 weeks of tokamak operations. This plan is based on a $55.4M DIII–D program funding for FY05, with $43.5M to GA. Other major collaborators include PPPL ($4.3M) LLNL ($3.1M), and ORNL ($2.5M). Funding of university collaborators are provided by DOE grants and GA subcontracts. In the event of other significant budgetary, technical, or programmatic changes this plan will be revised as necessary.

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1. SYNOPSIS OF THE 2005 DIII–D RESEARCH PLAN

The research campaign for 2005 has been organized into six research thrusts and the ongoing four Topical Science Areas. Approximately 55% of the experimental time has been allocated to the research thrusts, since these activities are aimed directly at critical objectives for the DIII-D Program and for the tokamak research program generally. Additional experimental time in the topical areas maintains the breadth and scientific depth of the DIII-D Program. Below we convey the essential content of the various research thrust and topical science experiments and their goals and anticipated and hoped for results. The research described has been allocated to 53 run days out of a possible 70 run days, with 17 days of contingency and director's reserve. The planning for 2005 is for a 14 run week campaign. Additional detailed information can be found on the web, and related links: http://fusion.gat.com/exp/2005/.

The experiment plan was put together with input and prioritization by the year 2005 Research Council. Based on the "DIII-D Five-Year Program Plan 2003–2008," January 2003, GA-A23927, the Research Council develops a research plan which is annually updated. Some highlights of the DIII-D research for the 2004 experiment campaign are posted on the web at (http://web.gat.com/diii-d/highlights/). DIII-D presentations to the 2004 31st European Conference on Plasma Physics and Controlled Fusion (EPS) are posted at (http://d3dnff.gat.com/publications/search/all.asp?meeting=160).

The year 2005 research thrusts are the same as for 2004 with the addition of the High Internal Inductance thrust. DIII-D experimental campaigns are planned to provide strong support for the physics needs of ITER as identified by the International Tokamak Physics Activity groups. Table 1 shows the support that DIII-D has provided for the ITPA proposed experiments.

The 2005 campaign is a continuation of the 2004 campaign. In December 2003, a call for experimental research proposals towards the DIII-D objectives was issued and over 450 proposals were presented at a community-wide Research Opportunities Forum (ROF) on December 9–11, 2003, which had significant remote participation. DIII-D was an active participant in the International Tokamak Physics Activity (ITPA) process conducted in 2002–2004, through which a number of joint international experiments were identified as high priority for the development of a database for burning plasma research. As a result of both these initiatives, we received 41 proposals from foreign laboratories. There were video conference, or at least telephone presentations, of the majority of these

Table I
DIII–D Conducted a Number of Experiments in 2004 in Support of the International Tokamak Physics Activity (ITPA)

ITPA Area	Title	DIII–D Experiment
CDB–3	Global H-mode/pedestal database	Pedestal similarity DIII–D/JET ρ_*
TP–1	Transport properties of hybrid scenarios	DIII–D hybrid scenarios
TP–2	Transport properties of steady-state scenarios	High beta, steady-state conditions on DIII–D
TP–5	Improved understanding of QDB/QH–mode	QH-mode plasma studies in DIII–D
TP–7	Real time profile control	Real time NTM stabilization by ECCD
PEP-2	JET/DIII–D pedestal similarity studies	Pedestal similarity DIII–D/JET ρ_*
PEP-8	Parameter studies in quiescent H–mode	Advances in understanding quiescent H–mode in DIII–D
DSOL-3	Scaling of radial transport	Edge impurity transport dynamics during the ELM cycle in DIII–D
MDC–1	Gas jet penetration for disruption mitigation	Imaging noble gas jet penetration during disruption mitigation
MDC–3	Joint experiments on NTMs	Cross device 2/1 NTM physics
MDC–5	Sawtooth control methods	Oval and bean sawtooth comparisons
MDC–6	Error field sideband effects for ITER	Size scaling for error field induced locked modes
SSEP–2	Preparation of ITER hybrid scenario	DIII–D hybrid scenarios

from outside the U.S. There was also Access Grid remote participation for proposals from Princeton Plasma Physics Laboratory (PPPL), Massachusetts Institute of Technology (MIT), and Oak Ridge National Laboratory (ORNL). All of the received proposals can be viewed at http://d3dnff.gat.com/opportunity/2004/review.asp. The 2004 campaign was originally planned for 21 weeks. A funding rescission resulted in an 18-week campaign. The extra planned 3 weeks formed the initial basis for the 14 week 2005 campaign. The remaining experiments for 2005 were chosen from the December 2003 ROF submissions and from additional proposals that were developed based upon the results of the 2004 campaign. This selection process was performed at the Thrust and Topical Science Area leader level with approval by the Director.

DIII–D continues to have a large research backlog as shown in Table II. A very good measure of this backlog is obtained from the run day requests from the research groups based upon the 2004 ROF. The total high quality experiments requested by all of the thrusts and TSAs was 188 days. These 188 days are made up of experiments carefully considered, culled, combined, and optimized by run time from the total ROF submission list. All are high priority experiments. A 50-week run plan would be needed to reasonably expect to execute these 188 days of high priority experiments. The combined 2004/2005 campaign consists of 32 run weeks allowing only a fraction of these experiments to be addressed.

Table II
Accounting of Run Day Requests for the 2004/2005 Campaign

Area	Days Requested	Days Allocated		Proposals Received
		2004	2005	
Stability TSA	15	8	6	54
Boundary TSA	16.5	8	8	57
Confinement TSA	18	10	7	71
H&CD TSA	10	4	3	29
T1 edge pedestal	17	7	6	57
T4 RWM	21	8	5	60
T6 Hi ℓ_i	11	0	4	13
T8 AT scenarios	26.5	11	8	59
T9 QH	10.5	3	2	30
T10 Hybrid	12	6	4	22
Totals	187.5	65	53	452

The 14 run week 2005 experiment plan, summarized in Table III, consists of efforts in six thrust areas and four topical areas.

- Thrust #1 edge pedestal (6-days)

  Significant effort will be devoted this year to exploring the feasibility of mitigating and suppressing Type-I ELMs using edge stochastic magnetic field perturbations. Experiments and modeling in 2005 will also carry on the 3–5 year plan established in 2003 to understand the physics mechanisms setting the width/height of the density and temperature pedestals in ELMing H-mode. Other experiments this year will focus on understanding the physics of Type-I ELM onset. Exploration of the VH-mode pedestal evolution and techniques for steady operation of VH-mode will be performed.

Table III
Run Time Allocations for the 2005 Experiment Campaign

#	Thrust Name	Description	Plan (Days)	Area Leaders
1	Edge pedestal	Determine the pedestal height and ELM size dependence on plasma parameters and atomic physics	6	**M. Fenstermacher** P. Snyder
4	RWM	Advance the physics understanding of resistive wall mode stabilization and validate effectiveness of internal coils	5	**M. Okabayashi** H.Reimerdes, E. Strait
6	High ℓ_i	Determine the feasibility of the high internal inductance approach for steady state operation.	4	**T. Luce** J. Ferron
8	AT scenario	Continue high beta full noninductive scenario development with new tools	8	**C. Greenfield** A. Garofalo
9	QH–mode	Develop an understanding of the QH–mode for ELM-free scenario projection to burning plasmas	2	**P. West** D. Doyle
10	Hybrid scenarios	Integrated, long-pulse scenario development for burning plasmas	4	**M. Wade** J. Jayakumar
		Thrust totals	35	
		Stability topical area	6	**E. Strait**
		Confinement topical area	7	**K. Burrell**
		Boundary topical area	8	**S. Allen**
		Heating and current drive topical area	3	**R. Prater**
		Total allocated days	53	
		Director's reserve	2	
		Contingency	15	
		Available days	70	

- Thrust #4 RWM (5-days)

The ultimate goal of Thrust 4 is the development of experimental methods to stabilize the resistive wall mode (RWM), which is a prerequisite for operation above the no-wall beta limit. One possibility is the stabilization of the RWM by sufficient toroidal plasma rotation, which has been demonstrated in DIII-D. In 2005 we will investigate the underlying dissipative process, whose understanding is essential in order to reliably predict the required plasma rotation in ITER. In accordance with these objectives we plan to develop a target plasma with rotation below the critical value. We also try to improve our understanding of rotational stabilization of the RWM.

- Thrust #6 High ℓ_i (4-days)

  Long-term goal: Determine the feasibility of the high internal inductance approach for steady state operation. This will involve demonstration and understanding of the physics of sawtooth suppression, development of the ABB rf systems for routine operations, and assessment of tools for control of the edge current density. None of these items is an absolute requirement for success of the thrust, but all are known to benefit the fusion performance of the scenario. This scenario is the primary candidate for steady state operation without the need for wall stabilization of low *n* kink modes.

- Thrust #8 advanced scenario development (8-days)

  The goal of the Advanced Scenario Development Thrust is fulfillment of the primary goal of the DIII–D program. To serve this end, Thrust 8 is carried out as a set of closely coupled experimental and modeling efforts. The goal of this multi-year effort is to yield a comprehensive scientific understanding that can transfer to future devices (ITER, FIRE, KSTAR,…). Performance demonstrations in DIII–D serve to illustrate our increased understanding as well as hardware developments in support of the *AT* research. Efforts at optimization of NCS plasmas with $f_{NI} \approx 100\%$ and $\beta_N \leq 3.5$ will continue. One goal is sustained, $\beta_N \geq 4$, but with $f_{NI} \leq 100\%$. Alternative approaches to the AT scenario such as "current hole" and "flat *q* profile" will be evaluated.

- Thrust #9 QH-mode (2-days)

  The quiescent H-mode provides a solution to a major issue for fusion reactors, namely the pulsed divertor heat load due to ELMs. ELM impulsive heat loading is a critical issue for both ITER and FIRE. Maintenance of a high pedestal pressure is critical for ITER and FIRE. The fusion community is very interested in extending ELM-free H-mode regimes to show promise for use in future burning plasmas. The key issues for QH mode research during 2005 are: 1) understanding the ELM suppression in QH mode, 2) extend the working density in QH-mode and the achievable plasma beta in QDB mode to higher values, 3) work with JT-60U on experiments to vary rotation and edge radial electric field and 4) understand the edge particle transport in the absence of ELMs. The key issue for QDB during 2005 is the use of profile control tools to investigate and optimize the β limit.

- Thrust #10 hybrid scenarios (4-days)

  The long-term goal of Thrust 10 is to develop and assess the viability of robust, stationary plasma scenarios that offer significant normalized performance advantage over conventional, ELMing H-mode discharges. Demonstration of such a scenario would allow next-step burning devices to achieve their desired fusion performance while operating well away from the engineering limits of the device. The near-term goal of Thrust 10 is to evaluate the operating space and assess the viability of stationary, high performance discharges developed on DIII-D in recent years. An important issue is to understand how the magnetic flux is transported by the low level MHD and why the energy confinement is somewhat better than in conventional ELMy H-modes.

- **Topical science areas**

  Stability Topical Area (6 days). In addition to advancing basic MHD physics and stability control, this area will continue to take responsibility for the development of general plasma control. NTM studies will also be part of the area. Error field experiments will be coordinated with Thrust 4 (with a focus upon high toroidal rotation). In 2005 stability experiments will be performed in the areas of neoclassical tearing mode physics, disruption mitigation, sawtooth physics, error fields, fast ion physics, and advanced plasma control.

  Confinement Topical Area (7 days). The overarching goal for this area is to develop a predictive understanding of transport. A large number of well-formulated experimental proposals were submitted to the five subgroups. The limited number of run days available this year required that these be severely reduced and combined into the nominal ten days allocated.

  Boundary Topical Area (8 days). Many good experiments are proposed in four subgroups. The larger effort should be in the Impurities and PSI group that is more focused on the longer-range goal of mass transport.

  Heating and Current Drive Topical Area (3 days). The objectives of the Heating and Current Drive Topical Science Area are (1) to develop and validate predictive models of heating and current drive for the systems available on DIII-D: electron cyclotron, fast wave, and neutral beam power; (2) to improve the quantitative understanding of the bootstrap current; and (3) to improve our understanding of the long-term evolution and stability of discharges with the current supported fully noninductively.

Each of the efforts has a responsible leader and deputy leaders. The plans and goals for the various thrusts and topical science areas are detailed below.

1.1. RESEARCH THRUSTS FOR 2005

1.1.1. RESEARCH THRUST 1, H–MODE PEDESTAL AND ELMS (Leader: M.E. Fenstermacher, Deputy: P.B. Snyder)

1.1.1.1. Focus of Thrust 1. Predict and control the pedestal width/height and ELM particle and energy losses.

Importance to DIII-D, Fusion Science and Next Step Experiments:

- The Snowmass and ITER design processes have identified the pedestal height, and the size of the associated Type-I ELMs, as some of the largest uncertainties in the design of a burning plasma tokamak. Predictions of the confinement in a BPX are critically dependent on the predicted pressure pedestal height while design of the plasma facing components is very dependent on the predicted ELM characteristics. The uncertainty in scaling these parameters from present devices to BPX conditions is very large due to lack of understanding of the physics mechanisms that control the density pedestal, temperature pedestal and ELM trigger and duration.

- Scaling of the pedestal is also important for evaluating the performance of different AT reactor scenarios that are currently under study at DIII-D. Many of these scenarios rely on an H-mode-like edge pedestal to allow high core stored energy and some type of transient phenomena at the edge to control impurity influx to the core plasma.

- Understanding the physics that controls the pedestal profiles and ELMs requires coupling of transport physics, stability physics and a host of boundary physics processes (neutral penetration and ionization, impurity sources and radiation, and parallel vs. perpendicular transport on open field lines). Understanding how these coupled processes interact will advance fusion and plasma science.

The design of the next step tokamak, ITER, is nearing completion. Confinement projections are based on our knowledge of pedestal scaling. If modifications to the operating scenario for ITER are required because of increased understanding of pedestal physics, then this must be known as soon as possible. In particular, the present ITER design is widely thought to be incompatible with large Type-I ELMs. The physics and scaling of smaller Type-I ELM regimes with good core confinement must be understood soon to have confidence that the ITER divertor and first wall design are adequate.

Recent results have also suggested that application of resonant edge magnetic perturbations may be an ELM suppression technique that could be extrapolated to ITER. Understanding the physics of the suppression is critical for guiding an optimum design of perturbation coils for future devices.

Studies of pedestal physics require a tight integration of transport, MHD stability and boundary physics expertise. Recent advances in understanding of the pedestal profiles indicates that the temperature pedestal may be set by plasma energy transport while the density pedestal may be dominated by neutral sources from the boundary region. Predicting the scaling of ELM onset appears to involve coupled peeling/ballooning modes that are driven in part by the pedestal pressure gradient and edge current gradients from pressure driven bootstrap current. Expertise from at least three of the DIII-D topical science areas is critical to understanding pedestal physics.

Proposed Work

- Significant effort (33% of Thrust 1 experimental time) will be devoted in 2005 to understanding the physics of Type-I ELM suppression using edge stochastic magnetic field perturbations. The primary tool for this work is the I-coil. Tests of n=3 and other perturbation configurations of the I- and C-coils on ELM behavior will be done and compared with available 3D field models. This ELM suppression technique will be applied to conventional H-mode plasmas, higher performance Hybrid plasmas, and high β_N AT-like plasmas. Higher current capability in the I-coil will allow investigation of the effect of induced island chains in the pedestal vs. a completely ergodic boundary.

- Experiments (17% of Thrust 1 run time) and modeling in 2005 will also carry on the 3–5 year plan established in 2003 to understand the physics mechanisms setting the width/height of the density and temperature pedestals in ELMing H-mode. This will be done primarily by focused dimensionless similarity experiments between DIII-D, NSTX, and MAST. This set of experiments will examine the aspect ratio dependence of pedestal parameters.

- Other experiments this year (17% of the run time) will focus on understanding pedestal stability physics and Type-I ELM onset. A comprehensive model that includes measurement of the current in the pedestal region, theoretical predictions of the edge bootstrap current contribution to the total edge current, and the implications of the edge current on the coupled peeling/ballooning linear stability trigger for Type-I ELMs has been formulated. The experiment will examine the effect of changes in plasma shape (squareness) on pedestal height/width and ELM instability using this formulation. Preliminary results show that significant improvements in pedestal performance may be achieved for future devices by optimizing the shape.

- Exploration of the VH-mode pedestal evolution and techniques for steady operation of VH-mode (33% of Thrust 1 run time) will be done in 2005. VH-mode is a promising ELM-free plasma with very high pedestal pressure and core confinement. Studies this year will focus on the mechanisms that cause the evolution of the pedestal and techniques to prevent the X-event that typically terminates VH-mode.

Expected Highlights

- A consistent model of ELM stability thresholds, including the effect of shaping parameter "squareness," based on linear coupled peeling/ballooning modes incorporating the measured edge current density.
- Physics understanding of the effect of edge stochastic magnetic field perturbations on the ELM instability threshold for a range of plasma shapes, edge safety factors and other configuration parameters.
- Detailed understanding of the VH-mode pedestal evolution and the X-event in terms of edge current and fuelling profile evolution and edge stability calculations.

Where We Want to be Next Year

We want to know if the density pedestal is set by neutral penetration physics and if the temperature pedestal is set by dimensionless scaling of plasma energy transport. We also want to understand the physics of ELM suppression by the application of edge magnetic field perturbations to predict whether it has broad enough applicability to advance to a major thrust of the DIII-D program. We want to understand the physics of the pedestal evolution in VH-mode and determine experimental techniques to extend VH-mode duration. Finally we want to have a verified model of ELM instability onset including the effect of pressure driven edge bootstrap currents and shape changes.

1.1.2. RESEARCH THRUST 4 — ADVANCE THE PHYSICS UNDERSTANDING OF RWM STABILITY, INCLUDING THE DEPENDENCE ON PLASMA ROTATION, WALL/PLASMA DISTANCE, AND ACTIVE FEEDBACK STABILIZATION (Leader: M. Okabayashi, Deputies: H. Reimerdes, T. Strait)

The ultimate goal of Thrust 4 is the development of experimental methods to stabilize the resistive wall mode (RWM), which is a prerequisite for operation above the no-wall beta limit. One possibility is the stabilization of the RWM by sufficient toroidal plasma rotation, which has been demonstrated in DIII-D. In 2005 we will investigate the underlying dissipative process, whose understanding is essential in order to reliably predict the required plasma rotation in ITER. Since a burning plasma experiment will most likely not have sufficient angular momentum input, the main focus in 2005 will be the direct feedback control of the RWM in discharges where the plasma rotation is not sufficient to stabilize the RWM. We, in particular, want to assess the advantages of internal control coils (I-coils) over external control coils (C-coils) in order to provide input into the ITER design. This requires the experimental verification of models, which predict that the current ITER design with external coils only is not suitable for operation significantly above the no-wall beta limit.

In accordance with these objectives we plan to develop a target plasma with rotation below the critical value:

1. The most promising and, hence, first approach is non-resonant magnetic braking using the internal coils. We will refine the target using rf heating to substitute NBI heating and decrease the momentum input and confinement.

2. At the same time we closely collaborate with Thrust 8 in order to assess the potential of alternative q-profiles as low-rotation targets.

3. The feedback system will be improved by using recently installed off-midplane poloidal field sensors.

4. The optimization of n=1 error field correction using the I-coils increases the available current for feedback.

5. The low-rotation target together with the feedback and error field correction improvements will be then used to compare the feedback performance of internal and external coils and verify RWM feedback modeling predictions.

We also try to improve our understanding of rotational stabilization of the RWM:

1. The main tool will be active measurements using resonant perturbation generated by the control coils. A measurement of the spectrum at high beta is necessary to validate the single mode approach with is the basis of the active measurement. We will then measure the RWM damping rate and rotation frequency for different plasma rotation frequencies and as a function of the radial electric field (counter-NBI) in order to test dissipation models.

2. We collaborate with JET and NSTX in order to generalize RWM characteristics and analyze aspect ratio dependence of rotational stabilization.

1.1.3. THRUST 6 — HIGH INTERNAL INDUCTANCE SCENARIO DEVELOPMENT (Leader: T.C. Luce; Deputy: J.R. Ferron)

1.1.3.1. Long-Term Goal. Development of a high fusion performance scenario that does not require wall stabilization or plasma rotation.

1.1.3.2. Background and Motivation. It has been known for more than 10 years that two distinct classes of q profiles provide both good MHD stability and good transport properties. The first class has zero or slightly negative magnetic shear at elevated $q_{\rm min}$. These profiles are stable to ballooning modes from the axis out to the radius where the shear becomes positive and, with sufficiently high q_{95} and pedestal currents, are stable again to ballooning modes in the edge region. By elevating $q_{\rm min}$, the low-order tearing modes are avoided, while increasing the bootstrap current. These same arguments describe one means by which the transport is reduced, since the modes predicted to cause transport are sensitive to the same dependences on magnetic geometry, but are not completely stabilized as are the ballooning modes. The pressure limit for these profiles is set by the n=1 external kink, either in the ideal form or as the resistive wall mode. Study of this scenario has been extensive in DIII-D and is on-going in Thrust 8. The other class of q profile that has demonstrated promising results in transient experiments is one with the maximum possible magnetic shear across the entire plasma. These profiles have a very high ballooning mode limit, again leading to low transport by the same argument as above. The pressure limit is set in these profiles by internal kinks. This means the relative location of the wall and the effects of plasma rotation are not significant. For future burning plasma experiments, the close-fitting conducting wall, internal coils, or high plasma rotation needed to stabilize the external kink may be difficult to supply. To maximize the magnetic shear, or equivalently the internal inductance $\ell_{\rm i}$, it would be advantageous to stabilize the m=1/n=1 internal kink as manifested in the sawtooth instability. With such stabilization, the central current density could increase further, leading to higher shear. The other limitation on internal inductance in H-mode plasmas at high β is the large edge current density due to the bootstrap current in the high pressure gradient in the pedestal. Any means to control the pedestal current without limiting the pressure would be an advantage. The pressure limit in transient discharges follows the empirical scaling of $4\ell_{\rm i}$. Calculations indicate a limit of $\ell_{\rm i}$ = 1.2 if $q(0)$ is limited to be 1, while $\ell_{\rm i}$ = 1.6 appears possible if $q(0)$ can be reduced to 0.55. In the FY04 campaign, transient discharges with $\ell_{\rm i}$ up to 1.2 and $\beta_{\rm N}$ up to 4.5 were demonstrated, validating the scenario design using $4\ell_{\rm i}$ as the pressure limit.

1.1.3.3. Near-Term Strategy and Experimental Plan. The goals for this year's campaign are:

1. To investigate the stability limits on the energy confinement and current redistribution time scales with $q(0) = 1$.

2. To test various means to control the m=1/n=1 instability in concert with experiments in the topical science areas.

3. If any of the tests in Goal 2 appear promising, try to demonstrate high β on the energy confinement time scale with $q(0)$ significantly less than 1.

The plan for this year envisions working on goals 1 and 2 in parallel. Only 3 days of experiments have been allocated to Thrust 6 in FY05. For Goal 1, a run day will be planned on the basis of last year's successful experiment. For Goal 2, the first step is to execute the planned heating and current drive TSA experiment on the interaction of fast waves with fast ions at high harmonics. Recent theoretical predictions indicate significant acceleration of NB ions should be possible under conditions favorable to the near-term Thrust 6 scenario. If that experiment demonstrates significant sawtooth stabilization, then a Thrust 6 day will be used to try to explore $q(0)$ significantly below 1. If that experiment is unsuccessful or if insurmountable problems arise with the fast wave system, the backup plan is to execute the stability TSA experiment on the stabilization of the sawtooth by ECCD. If that is successful, a Thrust 6 scenario will be designed to apply the ECCD. If that experiment is unsuccessful, then an L-mode demonstration of sustained $q(0) < 1$ will be done under Thrust 6 using the resonant absorption of the 60 MHz fast wave system. Based on the results of goals 1 and 2, then the third Thrust 6 run day will hopefully be devoted to goal 3, or if not, then to either of the first two goals that could make progress with an additional day.

1.1.4. THRUST 8 — ADVANCED TOKAMAK SCENARIO DEVELOPMENT (Leader: C.M. Greenfield; Deputy: A.M. Garofalo)

1.1.4.1. Description of Thrust 8. The goal of the Advanced Scenario Development Thrust is fulfillment of the primary goal of the DIII–D program: *The DIII–D Program's primary focus is the Advanced Tokamak (AT) Thrust that seeks to find the ultimate potential of the tokamak as a magnetic confinement system*. To serve this end, Thrust 8 is carried out as a set of closely coupled experimental and modeling efforts. The goal of this multi-year effort [*DIII–D National Fusion Program Five Year Plan 2003–2008*, Chapter 2] is to yield a comprehensive scientific understanding that can transfer to future devices (ITER, FIRE, KSTAR,...). Occasional performance demonstrations in DIII–D serve to demonstrate our increased understanding as well as hardware developments in support of the *AT* research.

The plan for Thrust 8 in 2005 continues to serve this long-term goal. During 2003 and 2004, we focused on production of AT discharges with noninductive current fraction $f_{NI} \approx 100\%$. Such conditions have been obtained for several hundred milliseconds at $\beta_N = 3.6$, and nearly stationary discharges with $f_{NI} \approx 90\%$ and $\beta_N = 3.5$ have been sustained for 2 seconds, limited only by hardware considerations. Our long term plan envisions scenarios operating at significantly higher β_N, motivated largely by the need for large bootstrap current fractions to minimize the external current drive requirements. Over half of the time allocated to Thrust 8 in the 2005 DIII–D program will be dedicated to demonstrating these higher levels of β_N in AT-like plasmas with the steady-state requirement relaxed.

At the same time, we will continue working to improve our ability to modify, and ultimately control, the current profile. Activities in this area will include fast wave (FW) coupling studies, needed both to benchmark computer models and to qualify the FW systems for use in AT experiments. Also included will be an experiment to continue development of an ability to control the current profile in real time using the plasma control system.

Finally, we will take advantage of both new and previous results as well as the increased electron cyclotron current drive (ECCD) and FW power anticipated to be available to increase the duration and β_N of plasmas with $f_{NI} \approx 100\%$.

1.1.4.2. 8 Day Experimental Program in 2005. The plan below adds up to 7.5 days. Due to the developmental nature of most of these experiments, the remaining 1/2 day will be allocated later to complete one of the following experimental efforts.

Development of discharges with $\beta_N \approx 4$ for 2 seconds (4 days: 2 in the "flat *q*" regime and 2 with a strongly shaped AT discharge)

The long-term plans described in the 5-year plan include operation at β_N up to levels in excess of 5. During our AT experiments, however, sustained operation has not been demonstrated at levels above $\beta_N \approx 3.5$. Discharges with a high triangularity double-null shape and/or broader pressure profiles (using gas puffing) have demonstrated $\beta_N \leq 4.2$, but only transiently. We will dedicate four days to demonstrate $\beta_N \approx 4$, sustained for about a current reconnection time, or 2 seconds. These studies will follow each of two approaches:

The first approach is the so-called "flat *q*" regime. This regime has already demonstrated access to β_N of nearly 4, and MHD stability calculations indicate potentially very high ideal wall beta limits $\beta_N \approx 12\ell_i$. The limitation to date has been the resistive wall mode (RWM). Thrust 4 has also taken an interest in this regime as a target for RWM stabilization efforts with $q_{min} > 2$. Thrust 8 will build on these results and work toward extending this regime to $\beta_N \approx 4$ sustained for 2 seconds.

In the second approach, we will revisit a regime studied several years ago. In those high triangularity double-null plasmas, $\beta_N \approx 3.8$ was achieved and sustained, but we were unable to increase β_N from this level due to RWM activity. During the ensuing years, much progress has been made in control of the RWM through error field correction. Application of established RWM control techniques to this discharge is anticipated to allow a significant increase in the achievable sustained β.

Development of transient discharges with $\beta_N \approx 5$ (1 day)

Most of the effort within Thrust 8 has focused on a particular family of *q* profiles; with $q_{95} \approx 4.5 - 5.5$, q_{min} between 1.5 and 2.5 and $q_0 - q_{min} \approx 0 - 1$ (flat to weakly reversed). There has been some discussion of the possibility that a fundamentally different *q* profile might ease the path to higher β as envisioned in the 5-year plan. Most of the effort during 2005 to identify such a *q* profile will take the form of modeling. One day of experimental time has been allocated to test the modeling predictions by developing transient discharges with β_N significantly in excess of the levels so far achieved, with $\beta_N \approx 5$ being the target.

Fast wave coupling studies (1/2 day)

The DIII–D fast wave system has been restarted, motivated largely by simulations indicating that both fast wave electron heating (FWEH) and current drive (FWCD) may be very beneficial to the AT. After the system has been commissioned (within the Heating and Current Drive Topical Science Area), we will perform coupling studies by injecting fast waves into AT plasmas.

This will address two objectives: First, several different codes are applied to calculations of the effect of introducing FW to an AT plasma, but the results are often inconsistent. This experiment will provide data to validate these codes, allowing more accurate predictions for future experiments. Second, coupling studies are a prerequisite for routine use of FWEH and FWCD in future AT experiments.

Current Profile Control Tool Development (1 day)

Ultimately, we envision the current profile to be controlled in real time in steady-state AT plasmas. The actuators for this current drive, gyrotrons (ECCD) and fast wave sources (FWCD) have been under development in DIII–D for several years. Real-time current profile measurements have been available for the last year, and were used for feedback control of the current profile in L–mode discharges during 2004. It was found that the parameterization in rtEFIT (real-time EFIT) used in those experiments was inadequate to represent reversed shear, an essential feature of AT discharges. This work will continue in 2005, with improvements made to rtEFIT and increased rf power. We will complete the L–mode work begun last year, and extend this effort to the early phases of AT discharges with an H–mode startup.

Although we do not yet have enough power to make real-time current profile control practical during the high power phase of these discharges, attempts at feedback control during the early phase have yielded improved control of the target q profiles as well as increased reproducibility. We anticipate that the results of this experiment will be immediately useful in other Thrust 8 experiments.

A secondary goal of these experiments, if possible, will be to begin building a data set that can be used to develop a model based control algorithm for future current profile control. It is anticipated that these experiments will need to be continued when more ECCD power is available (expected in 2006).

Improving the Performance of 100% Noninductive Discharges (1 day)

In 2004, we achieved conditions of $f_{NI} \approx 100\%$, but maintained for only a few hundred milliseconds. During these experiments, we only had about 2.2 MW of ECCD power available. During 2005, we expect this to increase to the neighborhood of 3 MW, along with the availability of a small amount of fast wave power (to be qualified as described above). Theory based simulations based on the 2004 discharges indicate that with this additional power, we should be able to maintain $f_{NI} \approx 100\%$ for a longer period, with the target being 2 seconds (duration of the gyrotrons with the shortest pulse length).

1.1.5. THRUST 9 — QH–MODE UNDERSTANDING AND PROJECTION (Leader: W.P. West; Deputy: E.J. Doyle)

1.1.5.1. Goals of the QH–Mode Thrust. Develop an Understanding of the QH-Mode edge stability and the QDB high performance scenario so that ELM-free scenarios can be achieved in burning plasmas.

- Importance: the quiescent H-mode provides a solution to a major issue for fusion reactors: Pulsed divertor heat load due to ELMs
  - ELM impulsive heat loading is a critical issue for ITER.
  - Maintenance of a high pedestal pressure is critical for ITER.
  - The fusion community is very interested in extending ELM-free H-mode regimes to show promise for use in future burning plasmas.
- What must we accomplish to achieve our long term goal?
  - Understand ELM suppression.
  - Understand the scaling of QH pedestal parameters and QDB core performance to larger devices.
  - Extend the parameter ranges over which QH mode is observed.

1.1.5.2. Summary of Past Work on the QH/QDB-Modes. The quiescent H-mode provides a solution to a major issue for fusion reactors, pulsed divertor heat load due to ELMs. ELM impulsive heat loading is a critical issue for the ITER divertor, while maintenance of a high pedestal pressure is critical for ITER core confinement. QH-mode is the only mode of operation which maintains a high edge pedestal and H-mode level confinement without ELMs that has been observed on multiple tokamaks. The fusion community is very interested in QH-mode, witnessed by the fact that the other three major tokamaks in the world, ASDEX-Upgrade, JT-60U and JET, have initiated QH research efforts.

QDB is most advanced DIII-D regime with an ITB, achieving sustained, high performance, $\beta_N H_{89} \sim 7$, $\beta_N \sim 3$, $H_{89} \sim 2.5$. It reaches a performance level near that of the ELMing hybrid scenario without the debilitating effects of ELMs. In addition it is an excellent test-bed for development of active profile/transport control tools.

The key issues for QH and QDB research during 2005 are: 1) understanding the ELM suppression in QH-mode, 2) investigate the influence of plasma shape, both squareness and triangularity, on the core and edge stability and the EHO, and 3) work with JT-60U on the importance of edge rotation and the radial electric field, and on developing QH operation in co-injected discharges.

1.1.6. THRUST 10 — INTEGRATED (HYBRID), LONG-PULSE SCENARIO DEVELOPMENT FOR BURNING PLASMAS (Leader: M.R. Wade, Deputy: R.J. Jayakumar)

The long-term goal of Thrust 10 is to develop and assess the viability of robust, stationary plasma scenarios that offer significant normalized performance advantage over conventional, ELMing H-mode discharges. Demonstration of such a scenario would allow next-step burning devices to achieve their desired fusion performance while operating well away from the engineering limits of the device. Recent experiments in Thrust 10 have shown the operating space (in both density and q_{95}) to be quite extensive with the performance equal to or better than the ITER baseline scenario over this entire space. These experiments were conducted as an ITPA joint experiment with participation from several other laboratories.

The experimental plan Thrust 10 in 2005 has been developed with the long-term goal of providing the next generation fusion devices with a robust and reliable operating regime which offers the potential for a substantial increase in performance and/or pulse duration over the conventional, sawtoothing, ELMing H-mode regime. The operating scenario utilizes the recently discovered hybrid regime of stationary discharges with low consumption of inductive flux. Thrust 10 also aims to convince the worldwide community to adopt the hybrid scenario as the new benchmark for pulsed tokamak performance in ITER. In order to achieve this aim, it is also necessary to develop a detailed understanding of the tokamak physics underlying the development of this hybrid regime.

Having expanded the operating space in 2004, the Thrust 10 experimental plan for 2005 will focus on two areas: 1) the key physics issues for extrapolating performance to future devices; and 2) integration of the enhanced performance capabilities of the hybrid scenario with edge plasmas capable of handling the increased heat flux. The issues being addressed in the 2005 Thrust 10 experimental plans are the following:

- Continued expansion the DIII-D hybrid experiments to higher density /collisionality.
- Assessment of the ρ_* dependence of transport in the hybrid regime and comparison with similar studies on JET.
- Determination of the mechanisms responsible for the effect of the m=3/n=2 tearing mode amplitude on the current profile.
- Verifying that the performance enhancement with good confinement is obtained in the reactor conditions of $T_i \sim T_e$.

- Assessment of the ability to suppress of Type I ELMs in a hybrid scenario discharge through the use of n=3 perturbations via the I-coil.

- Assessment of the ability to reduce the divertor target heat flux in hybrid scenario operation using a radiative divertor or mantle.

Three run days will be devoted to ongoing and new requests from ITPA Steady-State and Transport Working Groups: 1 each on expansion of operating space, ρ_* dependence, and $T_i \sim T_e$ operation. One day will be spent is collaboration with other thrusts: 1/2 day with Thrust 1 on applying stochastic fields to a hybrid discharge to suppress ELMs and 1/2 day on radiative divertor development in the hybrid regime in collaboration with the Boundary Physics Topical Science Area.

1.2. PHYSICS TOPICAL AREAS

1.2.1. STABILITY (Leader: E.J. Strait)

1.2.1.1. Goals. The long-term objective of MHD stability research in DIII-D is to establish the scientific basis for understanding and predicting limits to macroscopic stability of toroidal plasmas. In addition to the more focused research carried out in the Research Thrusts, the role of the Stability Topical Science area is to provide a broad range of good MHD stability science, investigate instability control in regimes relevant to ITER and other burning plasmas, and explore stability physics in new regimes beyond the scope of the advanced tokamak program.

1.2.1.2. Plans for 2005. Within the combined 2004-2005 operating schedule, a total of 13 days have been allocated to the Stability Topical Science area. Of these, approximately 6.5 days were completed in FY2004. The present plan covers the remaining 6.5 days to be scheduled in FY2005. This time will be used for experiments in neoclassical tearing mode physics, disruption mitigation, sawtooth physics, error fields, fast ion physics, and advanced plasma control. The planned experiments are as follows. Each is planned for one day unless otherwise noted.

1. **ECCD Stabilization of the 2/ 1 Mode.** The goal of this experiment is to advance our techniques for stabilization of the m/n=2/1 neoclassical tearing mode by localized electron cyclotron current drive. The experiment will focus on pre-emptive injection of current drive to prevent the onset of the mode, and raising beta in the stabilized plasma. The plasma scenario chosen for the experiment will depend in part on the gyrotron power available. NTM stabilization is a key issue for ITER. This is a joint ITPA experiment with ASDEX-Upgrade, JET, and JT-60U.

2. **ECCD Stabilization of the 3/ 2 Mode**. The goal of this experiment is to advance our techniques for stabilization of the m/n=3/2 neoclassical tearing mode by localized electron cyclotron current drive. The experiment will include variation of the width of the current drive layer to test theoretical predictions regarding the ratio of the current drive to the threshold island size. Improvements to the control scheme will also be developed. NTM stabilization is a key issue for ITER. This is a joint ITPA experiment with ASDEX-Upgrade, JET, and JT-60U.

3. **Physics of Gas Jet Penetration and Jet Imaging**. This experiment will make use of a new fast camera and upgraded gas injection system to investigate the physics of high-pressure gas jet penetration into the plasma. Disruption mitigation by

noble gas injection is a key issue for ITER. This is a joint ITPA experiment with JET, C-Mod, and others.

4. **Fast Ion Physics**. This experiment will investigate the thresholds for excitation of core Alfvén modes and investigate the role of core localized vs. global Alfvén modes in fast ion loss. It takes advantage of new diagnostic capabilities to detect internal modes that may not be readily visible on external magnetic diagnostics. This is a joint ITPA experiment with JET and JT-60U.

5. **Effect of ECCD on Sawteeth and NTM Seeding.** The goal of this experiment, continued from 2003, is to investigate the effect of localized electron cyclotron current drive on sawteeth in H-mode plasmas, and to test whether neoclassical tearing modes can be avoided by generating small-amplitude sawteeth that do not drive large seed islands. This is a joint ITPA experiment with ASDEX-Upgrade, JET, and others.

6. **Advanced Plasma Control (0.5 day).** This experiment will test model-based multivariable control of the plasma shape and position, and demonstrate solutions to nonlinear operating limit problems. This is a key element to improving the accuracy and reliability of DIII-D shape control, and a first step toward simulating the ITER control system.

7. **Sawtooth Stabilization at Low $q(0)$.** This experiment is aimed at stabilizing sawteeth with $q(0)$ well below unity, using ICRF and electron cyclotron current drive. Favorable results would support the high-ℓ_i scenario with a centrally peaked current density profile.

8. **Anatomy of a Tearing Mode (Piggyback, 0 days).** The goal of this experiment is to validate our physics understanding of tearing modes, by making detailed measurements of the island structure using the new fast channels of the motional Stark effect diagnostic, and DIII-D's other profile and fluctuation diagnostics. It can be done in conjunction with neoclassical tearing mode experiments (1) and (2) above, as well as others.

1.2.2. CONFINEMENT AND TRANSPORT (Leader: K.H. Burrell)

The long-term goal of the confinement and transport topical science area is to develop a predictive understanding of transport. As part of this work, we investigate the fundamental transport physics issues that are raised by the DIII-D advanced tokamak research. In addition, as a topical science area, we have the responsibility to foster investigations of novel transport ideas and to develop new discoveries.

For the 2005 campaign, the focus areas for confinement and transport research are:

1. Short wavelength turbulence and electron temperature gradient modes
2. Internal transport barrier physics
3. Rotation studies
4. Reynold's stress and the L to H transition..

The confinement and transport topical science area is divided into four working groups for the 2005 campaign: 1) fundamental turbulence, 2) test of theory-based models, 3) core transport and 4) H-mode physics.

The scientific questions considered in the fundamental turbulence experiments are: 1) What is the role of short wavelength turbulence? 2) How do the short wavelength turbulence results compare with theoretical models?

The scientific questions confronted in testing theory based models include: 1) How does aspect ratio affect transport? 2) Do critical electron temperature gradients exist and how do they scale with plasma parameters?

In the core transport area, we consider these scientific questions: 1) How do turbulence and transport vary when plasma goes through $q_{\min}$ = integer values? 2) Does the neoclassically predicted poloidal rotation agree with experimental results?

Finally, the H-mode physics area will consider whether turbulence changes and turbulent transport changes across the L to H transition consistent with the Reynold's stress model.

1.2.3. BOUNDARY PHYSICS (Leader: S.L. Allen)

1.2.3.1. Boundary Working Groups' Experiments for 2005.

- The boundary TSA is organized into four working groups.
  - — ELMs in the SOL and divertor.
  - — Fueling and radiative divertor.
  - — SOL dynamics.
  - — Impurity and tritium mass transport.

1.2.3.2._Boundary TSA Experiments in 2005.

- We are uniquely positioned to address critical ITER issues.
- The group investigating (hybrid), long-pulse plasma development is interested in determining whether or not the radiating divertor concept for divertor heat flux

reduction can be successfully integrated into their scenarios — our experimental focus is on the divertor physics that will allow them to make an informed assessment of this possibility.

- Likewise, the DIII-D programmatic focus on “mass transport in the boundary’’ will be carried out in the Boundary Topical Science Area.
- National and international collaboration will significantly improve this effort and the IEA/ITPA joint experiments should be given high priority.

1.2.3.3. Research Topics for 2005.

ELMs 1 — Working Group 1. No additional experimental days are requested in 2005. Piggyback experiments will be done during Thrust 1 and other experimental days to take advantage of some enhanced diagnostic capability for ELMs. Substantial analysis of data obtained in 2004 will be done in preparation for future experiments in 2006. This data analysis will focus on the two goals from the 2004 run campaign:

- Understand the effect of B-dependent particle drifts on SOL/divertor ELM behavior as a function of plasma density at high q_{95}.
  - Key question: Dependence of ELM asymmetries on drifts because of pre-ELM divertor conditions or because drifts affect behavior during ELM pulse?
  - Analysis: Compare 2003 at q_{95} ~ 3.1 with 2004 data at q_{95} ~ 4.2 for connection length dependence. Time dependent simulations with BOUT/UEDGE and SOLPS5.
- Understand the effect of divertor SOL flux expansion on ELM heat and particle flux profiles.
  - Key question: Can target energy density during ELMs be reduced by increasing flux expansion; i.e. does ELM particle and energy flux follow pre-ELM SOL field lines?
  - Analysis: Examine Type-I ELM divertor target heat and particle flux profiles vs flux expansion at fixed q_{95} and δ from 2004 experiments. Time dependent simulations with BOUT/UEDGE and SOLPS5.

Fueling and Radiative Divertor 1 — Working Group 2.

- Radiative divertor in high performance ("hybrid") plasmas.
- Key questions:
  - How well are trace impurities entrained in the divertor of high performance ("hybrid"), lower density plasmas under active cryo-pumping?

  How well can a perturbing amount of an injected impurity be confined to the DIII-D divertor and radiate enough to significantly reduce power loading at the divertor targets?

  Is there a proper choice for the direction of the $B x \nabla B$ ion drift that will optimize the impurity entrainment to the divertor?

Fueling and Radiative Divertor 2.

- Heat flux (or detachment) control with the I-Coil — *possible piggyback to "hybrid" experiment*
- Key questions:
  - Is the I-coil a useful knob in controlling detachment?
  - Can the I-coil broaden the operating space of detachment?
  - Based on previous DN I-coil bifurcation of heat flux peak — is this detachment?

Fueling and Radiative Divertor 3.

- DIMES to test survivability of mirrors in a divertor- needed for ITER
- DIMES test of erosion during detachment by argon impurity seeding. Previous tests showed high erosion during detachment with neon. Information important for ITER.
- DIMES with upper single null to test erosion of proposed main-chamber wall materials for ITER

SOL Dynamics 1 — Working Group 3.

- Are ELMs or "Blobs" more important for SOL particle and heat transport?
- Complete measurement of poloidal asymmetry of SOL turbulence.

Tritium and Impurity Mass Transport — Working Group 4

- Focus on carbon re the ITER tritium issue:
  - What is the source of carbon which ends up in co-deposits? Where does the C come from? What mechanism?
  - What transports C to the inner divertor? Nature of the large-scale, "anomalous" parallel SOL transport?
  - What controls deposition pattern of C? Nature of the local transport within inner divertor?
  - How to maximize recovery of the tritium? Oxygen baking for T-recovery being considered. Will do a C^{13} experiment again this year — in H-mode. Following analysis of removed tiles by Wampler, Sandia, and by Whyte, Madison, tiles will be studied in Toronto O-bake facility.

1.2.4. HEATING AND CURRENT DRIVE PHYSICS (Leader: R. Prater)

The objectives of the Heating and Current Drive Topical Science Area are: (1) to develop and validate predictive models of heating and current drive for the systems available on DIII-D: electron cyclotron, fast wave, and neutral beam power; (2) to improve the quantitative understanding of the bootstrap current; and (3) to improve our understanding of the long-term evolution and stability of discharges with the current supported fully noninductively.

In pursuance of these goals and in view of the allocation of experiment time, the priority of experiments in this area is first to advance the experiments on discharges with very high bootstrap fraction, approaching or exceeding unity. This experiment does not require high rf power so it is suitable for performance early in the campaign. The goal is to make use of the progress made in the past year to generate discharges with $\beta_N > 3$ but at low plasma current and with the Ohmic heating transformer open circuited. The existence of true steady states will be sought.

A key need for validating the computational model for electron cyclotron current drive (ECCD) is to measure ECCD in the temperature range needed for a burning plasma experiment. Electron temperatures above 15 keV can be generated in DIII-D by applying ECH power near the plasma center at low density. Adding modest ECCD power will allow the current drive efficiency to be determined at the high electron temperature. The effects of modestly nonthermal electron distribution functions and the action of transport on the distribution function will be studied for comparison with the calculations of the Fokker-Planck code CQL3D.

Modeling of high performance Advanced Tokamak discharges in DIII-D has identified the value of adding Fast Wave Current Drive (FWCD) for controlling the central safety factor. The fast wave systems are being brought into improved operability. The key scientific issues regarding FWCD which will be addressed are the absorption waves by the electrons and the parasitic absorption by the fast beam ions. By using ECH to vary the electron temperature, the dependence on T_e of the wave absorption and the efficiency of FWCD can be compared to models. By using two of the FW systems with different frequency (60 and 117 MHz) the effect of different frequency and $n_{||}$ can also be determined. These measurements can be compared with code calculations using CURRAY or a full wave code as a means of validating the codes. Similarly, absorption of the waves by fast ions, which is an important problem for ITER due to the presence of energetic alpha particles, will be studied and compared with code calculations.

In 2004 experiments were completed on ECCD at high electron temperature, on discharges with high bootstrap fraction, and on FWCD at high electron temperature, totaling four days. In the 2005 campaign, experiments are planned for three days on the following topics:

1. Completing the study of FWCD with high electron temperature. At high T_e the damping on electrons should be stronger, so that the initial value of the parallel index of refraction should affect the driven current. This potentially can increase the current drive efficiency.

2. Effect of damping of fast waves on energetic ions from neutral beam injection. This parasitic process may decrease the current drive efficiency. A new model for absorption by fast ions has been implemented in the codes, so the experiment will test the model.

3. Measurement of the minimum width of the ECCD profile, as a test of diagnostics, transport of the current-carrying electrons, and the analysis model. This experiment will use discharges in the QDB mode.

1.2.4.1. Tools for 2005.

- ECH
  - — 3 CPI gyrotrons, which operate at 1 MW for 5 s pulses.
    - ✭ One of these will become available in mid campaign
  - — 2 Gycom gyrotrons, which operate at 0.7 MW for 2 s pulses.

- ICRF
  - FMIT transmitter for 60 MHz operation.
  - Possibly one ABB transmitter for 120 MHz operation.
  - Four-strap antennas for each transmitter.

1.3. RESEARCH PROPOSALS RECEIVED

A detailed list of research proposals received during the 2004 ROF is given in Appendix A. These proposals formed the basis for the 2004 and 2005 campaigns.

1.4. DETAILED LIST OF SCHEDULED EXPERIMENTS

These scheduled experiments represent the present plan for campaign 2005.

Date	Description	Leader
10/11/04	Methane injection	Allen
10/11/04	1/2 day FW and FWCD at high T_e	Pinsker
10/12/04	Hybrid scenario long pulse demo	Wade
10/13/04	RWM feedback and flat q profile	Okabayshi
10/13/04	q profile RWM dependence	Garofalo
10/14/04	1/2 day carbon heated tile gap — DiMES #2	Rudakov
10/14/04	1/2 day FW and FWCD at high T_e	Pinsker
10/18/04	Disruption mitigation	Hollmann
10/19/04	Extend VH-mode with shaping or n=3 I-coil	Jackson
10/20/04	Hi K experiment 2005	Rhodes
10/21/04	Long pulse Demo	Wade
10/22/04	1/2 day — porous plug — DiMES	McLean
10/25/04	RWM flat q	Garofalo
10/26/04	Extend VH-mode	Jackson
10/26/04	1/2 day makeup for high k	Rhodes
10/27/04	VH-mode extension	Jackson
10/28/04	3/2 stabilization by ECCD	La Haye
10/28/04	DiMES erosion	Rudakov
10/29/04	RWM flat q makeup	Garofalo
10/29/04	Edge spectroscopy	Brooks
11/23/04	H-mode heat flux	Moyer
11/24/04	$\beta_N = 4$ day 1	Greenfield
11/29/04	Pedestal height and ELM size vs squareness	Leonard
11/30/04	Flat q feedback	Garofalo
12/1/04	ELM size vs squareness	Fenstermacher
12/2/04	E-ITB with ECH	Austin
12/6/04	Porous plug	Allen
12/7/04	FWCD at high T_e	Luce
12/8/04	Beta limit vs ℓ_i	Luce
12/9/04	Feedback — ELM noise	Okabayashi
12/9/04	Audio amplifiers — I-Coil	Okabayashi
12/13/04	Turbulence studies	Burrell
12/14/04	$\beta_N = 4$ day 2	Greenfield
12/15/04	ρ_* scaling	Wade
12/16/04	Real time current control	Greenfield
1/10/05	QH-mode #1 2005	West
1/11/05	Neoclassical rotation counter	Solomon
1/12/05	QH-mode #2 2005	Burrell

1/13/05	ECCD and QDB	Petty
1/17/05	Fast ion physics	Heidbrink
1/18/05	ELM supress at high B_r/B_T	Evans
1/19/05	Sawtooth stabilization	Luce
1/20/05	1/2 day ELM noise	Okabayashi
1/20/05	1/2 day audio amplifiers	Okabayashi
1/24/05	Sawtooth stabilize at low q_0	Luce
1/25/05	FW absorption by beam ions	Luce
1/26/05	Stochastic and radiative edge	Wade
1/27/05	Aspect ratio scaling (NSTX)	Synakowski
2/14/05	Sawtooth and ECCD	Luce
2/15/05	Boundary experiment	Allen
2/16/05	Critical gradients	DeBoo
2/17/05	q_0 below 1.0	Luce
2/22/05	1/2 day — advanced plasma control	Walker
2/22/05	3/2 NTM — ECCD	La Haye
2/23/05	Existence domain	Wade
2/24/05	DIII-D/NSTX pedestal	Maingi
2/28/05	Multi-material DiMES	Allen
3/1/05	$\beta_N = 5$ day 1	Greenfield
3/2/05	Radiative divertor	Allen
3/3/05	Noninductive development	Greenfield
3/14/05	$\beta_N = 5$ day 2	Greenfield
3/15/05	2/1 stabilization — ECCD	La Haye
3/16/05	RWM JET joint exp	Okabayashi
3/16/05	RWM NSTX joint exp	Okabayashi
3/21/05	C^{13} setup	Allen
3/22/05	Real time control	Greenfield
3/23/05	C^{13} injection — ITER tritium retention	Allen

1.5. THE 2005 OPERATIONS SCHEDULE

The operations schedule is designed for efficient and safe use of the DIII–D facility. Fourteen calendar weeks of plasma physics operations is scheduled for the fiscal year 2005. The plan is to have five 2- or 3-week run periods. The operations schedule is shown in Fig. 1. Operations are carried out 5 days per week for 8.5 hours. The 2005 operations schedule can be viewed at http://d3dnff.gat.com/Schedules/fy2005Sch.htm.

In addition to operating the tokamak, maintenance has to be performed and new hardware is being installed to enhance DIII–D capabilities. The schedule for these activities is for the maintenance to be done when the tokamak is not operating.

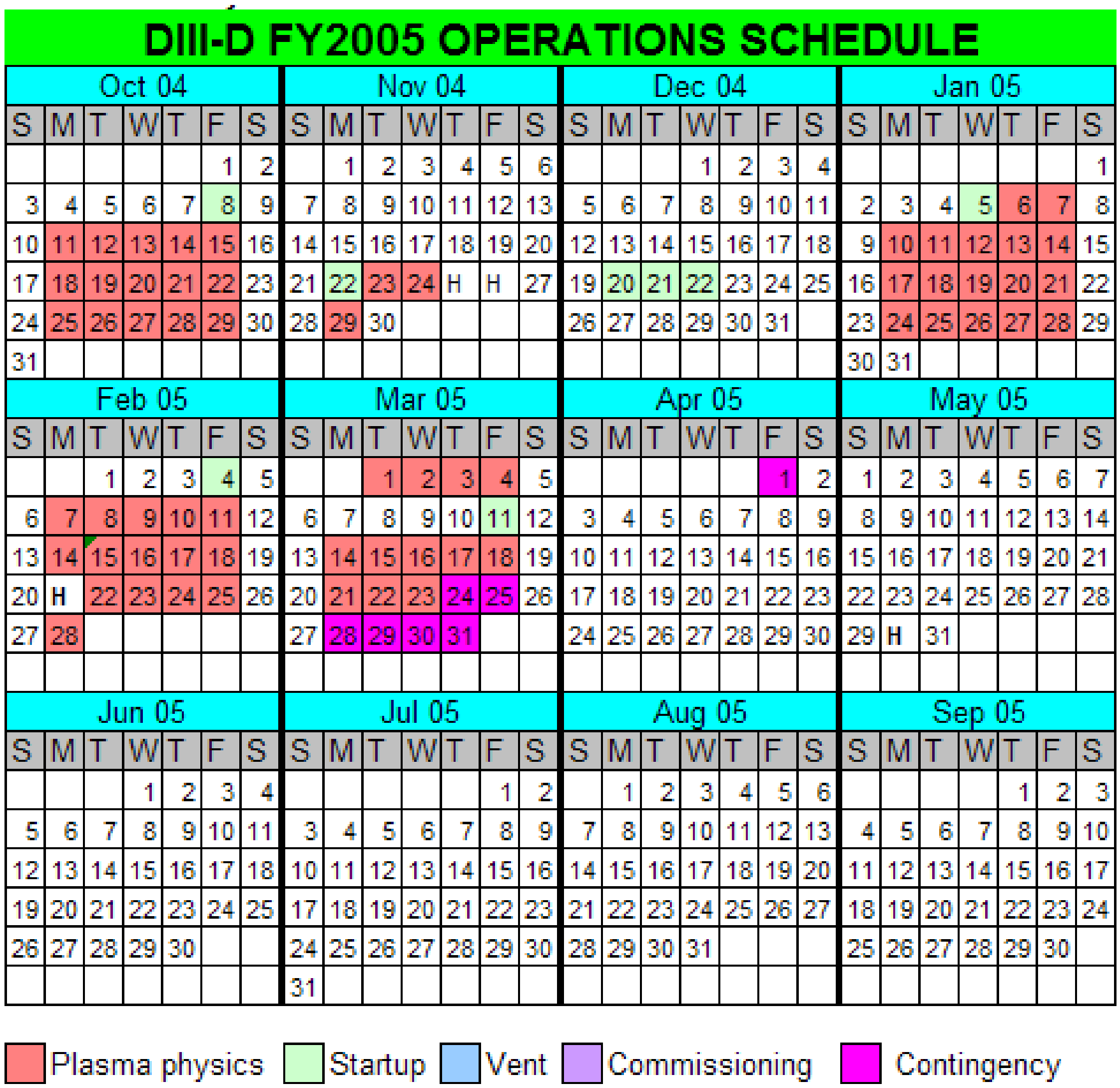

Fig. 1. DIII–D master schedule FY2005 (14 week plan).

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APPENDIX A
RESEARCH PROPOSALS RECEIVED

Submitted Proposals

Go To: Detail Text of Proposals Proposal Homepage Research Forum Homepage

To sort by each column, please click on the title. Click on the ID# to see the details of that proposal.

ID#	Name	Affiliation	Title	Research Area
1	Dan R Baker	General Atomics	Dependence of electron density profile on Te and q profiles	Confinement and Transport
2	John S. deGrassie	General Atomics	Toroidal Rotation in ECH and Ohmic H-modes	Confinement and Transport
3	John S. deGrassie	General Atomics	Dimensional Similarity on Toroidal Rotation w/o Torque	Confinement and Transport
4	John S. deGrassie	General Atomics	Toroidal Momentum Confinement Scaling With Input NBI Torque	Confinement and Transport
5	John S. deGrassie	General Atomics	Magnetic Error Fields and Toroidal Momentum Confinement	Confinement and Transport
6	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Generation and Maintenance of Current Hole	Advanced Scenario Development
7	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Current Hole in counter Ip discharge	Advanced Scenario Development
8	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Current profile modification by tearing modes in stationary (hybrid) discharges	Hybrid Scenarios
9	Anthony W Leonard	General Atomics	Edge current modification for ELM studies	Pedestal and ELMs
10	Anthony W Leonard	General Atomics	Outer wall fluxes due to ELMs	Divertor and Edge Physics
11	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Measurement of local oscillating magnetic field associated with RWM, using MSE.	Resistive Wall Modes

13	R.Jay Jayakumar	Lawrence Livermore National Laboratory	High performance discharges with flat q profile	Scenario Development
14	Hiro Takahashi	Princeton Plasma Physics Laboratory	Controlling ELMs and SOL Current in High betaN RWM Discharges Using Externally Applied Field	Pedestal and ELMs
15	Hiro Takahashi	Princeton Plasma Physics Laboratory	Sustain RWM Plasma Rotation through Entraining by Traveling I-coil Current	Resistive Wall Modes
16	Hiro Takahashi	Princeton Plasma Physics Laboratory	Measure Radial Profile of SOL Current during RWM	Resistive Wall Modes
17	Michio Okabayashi	Princeton Plasma Physics Laboratory	Exploration of RWM control near the ideal wall limit with voltage control board	Resistive Wall Modes
18	Hiro Takahashi	Princeton Plasma Physics Laboratory	Extend High betaN RWM Discharge by Countering Control Signal Contamination by SOL Current	Resistive Wall Modes
19	Hiro Takahashi	Princeton Plasma Physics Laboratory	Determine Causality Relationship between Scrape-Off Layer Current and MHD activity	Stability
22	Hiro Takahashi	Princeton Plasma Physics Laboratory	Feedback Control of Non-axisymmetric MHD Instability Using Actively Driven Scrape-Off-Layer Current	Stability
37	Hiro Takahashi	Princeton Plasma Physics Laboratory	Suppress SOL Current in High betaN RWM Discharges by Gas Puffing	Resistive Wall Modes
41	Hiro Takahashi	Princeton Plasma Physics Laboratory	Drive Scrape-Off Layer Current to Interact with MHD Activity	Stability
42	Hiro Takahashi	Princeton Plasma Physics Laboratory	Feedback Control of Vertical Instability Using Actively Driven Scrape-Off-Layer Current	Stability
44	Michio Okabayashi	Princeton Plasma Physics Laboratory	ITER RWM/FFA control simulation with C-coil, using I-coils as rotation profile control tools	Resistive Wall Modes
46	Michio Okabayashi	Princeton Plasma Physics Laboratory	Study of feedback challenge near the ideal wall limit using fake rotation shell logic	Resistive Wall Modes
47	Jim C. DeBoo	General Atomics	Transport barrier studies in QDB discharges	Confinement and Transport

48	Anthony W Leonard	General Atomics	Edge Current Measurement in VH-mode	Pedestal and ELMs
56	Anthony W Leonard	General Atomics	LIthium Beam Diagnostic Calibration Validation	Pedestal and ELMs
57	Charles J. Lasnier	Lawrence Livermore National Laboratory	The role of stochasticity and fast ion orbit loss in QH mode boundaries	QH Mode and QDB
59	Charles J. Lasnier	Lawrence Livermore National Laboratory	Stochastic threshold for ELM suppression	Pedestal and ELMs
60	Garrard D Conway	IPP Garching	Doppler reflectometry for Geodesic Acoustic Mode studies	Confinement and Transport
61	Richard Moyer	University of California, San Diego	Fast Te and turbulent heat flux measurements in L and H modes andacross the L-H transition	Confinement and Transport
62	Richard Moyer	University of California, San Diego	Effect of error fields, islands, and stochasticity on the L-H transition	Confinement and Transport
63	Jose A Boedo	University of California, San Diego	Poloidal asymmetry of Turbulence	Divertor and Edge Physics
64	Jose A Boedo	University of California, San Diego	Influence of ergodic fields on Intermittency	Divertor and Edge Physics
65	Jose A Boedo	University of California, San Diego	ELM dynamics in the edge and SOL	Pedestal and ELMs
66	Dmitry Rudakov	University of California, San Diego	Role of coherent modes on edge pedestal and ELM behavior	Pedestal and ELMs
67	Janardhan Manickam	Princeton Plasma Physics Laboratory	Investigation of feedback stabilization in low-shear systems	Stability
68	Keith H. Burrell	General Atomics	Main ion toroidal rotation studies in ECH and Ohmic H-mode using helium plasmas	Confinement and Transport
69	Punit Gohil	General Atomics	Increased density operation in QH-mode plasmas	QH Mode and QDB
70	Michio Okabayashi	Princeton Plasma Physics Laboratory	Active RFA measurement up to no wall beta limit using feedback	Resistive Wall Modes

71	Charles Greenfield	General Atomics	Optimize fully noninductive AT plasmas at high beta	Advanced Scenario Development
72	Charles Greenfield	General Atomics	Fluctuation documentation of AT plasmas	Advanced Scenario Development
73	Max E Fenstermacher	Lawrence Livermore National Laboratory	SOL Poloidal Flow by Carbon Imaging	Divertor and Edge Physics
75	Charles Greenfield	General Atomics	Demonstrate fast wave control of magnetic shear near magnetic axis	Advanced Scenario Development
76	Michio Okabayashi	Princeton Plasma Physics Laboratory	ELM rejection filter with wave-pocket model	Resistive Wall Modes
77	Keith H. Burrell	General Atomics	Test of neoclassical poloidal rotation theory in helium plasmas	Confinement and Transport
78	Janardhan Manickam	Princeton Plasma Physics Laboratory	Investigation of eigenmode rigidity using the RWM feedback system	Resistive Wall Modes
79	Max E Fenstermacher	Lawrence Livermore National Laboratory	Upper Puff and Pump Radiative Divertor with Impurity Injection	Divertor and Edge Physics
80	Michio Okabayashi	Princeton Plasma Physics Laboratory	Revisit of Psuedo-shell with Internal coil and internal radial sensors	Resistive Wall Modes
81	Jonathan E Menard	Princeton Plasma Physics Laboratory	Profile and stability modifications in high beta-N AT discharges using an I-coil ergodized edge	Advanced Scenario Development
82	T. C. Luce	General Atomics	100% Non-inductive High Performance	Advanced Scenario Development
83	T. C. Luce	General Atomics	Impact of Temperature Ratio on Transport in High Performance Discharges	Advanced Scenario Development
84	Jonathan E Menard	Princeton Plasma Physics Laboratory	Dependence of RWM stability on q(min) in high beta-N AT discharges	Resistive Wall Modes
85	Pete Politzer	General Atomics	Stationary, fully noninductive plasmas	Advanced Scenario Development

86	Pete Politzer	General Atomics	Stationary, fully noninductive plasmas	Heating and Current Drive
87	Pete Politzer	General Atomics	Tearing modes and regulation of the q-profile in the hybrid scenario	Hybrid Scenarios
88	T. C. Luce	General Atomics	Complete Mapping of the Hybrid Scenario Domain	Hybrid Scenarios
89	Pete Politzer	General Atomics	Tearing modes and regulation of the q-profile in the hybrid scenario	Stability
90	T. C. Luce	General Atomics	High Fusion Performance for 10 s	Hybrid Scenarios
91	Pete Politzer	General Atomics	Fusion ignition and burn simulation	Advanced Scenario Development
93	Pete Politzer	General Atomics	Fusion ignition and burn simulation	Hybrid Scenarios
94	T. C. Luce	General Atomics	Importance of Temperature Ratio and Rotation in Hybrid Scenarios	Hybrid Scenarios
95	Pete Politzer	General Atomics	Fusion ignition and burn simulation	Heating and Current Drive
96	Keith H. Burrell	General Atomics	and ECH H-mode reverse sign when the plasma current is reversed?	and Transport
97	Pete Politzer	General Atomics	Bootstrap current physics near the axis	Heating and Current Drive
98	Pete Politzer	General Atomics	Bootstrap current physics near the axis	Advanced Scenario Development
99	T. C. Luce	General Atomics	Ideal Beta Limits at High l_i	HiLi-High Inductance Scenario
100	Pete Politzer	General Atomics	Experiments on the physics of the bootstrap current	Heating and Current Drive
101	Kenneth Gentle	University of Texas	Modulated ECH as a Test of Models of Electron Thermal Transport	Confinement and Transport
102	Jose A Boedo	University of California, San Diego	Test of TRIP3D	Divertor and Edge Physics

103	T. C. Luce	General Atomics	Sawtooth Suppression by EC and FW	HiLi-High Inductance Scenario
104	Neil H Brooks	General Atomics	Radiative Divertor with Helium Plasma and Impurity Injection	Divertor and Edge Physics
105	Richard Moyer	University of California, San Diego	Plasma contact with main chamber wall during ELMs with and without the I-coil	Pedestal and ELMs
106	Robert I. Pinsker	General Atomics	Using edge ergodization to achieve good FW coupling to H-modes	Heating and Current Drive
107	Tim Scoville	General Atomics	Low density locked mode threshold using I-coil	Stability
108	Richard Moyer	University of California, San Diego	Extend ELM suppression with the I-coil to lower density, higher power, and lower triangularity	Pedestal and ELMs
109	Neil H Brooks	General Atomics	SOL Poloidal Flow by Doppler shift measurement	Divertor and Edge Physics
110	Robert I. Pinsker	General Atomics	Study of preionization with FW power - relevant to NSTX CS-free breakdown/rampup scenarios	Heating and Current Drive
111	Keith H. Burrell	General Atomics	Test of neoclassical prediction of toroidal rotation differences of ions as a function of grad P	Confinement and Transport
112	Masanori Murakami	Oak Ridge National Laboratory	Central magnetic shear control using fast wave current drive in AT plasmas	Scenario Development
113	Karl H. Finken	Forschungszentrum Juelich	Impurity transport and He exhaust during stochastic ELM suppression	Pedestal and ELMs
114	Emilia R. Solano	CIEMAT, Spain	Study of ELMs, strike point movements, peeling.	Pedestal and ELMs
115	Emilia R. Solano	CIEMAT, Spain	Driving negative toroidal current in current hole plasmas	Advanced Scenario Development
116	Max E Fenstermacher	Lawrence Livermore National Laboratory	ELMs in the Boundary Plasma vs. q and Bt	Divertor and Edge Physics
117	Peter C. Stangeby	GA ,LLNL and U of Toronto	Interpretation of the 13C deposition expt: DTS + spectroscopy measurements of detached plasmas	Divertor and Edge Physics
119	Ed Synakowski	Princeton Plasma Physics Laboratory	Comparison of Confinement of DIII-D and NSTX Plasmas	Confinement and Transport

120	Dan R Baker	General Atomics	Central Heating without Central Particle Source	Confinement and Transport
121	Neil H Brooks	General Atomics	Helium SAPP (Simple-As-Possible Plasmas) Experiments For Understanding Carbon Sputtering and Redepos	Divertor and Edge Physics
122	James R Wilson	Princeton Plasma Physics Laboratory	Investigation of Parametric Decay during ICRF	Heating and Current Drive
123	Buzhinskij Oleg Igorevich	TRINITI	Investigation of graphite samples exposed to divertor plasma using DiMES system	Divertor and Edge Physics
124	Punit Gohil	General Atomics	Examination of high k fluctuations with increased electron heating	Confinement and Transport
125	Thomas W. Petrie	General Atomics	Can Heat Flux Outside the Slot Divertor Be Reduced?	Divertor and Edge Physics
126	Dennis L. Youchison	Sandia National Laboratories	Tungsten Rod Armor Plasma Exposure	Divertor and Edge Physics
127	Jim C. DeBoo	General Atomics	Determine chie_inc and chie_pb in L-mode discharges	Confinement and Transport
128	Thomas W. Petrie	General Atomics	Variation in Pumping Due to Changes in Magnetic Balance in High Performance Plasmas in ìNormalî BT	Divertor and Edge Physics
129	Neil H Brooks	General Atomics	ELM Characterization with an Improved Temporal Fiducial	Divertor and Edge Physics
130	Punit Gohil	General Atomics	Real time control of plasma profiles	Advanced Scenario Development
131	Robert J La Haye	General Atomics	Low rotation plasma testbed for RWM feedback	Resistive Wall Modes
132	Thomas W. Petrie	General Atomics	Compatibility of the Radiative Divertor Concept With High Performance (ìATî) Operation	Advanced Scenario Development
133	Thomas W. Petrie	General Atomics	Particle Control in a Non-Symmetric Double-null Divertor	Divertor and Edge Physics

134	Thomas W. Petrie	General Atomics	Best Fueling Location For DN Plasmas: High-Field Side vs Low-Field Side	Divertor and Edge Physics
135	Thomas W. Petrie	General Atomics	The Effect of Divertor SOL Flux Expansion on ELM Pulse Intensity	Divertor and Edge Physics
136	Thomas W. Petrie	General Atomics	Evaluation of Transient Particle Flow Across the Divertor Private Flux Region Following an ELM	Divertor and Edge Physics
137	Dmitry Rudakov	University of California, San Diego	Contribution of SOL intermittent transport to main wall interaction in L and H mode	Divertor and Edge Physics
138	Ed Lazarus	Oak Ridge National Laboratory	Beans & Ovals	Stability
139	Robert J La Haye	General Atomics	Higher beta plasmas with 3/2 NTM avoided by ECCD	Stability
140	Todd E. Evans	General Atomics	Testing of the High Resolution DiMES Current Array (HRDCA) in LSN plasmas	Divertor and Edge Physics
141	Tim Scoville	General Atomics	Test models of error field amplification and rotation change hysteresis using I-coil	Stability
142	Robert I. Pinsker	General Atomics	Is direct electron damping of FWs correctly modelled? Comparison of NSTX and DIII-D	Heating and Current Drive
143	C. Craig Petty	General Atomics	Current Drive in the Current Hole	Advanced Scenario Development
144	C. Craig Petty	General Atomics	Higher Beta With High qmin Using Pressure Profile Control	Advanced Scenario Development
145	C. Craig Petty	General Atomics	Higher Beta with ECCD Suppression of 2/1 NTM	Stability
146	C. Craig Petty	General Atomics	ECCD in Long Pulse, High Performance Discharges	Hybrid Scenarios
147	C. Craig Petty	General Atomics	Electron Heat Pinch	Confinement and Transport
148	C. Craig Petty	General Atomics	Electron Transport in ITB Plasmas	Confinement and Transport

149	C. Craig Petty	General Atomics	ECCD in High Beta Poloidal Plasmas	Heating and Current Drive
150	King-Lap K.L. Wong	Princeton Plasma Physics Laboratory	Investigation of density pump-out and Er asymmetry induced by high power ECH with counter beams	Heating and Current Drive
151	C. Craig Petty	General Atomics	ITB Physics: Rotation and Ti/Te	Confinement and Transport
152	C. Craig Petty	General Atomics	Extreme Off-Axis ECCD	Heating and Current Drive
153	C. Craig Petty	General Atomics	High Performance Operation With Te=Ti	Advanced Scenario Development
154	C. Craig Petty	General Atomics	Pulsed ECCD for 3/2 NTM stabilization using PCS	Stability
155	C. Craig Petty	General Atomics	Direct Measurement of ECCD Width from Modulated ECCD	Heating and Current Drive
156	C. Craig Petty	General Atomics	Fiducial Discharges For Comparison With Hybrid Scenario	Hybrid Scenarios
157	C. Craig Petty	General Atomics	Te=Ti With Electron Heating in Hybrid Scenarios	Hybrid Scenarios
158	C. Craig Petty	General Atomics	Rho* Scaling of Hybrid Scenario	Hybrid Scenarios
159	Masanori Murakami	Oak Ridge National Laboratory	Demonstration of full noninductive AT operation using off-axis ECCD	Advanced Scenario Development
160	King-Lap K.L. Wong	Princeton Plasma Physics Laboratory	Modification of plasma rotation profile and angular momentum transport studies by RF waves	Confinement and Transport
161	John Ferron	General Atomics	Feedback control of q during Ip ramp	Advanced Scenario Development
162	C. Craig Petty	General Atomics	ECCD at high electron temperature	Heating and Current Drive
163	C. Craig Petty	General Atomics	Modulation of Bootstrap Current in QBD Regime	QH Mode and QDB

164	C. Craig Petty	General Atomics	Hybrid Scenario in QH-mode	QH Mode and QDB
165	Paul B. Parks	General Atomics	ìSurpassing GW density limit in RS plasma while avoiding NTMsî	Advanced Scenario Development
166	T. C. Luce	General Atomics	MHD Stability with q < 1	HiLi-High Inductance Scenario
167	T. C. Luce	General Atomics	Reduction of edge current density in high l_i plasmas with the I coil	HiLi-High Inductance Scenario
168	T. C. Luce	General Atomics	Mass scaling of confinement and L-H threshold	Confinement and Transport
169	T. C. Luce	General Atomics	Is Degradation of Confinement near the Greenwald Limit Just Low P/P_LH	Confinement and Transport
170	T. C. Luce	General Atomics	How Close to the L_H Threshold Is Gyro-Bohm Scaling Maintained?	Confinement and Transport
171	T. C. Luce	General Atomics	Stiffness in the Electron and Ion Channels	Confinement and Transport
172	T. C. Luce	General Atomics	Increase Beta with 2/1 Tearing Mode Suppression	Stability
173	T. C. Luce	General Atomics	Preventative ECCD for Avoidance of the 2/1 Tearing Mode	Stability
174	Masanori Murakami	Oak Ridge National Laboratory	Sustainment of hybrid discharges using central CD	Hybrid Scenarios
177	didier mazon	CEA Cadarache	Feedback control of the current profile and ITBs	Advanced Scenario Development
178	Wolfgang Jacob	Max-Planck-Institut fuer Plasmaphysik	DiMES heated tile gap experiments (tritium-retention)	Divertor and Edge Physics
179	Volker Philipps	Forschungszentrum Juelich	13C-Methane Injection followed by Oxygen-Baking (T-retention issue)	Divertor and Edge Physics
180	Neil H Brooks	General Atomics	Feasibility Studies for a Divertor CER Diagnostic	Divertor and Edge Physics
181	Buzhinskij Oleg Igorevich	TRINITI	"Real time" boronization on DIII-D	Divertor and Edge Physics

182	Dana H. Edgell	FAR-TECH, Inc.	Simple ELM Characterization and Discrimination for RWM Active Control Signals in DIII-D	Resistive Wall Modes
183	Edgell	FAR-TECH, Inc.	Model-based RWM Control	Wall Modes
184	Masanori Murakami	Oak Ridge National Laboratory	Sustained high q_min NCS discharges using off-axis ECCD	Advanced Scenario Development
185	Joel C. Hosea	Princeton Plasma Physics Laboratory	Compare loading/VMAX of the ABB antennas for several AT regimes	Heating and Current Drive
186	T. C. Luce	General Atomics	Are Small, Growing Tearing Modes Easier to Suppress than Saturated Modes	Stability
187	Eric M Hollmann	University of California, San Diego	Imaging noble gas jet penetration during disruption mitigation	Stability
188	T. C. Luce	General Atomics	Is Suppressing the 3/2 Tearing Mode Worth the Trouble?	Stability
189	T. C. Luce	General Atomics	Suppression of sawteeth with EC power	Stability
190	Dennis Whyte	University of Wisconsin, Madison	Disruption mitigation with higher pressure gas jet	Stability
191	James W. Davis	U of Toronto	Hydrocarbon dissociation and transport studies using a porous plug injector	Divertor and Edge Physics
192	T. C. Luce	General Atomics	Tearing Mode as a Voltage Source Due to Modulation of the Amplitude	Stability
193	Keith H. Burrell	General Atomics	Modulated transport studies of all four transport channels	Confinement and Transport
195	Wayne M Solomon	Princeton Plasma Physics Laboratory	Study of toroidal rotation with varying momentum input	Confinement and Transport
196	Ron Prater	General Atomics	Effect of radial transport on ECCD profile	Heating and Current Drive
197	Wayne M Solomon	Princeton Plasma Physics Laboratory	Detailed comparison of measured poloidal velocity profiles with neoclassical prediction	Confinement and Transport
198	Wayne M Solomon	Princeton Plasma Physics Laboratory	Onset of turbulence with increasing momentum input	Confinement and Transport

199	Dennis Whyte	University of Wisconsin, Madison	Identifying carbon source locations using the window-frame technique	Divertor and Edge Physics
200	Richard Moyer	University of California, San Diego	Can the I-coil provide a co-injected QH mode?	QH Mode and QDB
201	Ron Prater	General Atomics	Compare effectiveness of large ECCD current vs large current density in stabilizing the 3/2 NTM	Stability
202	Jon Kinsey	Lehigh University	Transport in TEM dominated plasmas	Confinement and Transport
204	Richard Moyer	University of California, San Diego	Can the I-coil be used to produce a quasi-stationary VH mode?	Pedestal and ELMs
205	Larry W. Owen	Oak Ridge National Laboratory	Pedestal particle source in H-mode plasmas	Pedestal and ELMs
206	Anthony W Leonard	General Atomics	Small pellets for impurity entrainment in radiative divertors	Divertor and Edge Physics
207	Jon Kinsey	Lehigh University	Shafranov shift stabilization in H-mode discharges	Confinement and Transport
208	John Ferron	General Atomics	Tune the I-coil setup for minimum rotation drag for q_min > 2	Advanced Scenario Development
209	John Ferron	General Atomics	Test the achievable beta with q(0) closer to q_min	Advanced Scenario Development
210	John Ferron	General Atomics	Test I-coil stabilization of low rotation AT, q_min > 2 discharges	Advanced Scenario Development
211	Dmitri A. Mossessian	Mass. Inst. of Technology	DIII-D/C-Mod similarity with RF heating and lower upper triangularity	Pedestal and ELMs
212	Alberto Loarte	EFDA-CSU Garching	JET/DIII-D similarity experiments	Pedestal and ELMs
213	Ronald V. Bravenec	University of Texas	Benchmarking gyrokinetic simulations (GYRO, GS2) against DIII-D discharges	Confinement and Transport
214	Maxim V Umansky	Lawrence Livermore National Laboratory	Studies of effects of induced edge stochasticity on intermittent edge transport	Divertor and Edge Physics
215	Dmitry Rudakov	University of California, San Diego	Study erosion of ITER-relevant first wall materials in USN and IWL discharges	Divertor and Edge Physics

216	Maxim V Umansky	Lawrence Livermore National Laboratory	Intermittent edge transport in helium plasmas	Divertor and Edge Physics
217	Michio Okabayashi	Princeton Plasma Physics Laboratory	Study of ideal MHD stability status between ELMs with ìactive RFA measurementî	Resistive Wall Modes
218	Eric Fredrickson	Princeton Plasma Physics Laboratory	NTM threshold comparison	Stability
		University of Wisconsin, Madison	Scaling of global hydrogenic retention with plasma parameters	Divertor and Edge Physics
220	Eric Fredrickson	Princeton Plasma Physics Laboratory	NSTX/DIII-D CAE/TAE comparison	Stability
221	T. C. Luce	General Atomics	Test of ECCD Efficiency at ITER-like Temperatures	Heating and Current Drive
222	T. C. Luce	General Atomics	Test Models of Fast Ion Absorption of High Harmonic FW	Heating and Current Drive
223	Rajesh Maingi	Oak Ridge National Laboratory	Dependence of H-mode Pedestal Structure on Aspect Ratio	Pedestal and ELMs
224	T. C. Luce	General Atomics	Verification of Neutral Beam Current Drive Profile	Heating and Current Drive
225	Leonid Rudakov	Naval Research Laboratory	Rotation waves in Fusion Plasma	Heating and Current Drive
226	T. C. Luce	General Atomics	Validation of Bootstrap Current Models	Heating and Current Drive
227	T. C. Luce	General Atomics	Test of Edge Bootstrap Models	Confinement and Transport
228	Steven Lisgo	U of Toronto	"Window-frame" experiments on main chamber recycling	Divertor and Edge Physics
229	William R. Wampler	Sandia National Laboratories	Carbon erosion with argon-induced detached plasma	Divertor and Edge Physics
230	Dmitry Rudakov	University of California, San Diego	Effect of the secondary electron emission on the Langmuir probe measurements	Divertor and Edge Physics
231	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Effect of rotation on qmin in hybrid discharges	Hybrid Scenarios
233	W. Phil West	General Atomics	Plasma Startup without the central solenoid or central pf coils using induction from outer pf coils	Stability

235	Peter C. Stangeby	GA ,LLNL and U of Toronto	ITER Critical Issue: Tritium-Retention Studies	Divertor and Edge Physics
236	C. Craig Petty	General Atomics	Fast Wave Damping on Ions and Electrons	Advanced Scenario Development
237	Todd E. Evans	General Atomics	Evaluate level of boundary toroidal asymmetry with I-coil perturbation	Divertor and Edge Physics
238	C. Craig Petty	General Atomics	ECCD Profile Width in QBD Mode	QH Mode and QDB
239	Garofalo	Columbia University	Induce plasma rotation using n=1 RFA	Wall Modes
240	Andrea M Garofalo	Columbia University	Develop target with low plasma-rotation using RF heating	Resistive Wall Modes
241	Morrell S. Chance	Princeton Plasma Physics Laboratory	Negative Helicity RWM n=1 braking	Resistive Wall Modes
242	Andrea M Garofalo	Columbia University	Measurement of the RFA vs. plasma rotation	Resistive Wall Modes
243	Andrea M Garofalo	Columbia University	Improvement of dynamic error field correction near the ideal-wall limit	Resistive Wall Modes
244	T. C. Luce	General Atomics	Electron Bernstein Wave Heating and Current Drive in DIII-D	Heating and Current Drive
245	T. C. Luce	General Atomics	Density Limit: Transport Increase or X-Point MARFE	Divertor and Edge Physics
246	T. C. Luce	General Atomics	Study of Radiative Divertor Solutions in Low Recycling Divertor Plasmas	Divertor and Edge Physics
247	W. Phil West	General Atomics	Thin melt layer dynamics in the divertor during disruptions	Divertor and Edge Physics
248	Bruce Lipschultz	MIT Plasma Science and Fusion Center	Extend SOL radial transport analysis to H-mode plasmas	Divertor and Edge Physics
249	Andrea M Garofalo	Columbia University	Optimization w.r.t. plasma rotation of the error field correction from I-coil	Resistive Wall Modes
250	Andrea M Garofalo	Columbia University	Develop low-rotation target using the flat q-profile scenario	Resistive Wall Modes
251	Andrea M Garofalo	Columbia University	Develop low-rotation target by varying the plasma density	Resistive Wall Modes
252	Andrea M Garofalo	Columbia University	Large rho_qmin and qmin AT scenario development	Advanced Scenario Development

253	Todd E. Evans	General Atomics	Validation of the TRIP3D field line integration code	Pedestal and ELMs
254	Andrea M Garofalo	Columbia University	Large rho_qmin using toroidal field ramp-down	Advanced Scenario Development
255	Raffi Nazikian	Princeton Plasma Physics Laboratory	ITB formation and turbulence suppression at rational q values	Confinement and Transport
256	Raffi Nazikian	Princeton Plasma Physics Laboratory	Direct measurement of core AE damping rates	Stability
257	Michael J Schaffer	GA/ORISE	First Principles Error Correction	Stability
258	David Rasmussen	Oak Ridge National Laboratory	Long pulse FW heating and current drive	Heating and Current Drive
259	Larry R. Baylor	Oak Ridge National Laboratory	High Density ELM suppresssion with pellets and a stochastic boundary	Pedestal and ELMs
260	Larry R. Baylor	Oak Ridge National Laboratory	Poloidal rotation from parallel neutral beam injection force	Confinement and Transport
261	Larry R. Baylor	Oak Ridge National Laboratory	Pellet Injection as a Pedestal Modification and ELM control tool	Pedestal and ELMs
262	Larry R. Baylor	Oak Ridge National Laboratory	Test of HFS Pellet Fueling Fast Transport Theory	Divertor and Edge Physics
263	George Tynan	University of California, San Diego	Evolution of turbulence-shear flow interactions as L-H transition is approached	Confinement and Transport
264	Larry R. Baylor	Oak Ridge National Laboratory	High Density Operation Compatible with Burning Plasma Scenario	Divertor and Edge Physics
265	Larry R. Baylor	Oak Ridge National Laboratory	Higher Density Operation of the QH-mode and compatibility with pellet injection	QH Mode and QDB
266	Larry R. Baylor	Oak Ridge National Laboratory	Pellet cloud diagnostic comparison with theory	Divertor and Edge Physics
267	Alexander Pigarov	University of California, San Diego	Impurity convective transport in SAPP and L-H shots	Divertor and Edge Physics
268	Gerald A Navratil	Columbia University	Preliminary Test of Audio Amplifiers for RWM Control	Resistive Wall Modes
269	Gerald A Navratil	Columbia University	Current Hole Plasma for RWM Studies	Resistive Wall Modes

270	Gerald A Navratil	Columbia University	Twelve independent channels for I-coil feedback	Resistive Wall Modes
271	Gerald A Navratil	Columbia University	MHD Spectroscopic Study of RWM Damping Rate with Feedback	Resistive Wall Modes
272	George Sips	IPP Garching	Density variation in Hybrid scenarios	Hybrid Scenarios
273	Larry R. Baylor	Oak Ridge National Laboratory	High density operation with long pulse pellet fueling	Hybrid Scenarios
274	Charles E. Kessel	Princeton Plasma Physics Laboratory	Beta Limitations from n=2 and 3 Linear Ideal Instabilities	Stability
275	Charles E. Kessel	Princeton Plasma Physics Laboratory	Interpolation of Plasma Shape and Density Operating Points	Advanced Scenario Development
276	Paul R THOMAS	CEA Cadarache	AC Edge Ergodisation using I-coils	Pedestal and ELMs
277	Charles E. Kessel	Princeton Plasma Physics Laboratory	Production of Sustainable ITBís Outside of Rho=0.5	Advanced Scenario Development
278	Martin Valovic	EURATOM/UKAEA FUSION ASSOCIATION	Aspect ratio scan of heat transport with MAST and DIII-D	Confinement and Transport
280	Gerald A Navratil	Columbia University	Study of n=2 and n=3 RWMs	Resistive Wall Modes
281	Clive D Challis	UKAEA Culham	Wide ITBs with negative shear and q-minimum=integer trigger	Confinement and Transport
282	Olivier Sauter	CRPP - EPFL	NTM Avoidance Using Sawtooth Control	Stability
283	Jef P.H.E Ongena	ERM-KMS, Lab Plasmaphysics, 1000 Brussel	JET / DIII-D similarity experiments at high delta with impurity seeding	Pedestal and ELMs
284	David F Howell	UKAEA Culham	Size scaling for error field locked mode thresholds	Stability
285	Sibylle Guenter	IPP Garching	Dependence of rotation damping on m-numbers of external error fields	Stability
286	Amanda E Hubbard	Mass. Inst. of Technology	Dimensionless Comparison of L-H threshold conditions on C-Mod and DIIID	Confinement and Transport
288	Sibylle Guenter	IPP Garching	Triggering of the transition of (3,2) NTMs into the FIR regime	Stability
289	Paul R THOMAS	CEA Cadarache	Does ELM suppression seen with n=3 coil change continuously with perturbation amplitude?	Pedestal and ELMs

290	gabriella Saibene	EFDA Close Support Unit - GArching	Type II ELMs at high density and/or high beta	Pedestal and ELMs
291	Punit Gohil	General Atomics	Affect of plasma size on ITB formation	Confinement and Transport
292	James R Wilson	Princeton Plasma Physics Laboratory	Stabilization of Sawteeth by freezing the q profile	HiLi-High Inductance Scenario
293	Olivier Sauter	CRPP - EPFL	ECCD Contribution To NTM Modified Rutherford Equation	Stability
294	Dale M Meade	Princeton Plasma Physics Laboratory	Determine Effect of Triangularity on Pedestal and Elms	Pedestal and ELMs
295	Dale M Meade	Princeton Plasma Physics Laboratory	Determine Effect of SN/DN Topology on Pedestal and Elms	Pedestal and ELMs
296	Dale M Meade	Princeton Plasma Physics Laboratory	Develop High Performance NCS AT modes for Next Step BPX and ARIES-RS/AT.	Advanced Scenario Development
297	Olivier Sauter	CRPP - EPFL	Electron vs ion transport with reverse shear profiles	Confinement and Transport
298	Dale M Meade	Princeton Plasma Physics Laboratory	Evaluate Double Null and Single Null on NCS AT Performance	Advanced Scenario Development
299	Dale M Meade	Princeton Plasma Physics Laboratory	Optimizing the Plasma Shape and Divertor Topology for the QH and QDB Modes	QH Mode and QDB
300	Dale M Meade	Princeton Plasma Physics Laboratory	Optimizing the Plasma Shape and Divertor Topology for Hybrid Scenarios	Hybrid Scenarios
301	John Ferron	General Atomics	Improve on high beta_N discharges with pressure profile broadening	Advanced Scenario Development
302	Nick C Hawkes	UKAEA Culham	Study heating mechanisms within the current hole	Advanced Scenario Development
303	John Ferron	General Atomics	Feedback control of the steady-state current profile	Advanced Scenario Development
304	Igor Semenov	Kurchatov Institute, Russia	The feedback effect between resonance surfaces and applied perturbations including SOL halo currents	Stability
305	John Ferron	General Atomics	Test a smaller outer gap in AT scenarios for higher achievable beta_N	Advanced Scenario Development

306	John Ferron	General Atomics	Steady-state in high beta, high kappa/delta discharges	Advanced Scenario Development
307	Simon D Pinches	Max-Planck-Intistitut fuer Plasmaphysik	Cross-Machine Scaling of RWMs	Resistive Wall Modes
308	Michio Okabayashi	Princeton Plasma Physics Laboratory	"Ergodic rotating limiter with n=1"	Pedestal and ELMs
309	Manabu Takechi	JAERI	Extend High betaN discharge by reduction of RWM and NTM in ITB plasmas (International remote exp.)	Resistive Wall Modes
310	Michael J Schaffer	GA/ORISE	L-H Transition vs. X-Point Potential	Divertor and Edge Physics
311	Michio Okabayashi	Princeton Plasma Physics Laboratory	Ideal MHD status of RWM, NTM, ELMs and I-coil optimization in AT plasma	Advanced Scenario Development
312	Emmanuel H Joffrin	CEA Cadarache	Investigation of the role of q profile in the hybrid scenario	Hybrid Scenarios
313	Richard J Buttery	EURATOM/UKAEA FUSION ASSOCIATION	2/1 NTM physics	Stability
314	David Mikkelsen	Princeton Plasma Physics Laboratory	Search for ETG modes with Central Electron Cyclotron Heating	and Transport
316	Richard H. Goulding	Oak Ridge National Laboratory	High Harmonic Fast Wave Studies: Comparison with NSTX Power Deposition and 117 MHz Performance	Heating and Current Drive
317	Richard J Buttery	EURATOM/UKAEA FUSION ASSOCIATION	RWM feedback after plasma stops	Resistive Wall Modes
318	Robert Budny	Princeton Plasma Physics Laboratory	Determining angular momentum transport using two extremely different rotation profiles	Resistive Wall Modes
320	Richard J Buttery	EURATOM/UKAEA FUSION ASSOCIATION	ELM control with n=1 fields	Pedestal and ELMs
321	C. Craig Petty	General Atomics	Sustained Monster Sawteeth	HiLi-High Inductance Scenario
322	Robert I. Pinsker	General Atomics	Moderate harmonic (3rd and 4th) ECH	Heating and Current Drive

323	Robert Budny	Princeton Plasma Physics Laboratory	Transport barriers with small applied torque	Confinement and Transport
324	Richard Groebner	General Atomics	Characterization of Turbulence in Pedestal	Pedestal and ELMs
325	M. F. F. Nave	Associacao EURATOM/IST	NTM triggering by magnetic mode coupling	Stability
326	Robert Budny	Princeton Plasma Physics Laboratory	Multi-species transport in steady state plasmas	QH Mode and QDB
327	Robert I. Pinsker	General Atomics	High central fast wave current drive efficiency at high electon beta with 110 GHz ECH	Heating and Current Drive
328	Gerrit Kramer	Princeton Plasma Physics Laboratory	Momentum and energy transport induced by error fields	Confinement and Transport
329	C. Craig Petty	General Atomics	Sustainment of High Li with Central Current Drive	HiLi-High Inductance Scenario
330	Gerrit Kramer	Princeton Plasma Physics Laboratory	The relation between Alfv?en cascades and BAEs in DIII-D	Stability
331	Gerrit Kramer	Princeton Plasma Physics Laboratory	Accurate benchmarking of ExB rotation from correlation reflectometry, BES and CER	Confinement and Transport
332	Francis W. Perkins	Princeton DIII-D	Evaluation of RWM Feedback Connections based on MHD Eigenfunctions	Resistive
333	clement wong	General Atomics	Heated and wetted Li-DiMES	Divertor and Edge Physics
334	Gerrit Kramer	Princeton Plasma Physics Laboratory	Toroidal turbulence velocity measurements from correlation reflectometry	Confinement and Transport
335	C. Craig Petty	General Atomics	Effect of Magnetic Shear on Transport	HiLi-High Inductance Scenario
336	Tom Osborne	General Atomics	Steady State VH-mode	Pedestal and ELMs
337	Tom Osborne	General Atomics	Scaling of ETB width with rho*	Pedestal and ELMs
338	Donald B. Batchelor	Oak Ridge National Laboratory	RF Modeling fot AT and high li discharges	Heating and Current Drive

339	Donald L. Hillis	Oak Ridge National Laboratory	Effects of High Recycling Impurities on Advanced Operating Scenarios	Hybrid Scenarios
340	Mickey R Wade	Oak Ridge National Laboratory	Low Squareness, High li Scenario Development	HiLi-High Inductance Scenario
341	Tom Osborne	General Atomics	Effect of Edge Current Density on ETB Width	Pedestal and ELMs
342	Mickey R Wade	Oak Ridge National Laboratory	Te=Ti, Low Rotation AT Target Development	Advanced Scenario Development
343	Mickey R Wade	Oak Ridge National Laboratory	Third Harmonic ECH and ECCD	Heating and Current Drive
344	Mickey R Wade	Oak Ridge National Laboratory	10-s High Performance Hybrid Scenario	Hybrid Scenarios
345	Andrea M Garofalo	Columbia University	Develop low-rotation target using magnetic braking	Resistive Wall Modes
346	Mickey R Wade	Oak Ridge National Laboratory	Te=Ti, Low Rotation Hybrid Scenario Development	Hybrid Scenarios
347	C. Craig Petty	General Atomics	Dependence of Stiffness on Elongation	Confinement and Transport
348	Mickey R Wade	Oak Ridge National Laboratory	Test of Conductivity Models	Heating and Current Drive
349	W. Phil West	General Atomics	Modification of Edge Current and Stability in QH and ELMing H modes using current ramps.	QH Mode and QDB
350	Wade	Laboratory	Reduced Toroidal Field	Wall Modes
351	C. Craig Petty	General Atomics	PEP Mode to Alternate Between Turbulence Modes	Confinement and Transport
352	Andrea M Garofalo	Columbia University	Test RWM stabilization by trapped particles model	Resistive Wall Modes
353	Mickey R Wade	Oak Ridge National Laboratory	Quantify effect of Tearing Modes on Particle and Energy Transport	Confinement and Transport
354	Michio Okabayashi	Princeton Plasma Physics Laboratory	Optimization of direct feedback RWM stabilization	Resistive Wall Modes
355	R.Jay Jayakumar	Lawrence Livermore National Laboratory	Effect of error field on the Dynamo action in Hybrid discharges	Hybrid Scenarios
356	Mickey R Wade	Oak Ridge National Laboratory	Edge Impurity Dynamics during ELMs	Pedestal and ELMs

357	Michio Okabayashi	Princeton Plasma Physics Laboratory	Application of feedback technique at AT plasmas like current hole	Resistive Wall Modes
358	Mickey R Wade	Oak Ridge National Laboratory	Helium Transport and Exhaust in Hybrid Scenario	Hybrid Scenarios
359	Andrea M Garofalo	Columbia University	RWM feedback tests in low rotation target	Resistive Wall Modes
360	Mickey R Wade	Oak Ridge National Laboratory	Effect of ECH on Impurity Transport in QDB	QH Mode and QDB
361	Mickey R Wade	Oak Ridge National Laboratory	Low Squareness, High Beta Discharges	Stability
362	Mickey R Wade	Oak Ridge National Laboratory	Direct Measurement of the Edge Bootstrap Current	Pedestal and ELMs
363	John Ferron	General Atomics	Development of high li scenarios and tests of the beta limit	HiLi-High Inductance Scenario
364	Mickey R Wade	Oak Ridge National Laboratory	Impurity Transport in High Non-Inductive Fraction Discharge	Advanced Scenario Development
365	Tom Osborne	General Atomics	Small, Type II, ELMs at High Density with Large ETB Width	Pedestal and ELMs
366	Andrea M Garofalo	Columbia University	High betaN sustainment using flat q-profile scenario	Advanced Scenario Development
367	Michio Okabayashi	Princeton Plasma Physics Laboratory	First attempt of Audio amplifier for RWM feedback	Resistive Wall Modes
368	Mickey R Wade	Oak Ridge National Laboratory	Measurement of Plasma Spin-Up Dynamics	Confinement and Transport
369	Wade	Laboratory	Plasma Response to Pellet Injection	Confinement and Transport
370	John Ferron	General Atomics	Reproduce a previous beta_N=5.2, li=1.1 discharge	HiLi-High Inductance Scenario
371	Mickey R Wade	Oak Ridge National Laboratory	Simultaneous Measurement of Electron and Ion Response to ELM	Pedestal and ELMs
372	clement wong	General Atomics	Three piggyback DiMES experiments	Divertor and Edge Physics
373	John Ferron	General Atomics	Steady-state VH-mode through controlled impurity radiation	Pedestal and ELMs

374	John Ferron	General Atomics	n=1 beta limit versus edge pedestal height	Advanced Scenario Development
375	Keith H. Burrell	General Atomics	Effect of Ip ramps on edge parameters at the L-H transition	Confinement and Transport
376	Keith H. Burrell	General Atomics	Investigate high triangularity QH-mode	QH Mode and QDB
377	Keith H. Burrell	General Atomics	Parametric dependence of edge Er well in QH-mode plasmas	QH Mode and QDB
378	Keith H. Burrell	General Atomics	Expand the QH-mode density range by utilizing increased current and a different shape	QH Mode and QDB
379	Keith H. Burrell	General Atomics	Does transport set edge gradients in QH-mode?	QH Mode and QDB
380	Michio Okabayashi	Princeton Plasma Physics Laboratory	Systematic study of critical rotation profile of RWM by using I-coil and comparison with MARS	Resistive Wall Modes
381	Keith H. Burrell	General Atomics	Effect of error field minimization on QH-mode plasmas	QH Mode and QDB
382	Keith H. Burrell	General Atomics	Does the EHO enhance edge impurity loss?	QH Mode and QDB
383	Keith H. Burrell	General Atomics	Improved startup phase for quiescent H-mode	QH Mode and QDB
384	Keith H. Burrell	General Atomics	Investigate effect of fast wave heating on quiescent H-mode	QH Mode and QDB
385	Keith H. Burrell	General Atomics	RF sustained QH-mode	QH Mode and QDB
386	Keith H. Burrell	General Atomics	Do all ions have the same T_i in the SOL of QH-mode plasmas?	QH Mode and QDB
387	Keith H. Burrell	General Atomics	Demonstrate an ITER hybrid scenario using QDB plasmas	QH Mode and QDB
388	Jonathan G. Watkins	Sandia National Laboratories	Stochastic Boundary q95 scan at constant density	Pedestal and ELMs
389	George R McKee	University of Wisconsin, Madison	Parametric scaling of Geodesic Acoustic Modes characteristics	Confinement and Transport
390	Wojciech Fundamenski	JET, UK	Near-SOL Energy Transport in ELMy H-modes	Pedestal and ELMs
391	Mathias Groth	Lawrence Livermore National Laboratory	Fuel and impurity sources: Is the divertor region the primary source?	Divertor and Edge Physics
392	Mathias Groth	Lawrence Livermore National Laboratory	Poloidal distribution of the neutral density in the pedestal / SOL region	Divertor and Edge Physics

393	Mathias Groth	Lawrence Livermore National Laboratory	Midplane Da and CIII emission profiles in the low-field side pedestal region during ELMs	Divertor and Edge Physics
394	Mathias Groth	Lawrence Livermore National Laboratory	Dependence of the gas jet penetration depth on the plasma pressure during disruption mitigation exp	Stability
395	Andrea M Garofalo	Columbia University	Continuos measurement of RFA vs betaN and vs plasma rotation	Resistive Wall Modes
396	Andrea M Garofalo	Columbia University	Test wall stabilization vs. wall distance	Resistive Wall Modes
397	Michio Okabayashi	Princeton Plasma Physics Laboratory	RWM stabilization by forced rotation with synchronizing the rotating field	Resistive Wall Modes
398	Lang L Lao	General Atomics	Exploration of Error Field Effects on Magnetic Surfaces to Guide Modeling Efforts	Stability
399	Dave Humphreys	General Atomics	3/2 NTM Suppression Using Feedback on Realtime Measurement of q-surface location	Stability
400	Dave Humphreys	General Atomics	Comparison of Vertical Position Variation and Mirror Steering Control for NTM Suppression	Stability
401	Dave Humphreys	General Atomics	Study MIMO Controller Effects on Plasma Shape/Stability Regulation	Stability
402	Dave Humphreys	General Atomics	Study of ITER Control Issues	Stability
403	Edward Doyle	UCLA	Generate co-NBI QDB plasma using I-coil for ELM suppression	QH Mode and QDB
405	Michio Okabayashi	Princeton Plasma Physics Laboratory	Active MHD spectroscopy around 400 Hz and Improvement of RWM feedback in 2.4Li and AT plasmas	Resistive Wall Modes
406	Edward Doyle	UCLA	Control of ITB radius with ECCD in flat q-profile discharges	Advanced Scenario Development
			Obtaining high performance operation with Te~Ti	Advanced Development
408	Edward Doyle	UCLA	Obtaining QDB operation with Te~Ti	QH Mode and QDB
409	Edward Doyle	UCLA	Investigate and optimize beta limits in QDB plasmas	QH Mode and QDB
410	Michio Okabayashi	Princeton Plasma Physics Laboratory	Possibility of Feedback parameter selection leading to ELM free operation	Resistive Wall Modes

411	Edward Doyle	UCLA	Investigation of current hole discharges in DIII-D	Advanced Scenario Development
412	Holger Reimerdes	Columbia University	Measurement of coil-plasma coupling for different helicities	Resistive Wall Modes
413	Holger Reimerdes	Columbia University	Develop standard use of MHD spectroscopy in high performance plasmas	Advanced Scenario Development
414	Holger Reimerdes	Columbia University	q- and rotation-profile dependence of the critical rotation for RWM stabilization	Resistive Wall Modes
415	Holger Reimerdes	Columbia University	Develop low-rotation target using active magnetic braking and real-time rotation measurements	Resistive Wall Modes
416	Holger Reimerdes	Columbia University	Early non-resonant braking	Resistive Wall Modes
417	Holger Reimerdes	Columbia University	Complete frequency scan at high betaN	Resistive Wall Modes
418	Holger Reimerdes	Columbia University	RWM scenario with counter injection	Resistive Wall Modes
419	Holger Reimerdes	Columbia University	Aspect ratio effects on RWM stability (joint DIII-D / NSTX experiment)	Resistive Wall Modes
420	Terry L. Rhodes	UCLA	Next step towards predictive transport capability: Detailed comparison of expt. to turb. simulations	Confinement and Transport
421	Terry L. Rhodes	UCLA	Existence of high-k turbulence and tests of theoretical predictions	Confinement and Transport
422	Terry L. Rhodes	UCLA	Continue tests and validation of intermediate-k FIR scattering system	Confinement and Transport
423	Ioan N. Bogatu	Non-affiliated	RWM Internal Structure Evolution Identification by SXR Contrast Enhancing Technique on DIII-D	Resistive Wall Modes
424	Thomas A. Casper	Lawrence Livermore National Laboratory	Edge current and collisionality modification with EC power	Pedestal and ELMs
425	Thomas A. Casper	Lawrence Livermore National Laboratory	Transport scaling using EC injection into ITB discharge	Confinement and Transport
426	Thomas A. Casper	Lawrence Livermore National Laboratory	Performance scaling and control in QDB discharges.	QH Mode and QDB

427	Ali Mahdavi	General Atomics	Test of the peeling-ballooning mode theory of the pedestal pressure limit and understanding of the o	Pedestal and ELMs
428	Ali Mahdavi	General Atomics	PEDESTAL AND CONFINEMENT ENHANCEMENT AND DESNITY INCREASE WITH PELLET FUELING	Pedestal and ELMs
429	George R McKee	University of Wisconsin, Madison	Test of electron thermal transport mechanisms	Confinement and Transport
430	Jonathan G. Watkins	Sandia National Laboratories	ELM control using xpt fueling	Pedestal and ELMs
431	gary jackson	General Atomics	Sustained VH-mode with a Stochastic Edge	Pedestal and ELMs
432	Jonathan G. Watkins	Sandia National Laboratories	density control with xpt fueling	Divertor and Edge Physics
433	Jonathan G. Watkins	Sandia National Laboratories	drsep scan with stochastic boundary	Pedestal and ELMs
434	Jonathan G. Watkins	Sandia National Laboratories	Very Narrow Target Heat Flux in H mode	Divertor and Edge Physics
435	Jonathan G. Watkins	Sandia National Laboratories	Target Plate ELM measurements	Pedestal and ELMs
436	Paul B. Parks	General Atomics	Towards a high-density continuous gas jet fueling approach	Divertor and Edge Physics
437	Max Austin	University of Texas	Electron-ITB's dependence on magnetic shear and rational q	Confinement and Transport
438	Jonathan G. Watkins	Sandia National Laboratories	Test trip3D with detailed target plate profiles during stochastic boundary operation	Pedestal and ELMs
439	Akihiko Isayama	JAERI	Suppression of 2/1 Neoclassical Tearing Mode by Early EC Wave Injection	Stability
440	Edward Doyle	UCLA	Test of profile control using ECH	Advanced Scenario Development
441	R. Coelho	Associacao EURATOM/IST	NTM excitation and plasma momentum braking by resonant error-fields	Stability
442	Deepak Gupta	University of Wisconsin, Madison	Direct Comparison of Growth and Shearing Rates of Turbulence	and Transport

443	gary jackson	General Atomics	Low Toroidal Rotation RWM stabilization with n=3 Stochastic Fields	Resistive Wall Modes
444	Charles Greenfield	General Atomics	Feedback control of current profile	Advanced Scenario Development
445	Ronald V. Bravenec	University of Texas	Benchmarking turbulence codes against ETG-free discharges	Confinement and Transport
446	Charles Greenfield	General Atomics	Kinetic profile control tool development	Advanced Scenario Development
447	Charles Greenfield	General Atomics	Search for ETG Streamers	Confinement and Transport
448	Charles Greenfield	General Atomics	Initial studies of current holes	Advanced Scenario Development
449	Charles Greenfield	General Atomics	AT plasmas with Te~Ti	Advanced Scenario Development
450	John Ferron	General Atomics	Return to 1.6 T to apply what we have learned for increasing beta	Advanced Scenario Development
452	Charles Greenfield	General Atomics	Internal Transport Barriers with Te~Ti	Confinement and Transport
453	John S. deGrassie	General Atomics	RFCD Sustainment of Hi-Li post kappa ramp	HiLi-High Inductance Scenario
454	M. F. F. Nave	Associacao EURATOM/IST	RWM/RFA excitation and relation to the ELM mode structure	Resistive Wall Modes
455	Guiding Wang	UCLA	The edge pedestal formation in different types of H-mode plasmas	Pedestal and ELMs
456	Mickey R Wade	Oak Ridge National Laboratory	Dynamics of the EQ Transition in QH-mode	QH Mode and QDB
457	Guiding Wang	UCLA	Characterize L-H transitions with NBI power close to power threshold with high resolution diagnostic	Confinement and Transport
458	Mickey R Wade	Oak Ridge National Laboratory	Current Hole H-mode Discharges	Advanced Scenario Development

459	gary jackson	General Atomics	An I-coil ELM trigger	ELMs
460	Mickey R Wade	Oak Ridge National Laboratory	Impurity Enrichment Using Puff and Pump in Hybrid Scenario	Hybrid Scenarios
461	Francis W. Perkins	Princeton DIII-D Collaboration	Neoclassical Tearing Modes: Stabilization Requirements at Small Amplitude and Mode Locking	Stability
462	Phil Snyder	General Atomics	Toroidal Asymmetry of the ELM Crash	Pedestal and ELMs
463	Jeffery Harris	Australian National University	I-Coil & ELMs: cross correlation between MHD and edge/divertor probes	Pedestal and ELMs
464	gary jackson	General Atomics	I-coil Induced Plasma Rotation	Resistive Wall Modes
465	Mickey R Wade	Oak Ridge National Laboratory	Effect of Loop Voltage on L-H Transition	Confinement and Transport
466	Michael Makowski	Lawrence Livermore National Laboratory	Using ECH Density Control to Broaden Pressure Profile and Increase the Beta Limit	Advanced Scenario Development
467	Phil Snyder	General Atomics	Pedestal Studies Using Small Pellets	Pedestal and ELMs
468	Dylan P. Brennan	GA/ORISE	Poles in Delta-Prime on Approach to a Sawtooth Crash	Stability
469	Dylan P. Brennan	GA/ORISE	A Study of Tearing Evolution to NTMs at Slow Beta Ramp Rates	Stability
470	Punit Gohil	General Atomics	Collaborative ITB studies on DIII-D and JT-60U	Confinement and Transport
471	William W Heidbrink	UC Irvine	Monster sawteeth that never crash	HiLi-High Inductance Scenario
472	Mickey R Wade	Oak Ridge National Laboratory	Sensitivity of Particle Transport to Electron/Ion Heating Balance	Confinement and Transport
473	Phil Snyder	General Atomics	VH Mode Edge Characterization	Pedestal and ELMs
474	Mickey R Wade	Oak Ridge National Laboratory	Effect of Magnetic Shear on Particle Transport	Confinement and Transport

475	Francis W. Perkins	Princeton DIII-D Collaboration	Does the plasma spin the pedestal or does the pedestal spin the plasma?	Pedestal and ELMs
476	William W Heidbrink	UC Irvine	Beam-ion profile diagnostic using Dalpha light	Stability
477	Mickey R Wade	Oak Ridge National Laboratory	ELM Refueling Dynamics of Recycling/Non-Recyling Impurities	Divertor and Edge Physics
478	Michael J Schaffer	GA/ORISE	Reduce B-coil Feed Error	Stability
479	Michael Makowski	Lawrence Livermore National Laboratory	Broad Pressure Profiles in high-kappa Discharges	Advanced Scenario Development
480	Phil Snyder	General Atomics	VH Mode Edge Control	Pedestal and ELMs
481	John Ferron	General Atomics	ECCD stabilization of NTMs in AT discharges	Advanced Scenario Development
482	Holger Reimerdes	Columbia University	Test of neoclassical ripple viscosity in co- and counter-injection discharges	Stability
483	Guiding Wang	UCLA	Modulated electron particle transport studies in QDB/QH discharges	Confinement and Transport
484	Guiding Wang	UCLA	Modulated electron particle transport studies in QDB/QH discharges	QH Mode and QDB
485	Jose A Boedo	University of California, San Diego	Multi-diagnostic Transport Studies in the SOL	Divertor and Edge Physics
486	Robert I. Pinsker	General Atomics	Continuation of ECH/ECCD Sawtooth Effects Experiments	Stability
487	lei zeng	UCLA	SOL and Pedestal Evolution in DIII-D Stochastic Magnetic Boundary	Pedestal and ELMs
488	Dan M. Thomas	General Atomics	I-Coil perturbation effects on the edge current during ELM modification	Pedestal and ELMs
489	Massimo De Benedetti	ENEA-Euratom Association, Frascati, Italy	Rotation braking, intermediate rotation regime and momentum transport barriers	Stability
490	Ted Strait	General Atomics	Low-rotation target for RWM feedback experiments using feedback-controlled resonant magnetic braking	Resistive Wall Modes
491	Ted Strait	General Atomics	Tests of RWM feedback control in rotation-stabilized plasmas	Resistive Wall Modes
492	Francis W. Perkins	Princeton DIII-D Collaboration	ECCD/ECH Requirements for 100% Non-Inductive Discharges	Heating and Current Drive

494	Francis W. Perkins	Princeton DIII-D Collaboration	Observation of Ballooning Mode Turbulence	Confinement and Transport
495	Lang L Lao	General Atomics	QH-Mode Similarity Experiments in DIII-D and JT-60U	QH Mode and QDB
496	lei zeng	UCLA	Dynamics of pedestal perturbation during ELM	Pedestal and ELMs
498	Charles Greenfield	General Atomics	NCS AT scenario with qmin>2	Advanced Scenario Development
499	lei zeng	UCLA	Measurement of EHO Characteristics - Location and Amplitude	QH Mode and QDB