GA–A27813

DIII–D YEAR 2014 EXPERIMENT PLAN

by

DIII–D RESEARCH TEAM

JUNE 2014

GENERAL ATOMICS

DISCLAIMER

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GENERAL ATOMICS PROJECT 30200
JUNE 2014

FOREWORD

This document presents the planned experimental activities for the DIII-D National Fusion Facility for the fiscal year 2014. This plan is part of a five-year cooperative agreement between General Atomics and the Department of Energy (DOE). The Experiment Plan advances on the objectives described in the DIII-D National Fusion Program Five-Year Plan 2014–2018 (GA-A27526). 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 2014 plan is for 18 weeks of tokamak research operations.

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2014 Campaign — October 2013 to September 2014

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1. SYNOPSIS OF THE 2014 DIII-D RESEARCH PLAN

The research campaign for 2014 was organized into the three physics research areas making up the Experimental Science Division, with two additional task forces coordinated independently of that management structure (Fig. 1). After completion of the experimental run plan, the Boundary and Plasma Materials Interaction Center (BPMIC) was created within the DIII-D program (details in Section 1.2.3). This report describes the development of the research plan for 2014 prior to the creation of the BPMIC, with a brief description of the management plan going forward. Within the planned 18 weeks (90 days) of physics operation, a total of 72 days of physics experiments are planned, with 18 days set aside for contingency time based on historical trends. At this time, three weeks of the FY14 research campaign has already been run in October 2013. Of the remaining 15 weeks (75 days) of operation, 15 days are held for contingency and 8 days are dedicated to the 2014 National Campaign. Of the remaining 52 days, 80% (42 days) has been allocated to the research areas and task forces, with the remaining 20% of the run time (10 days) held in Director's Reserve. Approximately 79% (33 days) of this initial time allocation has been allocated to the physics research areas, and their associated working groups. This reflects the broad base and scientific depth of the DIII-D experimental program. The remaining 21% (9 days) is allocated to the task forces, which are more narrowly focused on critical, shorter term, issues. Any allocation to Torkil Jensen Award experiments is part of the Director's Reserve run time. The Torkil Jensen Award, up to one day of experimental run time per proposal, was established prior to the 2009 campaign to encourage submission of proposals for experiments that are focused on new research topics with the potential for exploring transformational physics using very innovative techniques. Decisions on the use of the Director's Reserve and National Campaign time are expected in June.

For 2014 DIII-D will participate in National Campaign experiments in coordination with the NSTX-U and Alcator C-Mod programs. Approximately 8 days of these experiments were executed as part of the October 2013 run period, and approximately 8 additional days of National Campaign experiments are anticipated by the end of the September 2014 run period. The National Campaign experiments executed in October 2013 addressed the following topics: 1) Radiation asymmetry during massive gas injection (MGI) for disruption mitigation, 2) Control of H-mode particle transport with electrom cyclotron heating (ECH), 3) Burn control using 3D fields, 4) Death ray probe studies, 5) Snowflake optimization for heat flux reduction, 6) Snowflake optimization for heat flux reduction, 7) Heat flux spreading by 3D fields, 8) Scrape-off layer (SOL) heat flux width in inner wall limited (IWL) plasmas, and 9) I-MODE optimization without sawteeth. The topics under consideration for these remaining 8 days are: 1) Off-axis current drive for steady-state tokamak operation, 2) Quantify the effect of configuration on operating window for divertor detachment and heat flux control, 3) Assess peak heat loads and radiation asymmetries during mitigated disruptions, 4) Pedestal control in edge localized mode (ELM)-free H-modes, and 5) Improve understanding of ion cyclotron radioe frequency (ICRF) – edge plasma interactions. Contact experts for each of the remaining National Campaign topics have been identified at each of the three participating institutions, and proposals for National Campaign experimental run days will be presented to the DIII-D Director in April.

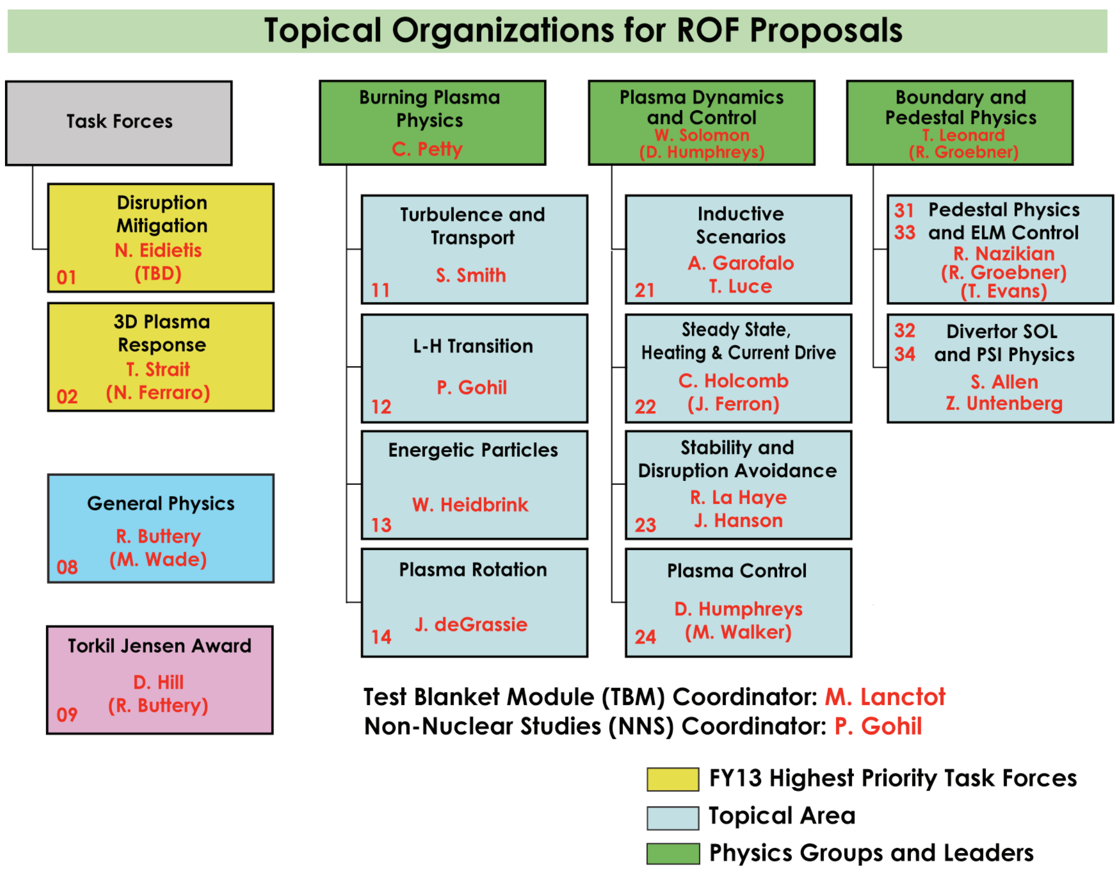

Fig. 1. The 2014 Experimental Campaign is organized into two task forces, the Torkil Jensen Award category, a General Physics category, and 10 working groups within the physics research areas of the Experimental Science Division. The task forces are considered high priority for the DIII-D program.

The DIII-D Director, in collaboration with the Research Council and the Experimental Science Division, identified high priority research areas for the DIII-D program for the 2014 run campaign. The high priority research topics are as follows:

- **Disruption Mitigation**: Reliable techniques for rapid and safe discharge termination would be of great benefit to ITER, especially over the next year during the licensing process. Research on this topic seeks to demonstrate methods for disruption mitigation (e.g., magnetic perturbations, shell pellets, shattered pellets, and massive gas injection) and support disruption modeling. This effort is organized as a task force under the Director of Experimental Science.

- **3D Plasma Response:** The effects of non-axisymmetric fields on tokamak plasmas can be either detrimental (loss of rotation, locked tearing modes) or beneficial (ELM suppression, rotation from neoclassical torque). In either case, it is crucial to understand the response of the plasma to externally imposed non-axisymmetric fields. DIII-D experiments will study the plasma response to applied non-axisymmetric fields using experimental measurements in comparison with analytic theories and numerical models such as IPEC, MARS-F and M3D-C1. This work addresses DIII-D Milestone 185 and the 2014 Joint Facilities Research Target. The effort is organized as a task force under the Director of Experimental Science.

- **Heat Flux Reduction and Plasma Detachment Through Variation in Divertor Conditions and Geometry:** Experiments in 2014 will explore control and stability of partially-detached divertor operation with the key goal of producing a radiating divertor plasma with low surface heat flux while preventing the cold dense plasma from entering the X-point region and compromising core plasma confinement. Our focus will not only include the detachment physics of the single-null and double-null divertor geometries commonly used in DIII-D experiments, but also the more "advanced" divertor geometries, such as those more representative of Super-X and Snowflake concepts. This work addresses DIII-D Milestone 186.

- **Nonlinear Interaction of Energetic Particles with Internal MHD Modes and Applied Fields:** Experiments this year will investigate the transition from steady state to bursting/frequency-chirping mode regimes as well as the underlying energetic particle (EP) transport using several diagnostic techniques including fast ion D_α (FIDA), pitch-angle and energy resolving scintillator detectors, foil detectors, 2.5 MeV neutron counters, and thermal infrared imaging of the vessel wall. Measurements will be compared to modeling that includes a self-consistent evolution of the mode and EP distribution as well as reduced models such as critical gradient and Monte-Carlo orbit following in the presence of prescribed modes. This work addresses DIII-D Milestone 187.

- **Establish Requirements for Control of Test Blanket Module (TBM)-induced Effects for ITER:** DIII-D experiments will investigate multi-coil (including local coil), multi-mode error field correction for control of TBM-induced effects including plasma rotation and confinement degradation as well as fast ion losses, in ITER relevant plasmas at high plasma β. The possible synergistic effects of core MHD and TBM fields on fast ion confinement will also be investigated. This work addresses DIII-D Milestone 188.

- **Driven Rotation for ITER:** High resolution edge flow measurements on DIII-D reveal a very localized, relatively high Mach flow. We expect this "intrinsic shear layer" to be present in ITER since it appears to be related to thermal ion orbit losses. Experiments will be performed in DIII-D to assess the relationship between this flow layer and the intrinsic toroidal rotation profile and explore means to increase the coupling between the edge layer and the inner bulk ion velocity. Results will be compared with simple theoretical ion loss models used to guide past experiments and to sophisticated codes such as NEO and the XGC-n code suite. This work addresses DIII-D Milestone 189.

- **Understanding and Improving Transport in Steady-State High q_{min} Scenarios**: on the steady-state path, the most critical issue is a focus on optimizing transport in high q_{min} regimes toward a self-consistent solution. Experience in 2013 showed that the challenges of maintaining high confinement in these discharges were related to fast ion loss. Studies planned and coordinated in the Dynamics and Control physics area in conjunction with transport experts from the Burning Plasma Physics area, will attempt to optimize these scenarios for high β_N operation.

- **High Priority Research Issues in the Burning Plasma Physics Area are**: 1) Characterizing electron, particle, and momentum transport through tests of gyrokinetic/gyrofluid predictions in reactor relevant conditions, 2) Testing techniques for controlling Alfvén eigenmodes that could potentially be applied to Advanced Tokamak (AT) plasmas, and 3) Developing a validated predictive model of fast ion transport due to Alfvén eigenmodes.

- **High Priority Research Issues in the Dynamics and Control Area Are**: 1) Scoping out paths to achieve $\beta_N = 5$, 2) conducting simulation experiments for long-pulse, high performance EAST scenarios, 3) Evaluating upper limit of performance of steady-state hybrid regime, and 4) Establishing reliable breakdown and early discharge evolution using available tools.

- **High Priority Research Issues in the Boundary and Pedestal Physics Area Are:** 1) Assessing the impact of magnetic geometry on detachment physics, 2) Informing physics models of radial transport/radial power widths, 3) Understanding the physics leading to edge harmonic oscillation (EHO) generation including the role of rotational shear (in collaboration with QH-mode research in the Dynamics and Control group), and 4) Identifying the physics mechanisms by which the resonant magnetic perturbation (RMP) regulates transport near the top of the pedestal.

Below we convey the essential content of the task forces and various physics research areas and their goals and anticipated results. The research described is based on an 18-week experimental campaign, of which 3 weeks were run in October of 2013, leaving 15 weeks in calendar 2014. To allow for hardware contingencies and 8 days of National Campaign experiments, experimental time has been allocated for 60 run days out of the remaining 75 run days, with 15 days of contingency. This includes up to 1 day of Torkil Jensen Award experiments within the 10 days of Director's Reserve run time. Additional detailed information can be found on the web, and related links: https://diii-d.gat.com/diii-d/Exp14.

The 2014 campaign follows a very successful FY2013 campaign in which 13 weeks of operation were completed. Experiments in 2013 continued to exploit the new capabilities added during the 2010–2011 Long Torus Opening Activity (LTOA), including: 1) reconfiguration of the 150-degree neutral beam line to provide 5 MW of neutral beam power that can be injected at any angle from horizontal on axis to 16.5 degrees tilted down off axis and 2) additional ECH power and pulse length (~5 s). In addition, for 2013 several significant diagnostic upgrades were implemented including: 1) an infrared television (IRTV) periscope viewing over 90 toroidal degrees of the vessel including the lower divertor, main chamber, and the upper divertor, and 2) a new Microwave Imaging Reflectometer (MIR) to complement the existing Electron Cyclotron Emission Imaging (ECEI) arrays. During this campaign, many experiments were conducted in support of physics areas identified by the International Tokamak Physics Activity (ITPA) working groups (Table I). These experiments continued to support long-term physics needs of ITER. While the ITER Design Review has been formally completed, many issues remain open and studies continue under the guidance of the ITER Science and Technology Advisory Committee (STAC). These, as well as other high priority physics issues for ITER, are given the highest priority in the 2014 experimental campaign. In 2014, DIII-D will also continue to actively support the ITPA through taking part in joint experiments (Table II).

Table I
DIII-D Experiments in 2012–13 Provided Data to Support Many ITPA Joint Experiments

ID No	Proposal Title	2012	2013
DIAG-2	Environmental tests on first mirrors	✔	
DIAG-3	Resolving the discrepancy between ECE and TS at high Te		
DIAG-4	Field test of a Capacitance diaphram Gauge as a Dust Monitor for ITER		
DIAG-5	Field test of an activation probe		
DIAG-6	Cross comparisons of Charge Exchange Recombination Spectroscopy and X-Ray Imaging Crystal Spectroscopy		
DSOL-23	Efficiency of ICRF conditioning		
DSOL-24	Disruption heat loads	✔	✔
DSOL-25	Melt layer motion and disintegration, droplet propagation and resulting impact on plasma performance		
DSOL-26	Marker experiments to study material migration	✔	
DSOL-27	Mitigation of fuel accumulation and impurity deposition in the gaps of castellated structures	✔	
DSOL-28	Narrow heat flux widths and divertor power dissipation		✔
DSOL-29	Behaviour of recrystallized tungsten under transient thermal shock		
DSOL-30	Performance of optimised castellations and of damaged surfaces under ITER relevant heat flux conditions		
EP-2	Fast ion losses and Redistribution from Localized Aes	✔	✔
EP-4	Effect of dynamical friciton (drag) at resonance on nonlinear AE evolution		✔
EP-5	TBM Induced Fast Ion Loss With Internal MHD Activity and RMP Fields	✔	
EP-6	Fast-Ion Losses and Associated Heat Load from Edge Perturbations (ELMs and RMPs)	✔	✔
EP-7	The impact of localised ECH on Alfven Eigenmode Activity	✔	✔
IOS-1.1	ITER baseline, at q_{95}=3, β_N=1.8, n_e=0.85n_{GW} (D, H, He)	✔	✔
IOS-1.2	Divertor heat flux reduction in ITER baseline scenario		✔
IOS-1.3	Operation near PLH		
IOS-3.2	Define access conditions to get to SS scenario	✔	✔
IOS-3.3	Core confinement for q(0)=2		✔
IOS-4.1	Access conditions for advanced inductive scenario with ITER-relevant restrictions	✔	✔
IOS-4.2	ρ^* dependence on transport and stability in hybrid scenarios	✔	Done
IOS-4.3	Collisionality scaling of confinement in advanced inductive plasmas	✔	✔
IOS-5.2	Maintaining ICRH Coupliing in expected ITER Regime.		
IOS 5.3	Assessment of lower hybrid current drive at high density for extrapolation to ITER advanced scenarios		
MDC-1	Disruption mitigation by massive gas jets	✔	✔
MDC-2	Joint experiments on resistive wall mode physics	✔	
MDC-8	Current drive prevention/stabilisation of NTMs	✔	✔
MDC-16	Runaway electron generation, confinement, and loss	✔	✔
MDC-17	Active disruption avoidance	✔	✔
MDC-18	Evaluation of Axisymmetric control aspects	✔	✔
MDC-19	Error field control at low plasma rotation		
MDC-20	Requirements for real-time sawtooth control		
MDC-21	Global mode stabilization physics and control		
MDC-22	Disruption prediction for ITER		
PEP-6	Pedestal Structure and ELM stability in DN		✔
PEP-19	Basic mechanisms of edge transport with resonant magnetic perturbations in toroidal plasma confinement devices	✔	✔
PEP-22	Controllability of pedestal and ELM characteristics by edge ECH/ECCD/LHCD	✔	
PEP-23+25	Quantification of the requirements for ELM suppression and mitigation by magnetic perturbations	✔	✔
PEP-26	Critical edge parameters for achieving L-H transition		
PEP-28	Physics of H-mode access with different X-point height		
PEP-29	Vertical jolts/kicks for ELM triggering and control		
PEP-30	ELM control by Pellet Pacing in ITER-like Plasma Conditions and Consequences for Plasma Confinement	✔	✔
PEP-31	Pedestal structure and edge relaxation mechanisms in I-mode	✔	✔
PEP-32	Access to and exit from H-mode with ELM mitigation at low input power above PLH		
PEP-33	Effect of current ramps on the L-H transition and on the stability and confinement of H-modes at low power above the threshold		
PEP-35	Compatibility of Pellet Fuelling with ELM Control Techniques	✔	✔
PEP-36	ELM energy losses and their dimensionless scaling in the context of operational parameters	✔	
TC-9 (fr. TP-6.1)	Scaling of intrinsic plasma rotation with no external momentum input	✔	
TC-12	H-mode transport and confinement at low aspect ratio		
TC-13	Ion and electron critical gradient and profile stiffness (change of title)	✔	✔
TC-14	RF Rotation Drive		
TC-15	Dependence of momentum and particle pinch on collisionality	✔	
TC-17	ρ^* scaling of the edge intrinsic torque		Done
TC-18	Dimensionless identiy experiment in I-mode		✔
TC-19	Chacteristics of I-mode plasmas		✔
TC-21	Characteristics of the LOC/SOC Transition		
TC-22	Evolution of transport during and immediately after H-mode to L-mode transitions		✔
TC-23	Physics on nonlocality phenomena		
TC-24	Impact of resonant magnetic perturbations on transport and confinement		✔
TC-10 (fr. TP-7)	Experimental identification of ITG, TEM and ETG turbulence and comparison with codes	✔	✔
TC-11	He and impurity profiles and transport coefficients (change of title)	✔	
MDC-15	Disruption database development		✔

Table II
DIII-D Experiments Planned for 2014 Will Support Many Joint Experiments of the ITPA

ID No.	Topical Group	Joint Experiment Description
PEP-19	Pedestal and edge	Basic mechanisms of edge transport with resonant magnetic perturbations in toroidal plasma confinement devices
PEP-23+25	Pedestal and edge	Quantification of the requirements for ELM suppression and mitigation by magnetic perturbations
PEP-30	Pedestal and edge	ELM control by pellet pacing in ITER-like plasma conditions and consequences for plasma confinement
EP-5	Energetic particles physics	TBM-induced fast ion loss with internal MHD activity and RMP fields
EP-7	Energetic particles physics	The impact of localized ECH on Alfvén eigenmode activity
IOS-1.1	Integrated operation scenarios	ITER baseline at q_{95}=3, β_N=1.9, n_e=0.85n_{GW} (D, H, He)
IOS-3.2	Integrated operation scenarios	Define access conditions to get to steady-state scenario
IOS-4.3	Integrated operation scenarios	Collisionality scaling of confinement in advanced inductive plasmas
MDC-8	MHD stability	Current drive prevention/stabilization of neoclassical tearing modes (NTMs)
MDC-15	MHD stability	Disruption database development
MDC-17	MHD stability	Active disruption avoidance
MDC-19	MHD stability	Error field control at low plasma rotation
MDC-22	MHD stability	Disruption prediction for ITER
TC-10	Transport and confinement	Experimental identification of ion temperature gradient (ITG), trapped electron mode (TEM) and electron temperature gradient (ETG) turbulence and comparison with codes
TC-24	Transport and confinement	Impact of resonant magnetic perturbations on transport and confinement

To enable the success of ITER by providing physics solutions to key physics issues is the highest priority of three overarching research areas for the DIII-D program. The ITER IO team participated in the process to plan the 18-weeks of experiments for 2014, including submission of 14 ROF proposals and consulting with DIII-D management through video conferences and Email proposals during the formulation of the run plan. ITER physics R&D needs incorporated in the program planning for 2014 include:

1. MHD stability, especially focusing on physics basis for the design of the Disruption Mitigation System (DMS) including high priority physics issues:
   a. Radiation peaking during the thermal quench (TQ),
   b. TQ and current quench (CQ) mitigation schemes,
   c. Runaway electron (RE) control schemes, and
   d. Disruption avoidance through tearing mode control with electron cyclotron current drive (ECCD) and 3D fields;

2. Divertor/Plasma Material Interaction (PMI) including:
   a. Divertor heat flux width scaling,
   b. Far SOL heat flux in the main chamber, and
   c. Impurity migration, fuel inventory and dust;

3. ELM control and pedestal physics especially focussing on:
   a. The physics basis for RMP ELM suppression,
   b. Optimizing pellet ELM pacing,
   c. Pedestal width and height scaling, and
   d. H-mode access in helium plasmas;

4. Transport and confinement including:
   a. Particle transport including fast ions,
   c. Intrinsic rotation scaling and,
   d. Stabilization of ETG and TEM turbulence;

5. Integrated operation scenarios including continuing investigation of candidate hybrid and steady-state scenarios;

6. Energetic particles including transport, redistribution and loss of fast particles and the effect of 3D fields on the losses, and;

7. The effects of localized 3D fields using the unique TBM mock-up device, including momentum transport, fast ion losses and the correction of the field effects at high beta.

The 18-week program plan for FY2014 provides experimental time for DIII-D to continue its leading roles in development of a physics basis for steady-state operation in ITER and beyond, and to advance the fundamental understanding of fusion plasmas along a broad front.

The 2014 experimental plan was compiled by the Experimental Science Division with advice on content and prioritization provided by the 2014 DIII-D Research Council. The Research Council reviews the research plan on an annual basis; for 2014 this was based on the new “DIII-D Five-Year Program Plan 2014–2018,” January 2014, GA-A27526. Adjustments are made for scientific and programmatic issues identified since that plan was written. As already stated, these deliberations consider the needs of ITER and ITPA, as well as input from the US Burning Plasma Organization.

The experimental plan supports three DOE Milestones 185–187 and two incremental milestones 188 and 189. One of these (Milestones 185) is in support of the Fusion Energy Science (FES) Joint Research Target.

Milestone 185: Quantify plasma response to externally imposed 3D fields — supports the Joint Facility Research Target (JRT) (September, 2014).

Milestone 186: Explore heat flux reduction and plasma detachment through variation in divertor conditions and geometry (September 2014).

Milestone 187: Investigate nonlinear interaction of energetic particles with internal MHD modes and applied fields (September 2014).

Milestone 188: Establish requirements for control of TBM-induced effects for ITER.

Milestone 189: Assess the physics of the localized bulk ion edge flow velocity as a source of non-beam driven rotation for ITER.

Joint Facility Research Target: **For both FES theory program and major facilities:**

Conduct experiments and analysis to investigate and quantify plasma response to non-axisymmetric (3D) magnetic fields in tokamaks. Effects of 3D fields can be both beneficial and detrimental and research will aim to validate theoretical models in order to predict plasma performance with varying levels and types of externally imposed 3D fields. Dependence of response to multiple plasma parameters will be explored in order to gain confidence in predictive capability of the models. Detailed Plan: The measured response will be compared to ideal and non-ideal MHD models in order to validate the predicted roles of screening and kink-resonant responses, and their dependence on parameters such as plasma rotation and plasma pressure. Each of the three major US facilities (C-Mod, DIII-D and NSTX) has the capability to apply 3D fields with a non-axisymmetric coil set. Coordinated experiments, measurements, and analysis will be carried out to assess the 3D plasma configurations that are created by these coils. Exploiting the complementary parameters and tools of the devices, joint teams will aim to improve the predictive understanding of the role that 3D fields play in tokamak plasmas. The research will strengthen the basis for avoiding the undesirable effects of 3D fields (loss of rotation, locked tearing modes) and enhancing their beneficial effects (ELM suppression, rotation drive) (September 2014).

In November 2013, a call for experimental research proposals towards the DIII-D objectives was issued and 418 proposals (Table III and Appendix A) were received and presented at a community-wide Research Opportunities Forum (ROF; https://fusion.gat.com/global/Rof2014) on February 11-13, 2014. The overall interest of the general fusion community in research on DIII-D is exemplified by the large number of proposal submissions that were received from universities (120) and foreign labs (37), including 14 proposals received directly from the ITER Organization (IO) in Cadarache, France. Remote participation, using H.323 video, was used in the plenary and most of the breakout sessions to allow participation by scientists at many remote locations in the US, including Princeton Plasma Physics Laboratory, Massachusetts Institute of Technology, and Oak Ridge National Laboratory, and internationally, including JET, ASDEX-Upgrade, EAST, TEXTOR and the ITER IO. The interest shown in the DIII-D program is partly a result of DIII-D's commitment to domestic and international collaborations as well as its participation in the ITPA process and the ITER Design Review. A listing of the proposals received at the ROF is included as Appendix A of this report and can be viewed at https://fusion.gat.com/global/Rof2014_submission.

Table III
Proposal Statistics for the 2014 Campaign

Area	Proposals Received	Unique Proposals (Est.)	Proposals in 18-week Plan for 2014 (Est.)	Backlog of Proposals Post 2014 (Est.)
Task Force and Torkil Jensen Award (reporting to Director of Experimental Science Division)				
Disruption mitigation	22	20	10	10
3D plasma response	34	31	6	25
General physics	1	1	0	1
Torkil Jensen Award	8	8	1	7
Physics Research Areas (reporting to Physics Research Area Leaders)				
Burning plasma physics	78	70	20	50
Dynamics and control	172	160	30	130
Boundary and pedestal physics	103	90	23	67
Totals	**418**	**390**	**90**	**280**

For 2014 the working groups reviewed these proposals and gathered additional ideas in response to results from the 2013 experimental campaign. The DIII-D Director provided guidance on the approximate run time anticipated in each physics area and task force. Reprioritization of the new set of proposals was done within the working groups and an overall prioritized run plan proposal, aligned with the run time guidance, was prepared in each physics group and task force, in discussion with the Director of Experimental Science Division. These plans were then presented to and confirmed by the Research Council. Based on this input, the Director established the final experimental run time allocation for each program area.

The final run plan (Tables IV and V and Fig. 2) reflects the DIII-D Team's commitment to support ITER Urgent Design Issues, as identified by the ITPA, US Burning Plasma Organization (BPO), the ITER Design Review Working Groups, and the ITER STAC. The plan is highlighted by experiments in support of urgent physics issues, where our research results may have an immediate impact on ITER operational plans. Experiments where DIII-D has unique capabilities to address these issues have been given highest priority.

Table IV
Run Time Allocations for the 2014 Experiment Campaign

Area	Description	Plan (Days)	ITPA/IEA Experiments	Area Leaders
Task Forces (reporting to Director of Experimental Science Division)				
Disruption mitigation	Develop a recommendation for ITER on the best rapid shutdown scheme	5	2	**N. Eidietis** TBD
3D plasma response	Test plasma response physics models against measurements	4	0	**T. Strait** N. Ferraro
General physics	Research outside the categories of the DIII-D program structure	0	0	**R. Buttery**, M. Wade
Torkil Jensen Award	Support experiments investigating potentially transformational physics using innovative techniques	1	0	**D. Hill,** R. Buttery
Physics Research Areas (reporting to Director of Experimental Science)				
Burning plasma physics	Advance the predictive capability of critical physics phenomena in burning plasmas	9	4	**C. Petty**
Dynamics and control	To develop viable integrated solutions for ITER, FNSF and a fusion power plant, understanding the physics basis to give confidence in extrapolation	14	6	**W. Solomon**
Boundary and pedestal physics	Provide physics understanding of SOL plasma, divertor plasma and plasma materials interaction toward solutions of steady state and transient heat and particle flux issues for ITER and future high power tokamaks	10	3	**T. Leonard,** **R. Maingi**
	Total allocated days	**43**	**15**	
	Director's reserve (includes National Campaigns)	**27**		
	Contingency	**20**		
	Available days	**90**		

DIII-D continues to have a large research backlog as is shown in Table III. A measure of this backlog is obtained from comparing the number of proposals that the area leaders expect can be reasonably completed in an 18-week campaign during 2014 (90) compared to the estimate of the total number of unique proposals (390). This leaves an estimated proposal backlog of 280 proposals. The 2014 campaign, therefore, will only allow an estimated 23% of the research proposed in the most recent (February 2014) Research Opportunities Forum (ROF) to be conducted.

The 18 run week experimental plan for 2014, summarized in Tables IV and V, consists of efforts in two task forces and three physics research areas. The physics research areas themselves are in turn made up of a total of 10 working groups (Fig. 1).

- **Torkil Jensen Award**

  Torkil was an extremely productive physicist whose long career was marked by innovative work on a wide variety of fusion-related subjects brought forward with a strong sense of optimism and enthusiasm. The Torkil Jensen Award was created to inspire proposals from the broader fusion community for experiments with potential for transformational new results with high visibility or scientific impact. This year, six proposals were submitted and will be reviewed by the award committee comprised of DIII-D and external experts chaired by David Hill of Lawrence Livermore National Laboratory (LLNL).

- **Task Force**

  Task Force on Disruption Mitigation (5 days). Disruptions pose an urgent challenge for ITER, with the need to develop a full mitigation design solution by 2016, and responsibility on the US to deliver that system. A strategy must be developed for handling or preventing the runaway beam that arises following thermal quench. Also the thermal quench itself must be mitigated in such as way as to avoid excessive localized heat loads, while also leading to acceptable current quench timescales. To meet these challenges, a disruption task force will be continued in the 2014 experimental campaign. Task Force experiments this year should focus on understanding and minimizing radiation asymmetries associated with the thermal quench, using shattered pellets and MGI and incorporating application of 3D fields and numerical simulation as appropriate. Related disruption mitigation experiments should emphasize quantifying and understanding what appears to be anomalous runaway electron dissipation; this is the most critical unresolved area of disruption research for ITER. An initial allocation of 5 days is provided. As new hardware is commissioned, we will consider the possibility of additional allocation to this field.

Task Force on 3D Plasma Response (including support of Milestone 185 and the 2014 JRT) (4 days). Strong results from experiments and analysis in 2013, including data from the expanded set of magnetic probes, positions the task force to make significant progress testing plasma response physics models and applying that understanding RMP ELM control and error field correction. The Task Force should coordinate efforts with the Boundary and Pedestal Physics group, especially in RMP physics. The installation of the Test Blanket Module mockup coil into the 285 port for the remainder of FY14 operations provides an additional localized field perturbation to aid this work.

- **Physics Research Areas**

Burning Plasma Physics (including support of Milestones 187 and 189) (9 days). Understanding the physics of a burning plasma is a key long-term challenge — to prepare the scientific basis for the understanding and exploitation of ITER and beyond, and to understand the optimization of plasmas for fusion grade performance. For 2014 the emphasis of the proposed experimental plan should be on testing gyrokinetic/gyrofluid predictions, exploring techniques for controlling Alfvén eigenmodes in AT plasmas [jointly with disruption and control (D&C) group], and developing a validated predictive model for fast ion transport. It is important for the detailed planning of proposed joint experiments with the other experimental science groups [D&C and boundary and pedestal (B&P)] be closely coordinated to arrive at an appropriate set of goals and plasma/system requirements. An initial allocation of nine days is provided for burning plasma physics experiments.

Dynamics and Control Research Area (including support of Milestone 188) (14 days). The Dynamics and Control program seeks to understand and optimize a wide range of operating scenarios and their research includes related control development. Effort in this area also supports a growing collaboration with the long-pulse superconducting EAST experiment. Priority should be given to the areas delineated in the run-time guidance memo, namely: evaluating the upper limit of performance of steady-state hybrid regime; scoping out paths to achieve β_N=5 transiently, conducting simulation experiments for long-pulse, high performance EAST scenarios, and establishing reliable breakdown and early discharge evolution using available tools. For the last category, it is important to have well defined scope and assessment metrics.

Boundary and Pedestal Physics (including support of Milestone 186) (10 days). This area is focused on the development of validated modeling capability to project boundary and pedestal behavior in future devices, and the development of innovative techniques for improved solutions in future devices. Priorities in 2014 should include:

divertor detachment physics, understanding the physics of the QH-mode EHO, and identifying the means by which the RMP regulates the pedestal to suppress ELMs. Given the complexity of the SOL/divertor physics, the large number of possible control parameters, and breadth of diagnostic information, it is essential that a coordinated set of prioritized critical questions be articulated to inform detailed planning. Experiments on ELM pellet pacing lack sufficient hardware support to schedule now, given the need to support higher priority disruption mitigation experiments. The plan should include one day using the Li dropper to explore the impact of reduced particle recycling on the pedestal and H-mode confinement. An initial allocation of 10 days is provided for Boundary and Pedestal experiments.

In addition to the formal structure of Task Forces and Physics Research Areas, in the 2014 run campaign there will be two efforts to coordinate experiments across the groups.

TBM Experiments: In February the ITER TBM mockup was installed in the 285 degree port and will be available for the remainder of the FY14 campaign. TBM experiments, which are proposed in several areas, will be carefully coordinated and appropriately integrated to ensure that experiments maximize the scientific benefit from such a localized field perturbation. The TBM is not likely to be available beyond FY14.

Non-Nuclear Campaign: Several experiments proposed during the ROF specified the need for either helium or hydrogen plasma operation, and identified relevance to the non-nuclear phase of ITER operation. The physics topics of these experiments span several research areas and would normally be scheduled separately to optimize participation. However, conversion of DIII-D operation to high purity helium or hydrogen plasmas and then back to deuterium requires between 1 and 2 days of plasma operation, so it is very inefficient to do this more than once per run campaign. Therefore, these experiments will be coordinated as a “Non-Nuclear Campaign” to be scheduled together in a block of successive run days.

The plans and goals for the various science areas are detailed below.

1.1. TASK FORCES FOR 2014

1.1.1. TASK FORCE ON DISRUPTION MITIGATION (Leader: N.W. Eidietis,)

This task force is responsible for developing improved disruption mitigation techniques for ITER.

1.1.1.1. Mission. Establish the physics basis for ITER to specify the best rapid shutdown scheme or combination of schemes.

1.1.1.2. Importance and Urgency. Unmitigated disruptions are a significant concern for ITER because of possible wall damage due to localized heat loads, vessel forces and runaway electron beams. Solutions to these issues will impact hardware decisions for ITER. The US IPO has been tasked with specifying the Disruption Mitigation System for ITER.

1.1.1.3. Research Areas for 2014.

- Understanding the toroidal and poloidal asymmetries of radiation, and the role of MHD mixing, during thermal and current quench phases of disruptions mitigated by MGI.
- Exploration of the critical electric field for runaway electron production and techniques for dissipation/mitigation of RE effects.
- Measuring and validating code predictions of main chamber heat loads during disruptions.

1.1.1.4. New and/or Unique Tools.

- New argon pellet injector to induce runaway electron beams in DIII-D.
- New CERBERUS MGI valve at different toroidal and poloidal location from existing MEDUSA MGI valve. Two-location massive gas injection is not itself unique, but offers unique opportunities to compare with the other techniques, and for diagnosis with DIII-D soft x-ray (SXR), electron cyclotron emission (ECE), hard x-ray (HXR) and other diagnostics.
- Shattered pellet injection with new bent-tube launching geometry for increased uniformity of spray of small particulates from shattered pellet. Experiments will target thermal quench radiative heat load mitigation and runaway mitigation.

- Runaway beam control developed to assess drive, sinks and mitigation of growing/mature runaway beams.

1.1.2. TASK FORCE ON 3D PLASMA RESPONSE (Leader: T. Strait, Deputy Leader: N. Ferraro)

This task force is responsible for measuring the magnetic plasma response to applied 3D fields and validating 3D models.

1.1.2.1. Mission. Understand the impact of applied/intrinsic 3D fields on plasma stability and transport through the use of a validated, predictive model of the magnetic plasma response to non-axisymmetric fields.

1.1.2.2. Importance and Urgency. This research recognized as sufficiently important and urgent at this time that it is the subject of the JRT for 2014. It is also the topic of DIII-D Milestone 185 for 2014, "Quantify plasma response to externally imposed 3D fields."

1.1.2.3. Research Areas for 2014.

- Measuring plasma response to external magnetic perturbation fields under plasma conditions [e.g. symmetric double null (DN) operation] for which simulations by 3D equilibrium codes can be validated.
- Determining the 3D plasma response during RMP ELM suppression/mitigation.
- Optimization of 3D applied fields for error field correction

1.1.2.4. New and/or Unique Tools.

- Comprehensive upgrade to in-vessel magnetics including increased poloidal and toroidal arrays of probes and flux loops
- Unique magnetic spectra generation (e.g., n=1,2,3) from external (C-coils) and internal coils (I-coils), and the localized fields from the TBM coils.

1.2. PHYSICS RESEARCH AREAS

Consistent with 2013, these research areas used for the organization of the 2014 experimental campaign parallel the organization of the DIII-D Experimental Science Division at the time of the formulation of the experimental run plan. Each consists of one or more working groups, reporting to the physics group leader.

1.2.1. DYNAMICS AND CONTROL (Leader: W.M. Solomon)

The priorities of this area flow from three principal goals in 2014: (1) to identify the optimization and control requirements for ITER Q=10 operation with low injected torque; (2) to understand the role of current profile in optimizing the performance for a fusion steady state; (3) to develop and perform basic characterization of the main candidate techniques for avoiding disruption events in ITER. Necessary stability and control work also flows from these objectives.

1.2.1.1. Mission. To develop viable integrated solutions for ITER, Fusion National Science Facility (FNSF) and a fusion power plant and understanding the physics basis to give confidence in extrapolation.

1.2.1.2. Importance and Urgency.

- In the coming years it is vital to anticipate the new physics conditions expected in ITER in order to develop the required re-optimizations and control approaches necessary to ensure ITER meets its main Q=10 research goals.
- Fusion power plants and nuclear science facilities require steady state regimes at higher performance levels than ITER. The approach for these regimes needs to be determined, in order to determine the research requirements for FNSF and a power plant, and the plant requirements for ITER in support of this mission.
- Disruptions remain the most critical challenge for ITER. The required mitigation solutions have not been determined, but if insufficient will result in damage to ITER. The US is responsible for developing the ITER disruption mitigation system by 2016. It is also mandatory to minimize incidence of disruptions (<1% in ITER) with suitable stability and control. For 2014 work on disruption mitigation techniques will be handled again by a task force, and work to develop disruption avoidance actuators will be done within this physics research area.

1.2.1.3. Research Areas for 2014. This physics group is organized into the following topical areas:

- **ITER Inductive Scenarios.** This area focuses on three candidate regimes for Q=10 operation in ITER: the baseline, QH-mode and advanced inductive. The focus in 2014 is: 1) Sustaining low torque QH-mode at high normalized fusion performance, 2) QH-mode creation and sustainment with ITER-relevant co-I_p neutral beam injection (NBI) torque, and 3) Determining EHO-induced particle transport rates at ITER-relevant conditions. This area will also explore ITER baseline scenario integration: Dominant electron heated, low torque (core) + ELM/heat flux control (edge). In 2015–18 the program will progress through exploring hydrogen/helium operation, L/H access, current profile role, implementation of ELM/EHO control, active disruption avoidance, radiative divertor solutions and innovative improvements from this or other parts of the program.

- **Steady-State Heating and Current Drive.** This area focuses on high β_N steady state potential exploring two principal lines for the core regime, the "high $\rho(q_{min})$" and the "high ℓ_i". Studies in 2014 focus on: 1) Understanding and improving $q_{min} > 2$ confinement and measure off-axis neutral beam current drive, 2) Maximizing beta and confinement in high performance, high q_{min} plasmas, and 3) Demonstrating existence of fully noninductive Q=5 scenario in ITER shape. This area will also explore the effectiveness of strike point sweeping and puff-and-pump on minimizing divertor tile temperatures in AT plasmas**.** In 2015 and beyond the focus will be on developing scenarios for FNSF and higher β_N power plant demonstrations, fully-aligned solutions, increased electron heating and low torque. In parallel the program will continue to pursue integration with edge solutions and implementing the necessary stability control. Relevant heating and current drive physics will also be explored.

- **Stability and Disruption Avoidance.** This area provides the underlying physics basis and control tools for stability pertinent to the scenarios above. Focus in 2014 is on: 1) Development of multi-harmonic error field control in ohmic and H-mode plasmas, 2) Disruption avoidance by improving 2/1 neoclassical tearing mode (NTM) control with steered mirror ECCD. Later years will develop these themes with increased understanding of 3D field interactions, progress towards routine disruption avoidance or event recovery, and if needed, resistive wall mode control. The effort of this group in past years to evaluate the full 3D equilibrium responses to applied magnetic perturbations for model validation will be part of the focus of the new 3D Plasma Response Task Force for 2014.

- **Control Group** seeks to integrate cutting edge control science with stability and configuration control techniques in order to provide robust disruption free operation in ITER and future devices. In 2014, the program supports the above stability and scenario developments, and in particular seeks to develop current profile control actuators to access and maintain high performance steady-state profiles. Later years will see an increasing focus on controlled operation near the margins with robust and active disruption avoidance.

1.2.1.4. New and/or Unique Tools for 2014.

- High power ECH/ECCD (six gyrotrons) with real time steering having significantly improved precision and response time in 2014, for off-axis current drive and stability control.
- Counter-NBI, provided by the rotated 210 degree beamline, allows control of applied torque decoupled from heating power, facilitating low-rotation studies.
- Off-axis NBI provided by the 150° beamline allows off-axis neutral beam current drive.
- The pumped divertor regions facilitate particle control in plasma shapes optimized for high β.
- The internal I-coil (with all 12 coils in operation for 2014) and external C-coil for unique harmonic flexibility to provide/optimize simultaneous error field, neoclassical toroidal viscosity (NTV) rotation and resistive wall mode (RWM) control.

1.2.2. BURNING PLASMA PHYSICS (Leader: C.C. Petty)

1.2.2.1. Mission. Advance the predictive capability of critical physics phenomena in burning plasmas.

1.2.2.2. Importance and Urgency. Understanding the underlying mechanisms behind observed physical phenomena is critical for the design and operation of future devices. Validation of comprehensive physics models in the areas of transport and energetic particles will be a key focus of this group.

1.2.2.3. Research Area for 2014. This physics area is organized into two topical groups, Energetic Particles and Transport. For planning purposes, the latter group is further divided into core transport and turbulence, plasma rotation, and the L-H transition. In addition, the integrated modeling effort resides in the Burning Plasma Physics area. It is involved in general model development and serves as our liaison to other DIII-D groups that are strongly involved with model and software tool development. Members of the

Burning Plasma Physics area are expected to work with the other physics areas on transport and energetic particle issues of importance.

- **Energetic Particles**. This research program strives to validate theoretical models of fast-ion instabilities, to predict their consequences in ITER, and to develop the means to control their effects. The experimental goals for this year are to: 1) understand the nonlinear dynamics (chirping) of Alfvén eigenmodes, and 2) explore the control of Alfvén eigenmodes with I-coil perturbations.

- **Core Transport and Turbulence**. The long-term goal of this group is a predictive understanding of transport embodied in a suite of well tested modeling codes. The transport model validation approach on DIII-D utilizes a primacy hierarchy that addresses multiple levels, the goal being to determine whether success/failure is systematic (multiple channels, a range of spatiotemporal scales) or is limited to certain areas. Experiments this year will focus on: 1) q_{min} dependence of transport at high beta, 2) Connection between momentum and particle transport with varying dominant modes. This group will also continue to analyze and model experiments from 2012 as part of the JRT that tested the profile stiffness and critical gradient predictions in the trapped gyro-Landau fluid (TGLF) code against experimental data.

- **Plasma Rotation**. Goal this year is to understand the effect of the localized TBM fields on plasma rotation at significant plasma beta, and to quantify the edge flow layer through a combination of reciprocating probe and new main ion charge exchange recombination (CER) measurements near the plasma boundary.

- **L-H Transition**. The proposal this year is to focus on the underlying fluctuations physics behind the isotope dependence of the L-H transition threshold power by comparing hydrogen and deuterium plasmas. A full fluctuation diagnostic set [beam emission spectroscopy (BES), Doppler backscattering system (DBS) and midplane reciprocating probe] and a near-ITER-like plasma shape are important aspects of these experiments.

1.2.2.4. New and/or Unique Tools.

- DIII-D’s uniquely comprehensive diagnostic set facilitates the detailed science studies done in the Burning Plasma Physics area. New or improved diagnostics include fast time response photomultipliers for FILD, inboard/outboard CER chords with improve spatial resolution in the pedestal region and an increased number of chords measuring the main ion temperatures and rotation velocities for 2014, HF-CHERS, and a flexible 2D fiber optic holder for BES.

- Unique capabilities to vary shape, heating location and mix, and density. The off-axis beam and real time steerable ECH launchers, with improved response time and increase aiming precision for 2014, are an important enhancement to our ability to vary the heating profile.
- Overlapping spectral coverage of fluctuation measurements including the ITG, TEM and ETG regimes.

1.2.3. BOUNDARY AND PEDESTAL PHYSICS (Leaders: A.W. Leonard and R. Maingi)

NOTE: Recognition of the importance of this area led to the creation of the BPMIC organization in March 2014. This organizational change was done after the run plan for the 2014 experimental campaign had been completed. The BPMIC will take responsibility for the divertor/SOL and plasma material interaction (PMI) research described below, including supervising the execution of the experiments in this area for 2014, and generation of the run plan for experiments in this area for 2015 and beyond. The pedestal and ELM physics research described below will be a new research area within the DIII-D Experimental Science Division for the remainder of 2014 and beyond, with responsibility for execution of 2014 experiments in these areas and generation of the run plan in these topics for 2015 and beyond.

1.2.3.1. Mission. Provide physics understanding of SOL plasma, divertor plasma and plasma materials interaction toward solutions of steady state and transient heat and particle flux issues for ITER and future high power tokamaks.

1.2.3.2. Importance and Urgency. Determining and understanding the physics of SOL plasma, divertor plasma and plasma materials interactions is critical for the design and operation of ITER and future devices.

1.2.3.3. Research Areas for 2014. This physics group is organized into the following topical areas.

- **Pedestal.**
  - o Pedestal Opimization**.** Examine proposed mechanisms governing transport in the pedestal, including, kinetic ballooning modes (KBMs), electron temperature gradient (ETG) and Paleoclassical transport and use understanding to optimize the height and width of the pedestal. For 2014 the focus will be on the effect of Lithium conditioning on the pedestal performance, and the scaling of pedestal peak parameters with Z_{eff}.
  - o Pedestal Evolution Studies. Use enhanced pedestal diagnostics to test gyrokinetic models of pedestal recovery evolution from just after the ELM crash to the next

ELM including looking for evidence of a radial pinch in pedestal particle transport.

- **Divertor and SOL Physics.**
  - Divertor Detachment and Plasma Flows. Test models of detachment onset and the interaction of plasma flows with attached and detached divertor plasmas. Explore configurations with potential for enhanced divertor detachment and heat flux spreading control. For 2014 the focus will be on: 1) Quantifying the dependence of detachment on parallel heat flux with new diagnostics in both L-mode and H-mode plasmas and 2) Demonstrating control and detached divertor operation during operation with enhance poloidal flux expansion (e.g. using a Snowflake divertor configuration).
  - Thermal Transport in the Plasma Boundary. Develop understanding of the heat transport in the plasma SOL and divertor toward predictive capability for ITER including fluctuation driven transport in the SOL. Examine the SOL transport and profiles that lead to the observed scaling of divertor heat flux width. For 2014 the focus will be on adding detached divertor cases and inner wall limited configurations (relevant to ITER startup scenarios) to the growing database of SOL heat flux width scaling.

- **ELM Control.**
  - Resonant Magnetic Perturbations. Determine the physical processes that lead to ELM suppression with the application of RMP fields. This includes the plasma response to determine the actual magnetic field structure within the plasma, and the mechanism for enhanced transport that limits the pedestal profiles to below the critical ELM gradients. For 2014 the focus will be on: 1) quantifying the magnetic structure including the plasma response during RMP application, and 2) determining the mechanism for enhanced particle transport at the top of the pedestal during RMP ELM suppression
  - QH-mode. Establish the viability of utilizing QH-mode in ITER. For 2014 the focus will be to determine the physics of the critical rotation shear needed to generate the saturated EHO instability by comparing co-I_p vs counter-I_p beam injection in QH-mode.
  - Pellet ELM Pacing. Establish the viability of pellet ELM pacing for ITER. Demonstrate that rapid pellets can increase the ELM frequency by at least a factor of 10 with little degradation to plasma confinement. Determine the minimum pellet penetration into the pedestal that still triggers an ELM. Demonstrate the compatibility of pellet ELM pacing with high field side central pellet fueling. For 2014 the focus will be on establishing robustness of pellet pacing technique, and

minimum pellet size for ELM triggering. However the pellet pacing hardware will be provided on a best effort basis by personnel who are also responsible for the very high priority systems [MGI, shattered pellet injection (SPI), Ar pellet injector] for the disruption mitigation toroidal field (TF). Scheduling of pellet pacing experiments awaits decisions about Director's Reserve experimental time.

- **Plasma Material Interface.**
  - High-Z Material Erosion. Measure the gross and next erosion rate for high-Z materials, Mo or W, using the DiMES facility. Compare the results with models for gross and net erosion. For 2014 the experiment will expose both W samples to high temperature, low density L-mode plasmas with simultaneous puffing of methane gas near the DiMES sample to test the mitigation of high-Z erosion by low-Z shielding gas.
  - Low-Z Material Erosion and Mitigation. Use the DiMES facility to expose aluminum samples (as a good proxy for ITER-relevant beryllium) to ELMing H-mode plasmas. This experiment is part of a PhD thesis.

1.2.3.4. New and Unique Tools.

- 2D profile of SOL and divertor carbon flow velocity using a coherence imaging diagnostic.
- Improved divertor Thomson scattering with a new higher power and higher frequency laser, and significantly improved accuracy for low temperature measurements down to 0.5 eV in 2014.
- New periscope for large area views of the vessel surface in visible and infrared (IR) emission.
- Combination of upper and lower internal perturbation coils (I-coils) capable of high frequency or high current operation with external error field correction coils (C-coils).
- Unique diagnostics, such as tangential soft x-ray imaging at the X-point region and above midplane magnetic probes, to measure plasma response including resonant field amplification and island formation.
- Application of state-of-the-art modeling tools such as MARS-F, PIES, VMEC, M3DC1, ELITE, XGC0 and other codes to assess the plasma response to non-axisymmetric fields, in collaboration with the 3D Plasma Response TF.
- Flexible coils (I-coils and C-coils) to produce non-resonant fields for driving NTV plasma flows.

1.3. RESEARCH PROPOSALS RECEIVED

A detailed list of research proposals received during the December 2013 ROF is given in Appendix A. These proposals formed the basis for the planning of the 15 remaining weeks of the FY2014 run campaign.

Table V
Detailed list of Scheduled Experiments for the 2014 Experiment Campaign

Date	Title	Area	SL
9/29/13	Boronization/bake	Operations	Lee, R.
9/30/13	Plasma startup	Operations	Hyatt, A.
10/1/13	Plasma startup	Operations	Hyatt, A.
10/1/13	Control of H-mode particle transport with ECH	Transport	Ernst, D.
10/2/13	Control of H-mode particle transport with ECH	Transport	Ernst, D.
10/2/13	Plasma startup	Operations	Hyatt, A.
10/3/13	ITER baseline transport with core electron heating	Transport	Petty, C.
10/4/13	Effect of Alfvén eigenmodes on NBCD	Energetic particles	Podesta, M.
10/7/13	Optimize High-ℓ_i scenarios for ITER	Inductive scenarios	Ferron, J.
10/8/13	Snowflake divertor optimization for heat flux mitigation	Divertor and SOL physics	Soukhanovskii, V.
10/9/13	Most promising scenario	Inductive scenarios	Wade, M.
10/10/13	Burn control using 3D fields	Plasma control	Hawryluk, R.
10/10/13	SOL density profile for helicon antenna design tests	Plasma control	Prater, R.
10/11/13	Snowflake divertor optimization for heat flux mitigation	Divertor and SOL physics	Soukhanovskii, V.
10/14/13	Extended development and assessment of I-mode on DIII-D	ELM control	Whyte, D.
10/15/13	Make-up for time lost Oct 9 – Expt 21-02	Operations	Turco, F.
10/15/13	Make-up for time lost Oct 7 – Expt 21-01	Operations	Ferron, J.
10/16/13	Transport vs ExB shear in advanced inductive	Transport	McKee, G.
10/17/13	Heat flux mitigation by 3D fields	Divertor and SOL physics	Ahn, J.
10/17/13	Sheath physics studies	Divertor and SOL physics	Watkins, J.
10/17/13	SOL heat flux width in IWL plasma	Divertor and SOL physics	maingi, r.
10/18/13	MGI and radiation asymmetry	Disruptions TF	Granetz, R.
3/19/14	Plasma startup	Operations	Hyatt, A.
3/20/14	Plasma startup	Operations	Hyatt, A.
3/21/14	Plasma startup	Operations	Hyatt, A.
3/24/14	Plasma startup	Operations	Hyatt, A.
3/25/14	Plasma startup	Operations	Hyatt, A.
3/26/14	Plasma startup	Operations	Hyatt, A.
3/27/14	Plasma startup	Operations	Hyatt, A.
3/28/14	Plasma startup	Operations	Hyatt, A.
3/31/14	Plasma startup	Operations	Hyatt, A.
4/1/14	Plasma startup	Operations	Hyatt, A.
4/2/14	Plasma startup	Operations	Hyatt, A.
4/3/14	Plasma startup	Operations	Hyatt, A.
4/4/14	Plasma startup	Operations	Hyatt, A.
4/7/14	Plasma startup	Operations	Hyatt, A.
4/11/14	Plasma startup	Operations	Hyatt, A.
4/12/14	Boronization/bake	Operations	Lee, R.
4/14/14	QH-mode, EHO critical rotation gradient, Fwd-I_p	ELM control	Burrell, K., Nazikian, R.
4/15/14	Sustain low torque QH-mode at high normalized fusion performance	Inductive scenarios	Garofalo, A., Fenstermacher, M.

4/16/14	TBM momentum transport – estimating the TBM-induced torque in TBM modulation experiment	Plasma rotation	Tala, T., Logan, N.
4/16/14	Profile control (current and pressure)	Plasma control	Barton, J.
4/17/14	Plasma response with n=2 fields	3D plasma response TF	Paz-Soldan, C.
4/18/14	Explore paths for reducing fast ion transport in high $q_{\min}$ plasmas	Steady-state scenarios	Holcomb, C., Heidbrink, W.
4/18/14	Reduce fast-ion transport from Alfvén eigenmodes in high $q_{\min}$, steady-state scenario plasmas	Energetic particles	Heidbrink, W.
4/21/14	Explore access to β_N~5 using high $q_{\min}$ approach – Day 1	Steady-state scenarios	Hanson, J.
4/21/14	Improve efficiency of scenario development – Day 1	Steady-state scenarios	Jackson, G., Humphreys, D.
4/22/14	q-resonance of n<12 coil RMP ELM control	ELM control	Orlov, D., Nazikian, R.
4/22/14	DiMES high-Z erosion mitigation by low-Z gas	Plasma material interaction	Rudakov, D.
4/23/14	Divertor detachment dependence on power, $q_{\|\|}$	Divertor and SOL physics	McLean, A., Unterberg, E.
4/24/14	Contingency	Operations	Fenstermacher, M.
4/24/14	NTM control hardware/software – Day 1	Plasma control	Kolemen, E.
4/25/14	Unmitigated disruption heat loads	Disruptions TF	Hollmann, E.
5/2/14	Plasma startup	Operations	Hyatt, A.
5/3/14	Boronization/bake	Operations	Lee, R.
5/5/14	Stabilize ETG and TEM in QH-mode Day 1	Transport	Ernst, D.
5/6/14	QH-mode, EHO critical rotation gradient, Rev-I_p	ELM control	Burrell, K.
5/7/14	Stabilize ETG and TEM in QH-mode Day 2	Transport	Ernst, D.
5/8/14	Transport characterization at the top of the pedestal in RMP ELM suppressed plasmas	ELM control	Smith, S., Nazikian, R.
5/8/14	NTM Control Hardware/Software - Day 2	Plasma control	Kolemen, E.
5/9/14	Contingency	Operations	Fenstermacher, M.
5/9/14	Higher Z quiescent runaway electron dissipation	Disruptions TF	Paz-Soldan, C., Hollmann, E.
5/12/14	Plasma response data for model validation	3D plasma response TF	King, J., Strait, E.
5/13/14	Effect of lithium conditioning on the H-mode pedestal profiles and ELM stability	Pedestal physics	Jackson, G.
5/14/14	Pedestal Response to n=3 RMP in ISS ELM suppressed and ELM mitigated plasmas	3D plasma response TF	Nazikian, R.
5/14/14	RMP 3D magnetic structure	ELM control	Nazikian, R.
5/15/14	Sustained zero torque ITER baseline scenario - Day 1	Inductive scenarios	Paz-Soldan, C.
5/15/14	Divertor detachment control	Plasma control	Kolemen, E.
5/16/14	Dependence of thermal quench radiation asymmetry on plasma properties	Disruptions TF	Shiraki, D., Paz-Soldan, C.
5/19/14	Concentrated losses of fast ions by core MHD/3D fields combined with TBM - synergy between MHD and TBM fields on fast ion losses: AE, NTM, sawtooth	Energetic particles	Pace, D.
5/20/14	Correction of TBM mock-up field at high β: Role of field amplification – Day 1	3D plasma response TF	Lanctot, M.
5/20/14	Snowflake geometry control	Plasma control	Kolemen, E.
5/21/14	Explore access to β_N~5 using high $q_{\min}$ approach – Day 2	Steady-state scenarios	Hanson, J.
5/21/14	Improve efficiency of scenario development – Day 2	Steady-state scenarios	Luce, T.

5/22/14	Evaluate upper limits of performance for steady-state "Hybrid" regime – Day 2	Steady-state scenarios	Turco, F.
5/23/14	Contingency	Operations	Fenstermacher, M.
5/23/14	RE plateau dissipation and final loss	Disruptions TF	Hollmann, E.
6/6/14	Plasma startup	Operations	Hyatt, A.
6/9/14	Sustained zero torque ITER baseline scenario – Day 2	Inductive scenarios	Paz-Soldan, C.
6/10/14	Effect of collisionality and Z_{eff} on pedestal structure in peeling and ballooning mode limited regimes	Pedestal physics	Osborne, T.
6/11/14	Edge flow layer: Mach probe and edge main ion CER	Plasma rotation	Battaglia, D.
6/11/14	Magnetic fluctuations and electromagnetic turbulence	Transport	Rhodes, T.
6/12/14	TBM effects in the low torque ITER baseline	Inductive scenarios	Lanctot, M.
6/12/14	Start-up control development	Plasma control	Jackson, G.
6/13/14	Correction of TBM mock-up field at high β: Role of field amplification – Day 2	3D plasma response TF	Lanctot, M.
6/13/14	Contingency	Operations	Fenstermacher, M.
6/16/14	Collisionality scaling of transport in advanced inductive (Hybrid) plasmas	Transport	Yan, Z.
6/16/14	Collisionality scaling of transport in advanced inductive plasmas	Inductive scenarios	Yan, Z.
6/17/14	Enhanced radial diffusion with poloidal flux expansion	Divertor and SOL physics	Soukhanovskii, V.
6/17/14	Off normal fault response tests II	Plasma control	Humphreys, D.
6/18/14	Validate critical gradient model of Alfvén eigenmode transport	Energetic particles	Heidbrink, W., Van Zeeland, M.
6/18/14	ECH control of Alfvén eigenmode stability	Energetic particles	Van Zeeland, M., Pace, D.
6/19/14	Edge flow layer: Mach probe and edge main ion CER	Plasma rotation	Battaglia, D.
6/19/14	Contingency	Operations	Fenstermacher, M.
6/20/14	Testing kinetic RWM stabilization theory at marginal stability	Steady-state scenarios	Sabbagh, S.
6/23/14	Explore access to β_N~5 using high-ℓ_i approach	Steady-state scenarios	Ferron, J., Holcomb, C.
6/24/14	Investigation and optimization of current ramp-up	Inductive scenarios	Solomon, W.
6/24/14	Transport during current ramp-up and ramp-down in ITER baseline	Transport	McKee, G.
6/25/14	Identify heat flux width scaling physics	Divertor and SOL physics	Makowski, M.
6/26/14	Contingency	Operations	Fenstermacher, M.
6/26/14	Contingency	Operations	Fenstermacher, M.
6/26/14	Powered VFI control	Plasma control	Hyatt, A.
6/27/14	SPI/MGI comparison for TQ mitigation – Day 2	Disruptions TF	Commaux, N.
7/11/14	Plasma startup	Operations	Hyatt, A.
7/12/14	Boronization/bake	Operations	Lee, R.
7/14/14	Investigation of high-Z impurity behavior in QH-mode and radiative divertor	Inductive scenarios	Grierson, B., Garofalo, A.
7/15/14	Optimize high β_P scenario for EAST	Steady-state scenarios	Gong, X.
7/16/14	Stationary advanced inductive plasmas without tearing modes	Inductive scenarios	Xu, G.
7/17/14	Evaluate upper limits of performance for steady-state "Hybrid" regime – Day 1	Steady-state scenarios	Petty, C.
7/17/14	Contingency	Operations	Fenstermacher, M.
7/17/14	β_N control	Plasma control	Kolemen, E.
7/18/14	RE Plateau dissipation and final loss	Disruptions TF	Hollmann, E.

7/21/14	Director's Reserve	Operations	Wade, M.
7/22/14	Director's Reserve	Operations	Wade, M.
7/23/14	Director's Reserve	Operations	Wade, M.
7/24/14	Director's Reserve	Operations	Wade, M.
7/24/14	METIS Day 1	Plasma control	Moreau, D.
7/25/14	Director's Reserve	Operations	Wade, M.
7/28/14	Director's Reserve	Operations	Wade, M.
7/29/14	Director's Reserve	Operations	Wade, M.
7/30/14	Director's Reserve	Operations	Wade, M.
7/31/14	Director's Reserve	Operations	Wade, M.
7/31/14	RMP ELM control	Plasma control	Kolemen, E.
8/1/14	Contingency	Operations	Fenstermacher, M.
8/4/14	Director's Reserve	Operations	Wade, M.
8/5/14	National campaign experiment	Operations	Wade, M.
8/6/14	National campaign experiment	Operations	Wade, M.
8/7/14	National campaign experiment	Operations	Wade, M.
8/7/14	METIS Day 2	Plasma control	Moreau, D.
8/8/14	National campaign experiment	Operations	Wade, M.
8/22/14	Plasma startup	Operations	Hyatt, A.
8/23/14	Boronization/bake	Operations	Lee, R.
8/25/14	RMP ELM control in helium plasmas	ELM control	Evans, T.
8/26/14	DiMES low-Z erosion – aluminum	Plasma material interaction	Chrobak, C.
8/26/14	Contingency	Operations	Fenstermacher, M.
8/27/14	Isotope scaling of L-H and H-L power thresholds in hydrogen and deuterium plasmas	L-H transition	Gohil, P., Yan, Z.
8/28/14	National campaign experiment	Operations	Wade, M.
8/28/14	Real time EFC with SURFMN	Plasma control	Kolemen, E.
8/29/14	Contingency	Operations	Fenstermacher, M.
9/1/14	National campaign experiment	Operations	Wade, M.
9/2/14	National campaign experiment	Operations	Wade, M.
9/3/14	National campaign experiment	Operations	Wade, M.
9/4/14	National campaign experiment	Operations	Wade, M.
9/4/14	Stability boundary control	Plasma control	Kolemen, E.
9/5/14	Contingency	Operations	Fenstermacher, M.
9/8/14	Contingency	Operations	Fenstermacher, M.
9/9/14	Contingency	Operations	Fenstermacher, M.
9/10/14	Contingency	Operations	Fenstermacher, M.
9/11/14	Contingency	Operations	Fenstermacher, M.
9/11/14	Control TBD	Plasma control	Humphreys, D.
9/12/14	Contingency	Operations	Fenstermacher, M.

1.4. THE 2014 OPERATIONS SCHEDULE

The operations schedule is designed for efficient and safe use of the DIII-D facility. Eighteen calendar weeks of plasma physics operations are scheduled for the fiscal year 2014, of which 3 weeks were run in October 2013. The operations schedule is shown in Fig. 2. Operations in 2014 are carried out 5 days per week for 8.5 hours (8:30 am – 5:00 pm) with 2 hours of additional run time each week dedicated to development and testing of plasma and operations control algorithms. The 2014 operations schedule can be viewed at http://d3dnff.gat.com/Schedules/fy2014Sch.htm. FY2014 operations are scheduled to end on September 12, 2014.

In addition to operating the tokamak, maintenance has to be performed and new hardware is being installed to enhance DIII-D capabilities. The schedule calls for these maintenance activities to be carried out during the weeks that the tokamak is not operating.

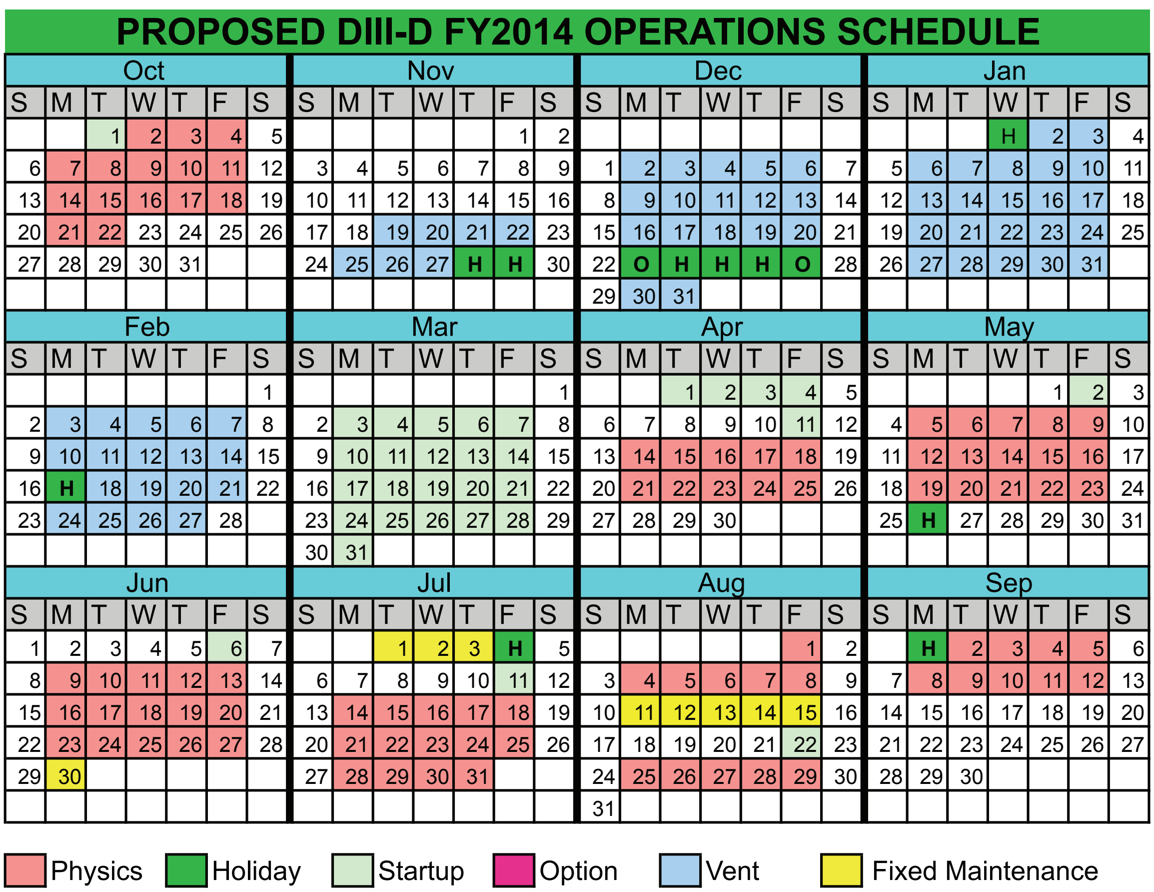

Fig. 2. DIII–D master schedule FY2014 (18-week plan).

ACKNOWLEDGMENT

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APPENDIX A
RESEARCH PROPOSALS RECEIVED

ID	Title	Research Area	Name	Affiliation
385	The effect of LSN shape on the q_{95} windows in RMP ELM suppression	ELM control	deGrassie	GA
386	Measure intrinsic rotation size scaling in DIII-D alone -II	Plasma rotation	deGrassie	GA
387	3D fields and ECH density pumpout	Turbulence & transport	deGrassie	GA
388	High collisionless NBI torque drive for GAMs, aka the VH-mode path?	Turbulence & transport	deGrassie	GA
389	Effect of n=1 applied and error fields on n=3 RMP ELM suppression	ELM control	deGrassie	GA
390	RMP ELM suppression at q_{95} above 4	ELM control	deGrassie	GA
391	Current/density scaling of intrinsic rotation and ITG/TEM transition	Plasma rotation	Schmitz	UCLA
392	Influence of rotation and rotation shear on ELM suppression	ELM control	Mordijck	Wm & Mary
393	Collisionality impact on momentum and particle transport	Turbulence & transport	Mordijck	Wm & Mary
394	Role of density and impurities on particle and momentum transport	Turbulence & transport	Mordijck	Wm & Mary
395	Rotation reversal	Plasma rotation	Mordijck	Wm & Mary
396	Measurement of RE diffusion to center post	Disruption mitigation	Hollmann	UCSD
397	Disruption main chamber heat loads	Disruption mitigation	Hollmann	UCSD
398	TQ radiation distribution from R-2 MGI	Disruption mitigation	Hollmann	UCSD
399	TQ radiation distribution from R-2 MGI	Disruption mitigation	Hollmann	UCSD
400	Studies of RE final loss	Disruption mitigation	Hollmann	UCSD
401	ITER baseline scenario demonstration	Inductive scenarios	Luce	GA
402	Radiative divertor solutions in the ITER baseline scenario	Inductive scenarios	Luce	GA

403	Radiative divertor solutions in the ITER baseline scenario	Divertor & SOL physics	Luce	GA
404	ITER baseline scenario operation near the LH threshold	Inductive scenarios	Luce	GA
405	Access conditions for steady-state operation in ITER	Steady-state heating & CD	Luce	GA
406	Fast-ion and thermal transport at high q_{min}	Steady-state heating & CD	Luce	GA
407	n-scaling of magnetic errors (TBM related)	Plasma rotation	deGrassie	GA
408	Access to advanced inductive operation in ITER	Inductive scenarios	Luce	GA
409	Collisionality scaling of confinement in advanced inductive regimes	Inductive scenarios	Luce	GA
410	Sensitivity of RMP ELM suppression with less than 12 I-coils to I-coil configuration	ELM control	Fenstermacher	LLNL
411	Demonstration of stationary inductive solutions at low and moderate q_{95}	Inductive scenarios	Luce	GA
412	Development of reproducible startup and target q profile control for steady-state scenarios	Steady-state heating & CD	Luce	GA
413	Demonstrate access to β_N=5 with q_{min}>2	Steady-state heating & CD	Luce	GA
414	High ℓ_i steady-state scenario development	Steady-state heating & CD	Luce	GA
415	Access to zero torque advanced inductive with direct stabilization of the 2/1 mode by ECCD	Inductive scenarios	Luce	GA
416	Burn control in ITER baseline scenario	Inductive scenarios	Luce	GA
417	Comparison of H-Mode transport with Co- and Ctr-NBI	Turbulence & Transport	Luce	GA
418	Mapping the current rise stability boundary for the ITER baseline scenario	Inductive scenarios	Luce	GA
419	Support of ITER research plan for Q=10 operation	Inductive scenarios	Luce	GA

420	Identification of I-mode through simultaneous core and edge turbulence measurements	Turbulence & transport	White	MIT
421	Investigate disagreements between Thomson scattering and ECE measurements in high T_e discharges	General physics	White	MIT
422	Separation of thermal and particle transport in I-mode plasmas	Turbulence & transport	White	MIT
423	Coupling of multi-channel transport and turbulence across rotation reversals	Plasma rotation	White	MIT
424	Search for evidence of non-local transport across slow L-H transitions	Turbulence & transport	White	MIT
425	Flow or flow shear for m/n=2/1 tearing mode stabilization?	Stability & disruption avoidance	La Haye	GA
426	Investigate the role of RS on inward momentum transport	Plasma rotation	Boedo	UCSD
427	Collisionality dependence of intrinsic rotation	Plasma rotation	Boedo	UCSD
428	Scaling of L-H transiton power with X-point location and collisionality	L-H transition	Boedo	UCSD
429	Investigate the role of RS on inward momentum transport	Plasma rotation	Boedo	UCSD
430	Test of turbulence spreading using turbulence propagation	Turbulence & transport	Petty	GA
431	Turbulent transport in detached divertor	Divertor & SOL physics	Boedo	UCSD
432	Transport mechanisms induced by RMP	ELM control	Boedo	UCSD
433	Investigate the role of RS on inward momentum transport	Plasma rotation	Boedo	UCSD
434	Coupling between core and SOL parallel flow	Divertor & SOL physics	Boedo	UCSD
435	Electron critical gradient in H-mode	Turbulence & transport	Petty	GA
436	High beta hybrids and pressure profile broadening	Steady-state heating & CD	Petty	GA
437	TQ radiation distribution from R-2 MGI	Disruption mitigation	Granetz	MIT
438	Optimize electron pedestal pressure in ECH-heated QH-mode plasmas	Pedestal structure	Schmitz	UCLA

439	Optimize electron pedestal pressure in ECH-heated QH-mode plasmas	Pedestal structure	Schmitz	UCLA
440	Beam density effects on carbon density profile	Turbulence & transport	Chrystal	UCSD
441	Active particle exhaust of H-mode plasmas in the Snowflake-minus divertor configuration	Divertor & SOL physics	Petrie	GA
442	Measurement of inductive poloidal current	Stability & disruption avoidance	Petty	GA
443	Effect of changing the ∇B drift direction on Snowflake divertor behavior, including detachment	Divertor & SOL physics	Petrie	GA
444	Identify the optimal impurity for high power high performance plasmas during radiating divertor ops	Inductive scenarios	Petrie	GA
445	Effect of islands on ECCD	Stability & disruption avoidance	Petty	GA
446	Probe the viscosity of inter-mode coupling	Plasma rotation	Tobias	PPPL
447	Confinement and stability properties of “resonant” MHD rotation	Plasma rotation	Tobias	PPPL
448	Density control and active impurity removal from double-null H-mode plasmas	Inductive scenarios	Petrie	GA
449	Drift wave and NTM coupling	Turbulence & transport	Tobias	PPPL
450	Hybrids with co-NBI QH-mode edge	Inductive scenarios	Petty	GA
451	Disruption mitigation by differential rotation of internal MHD	Stability & disruption avoidance	Tobias	PPPL
452	Source of magnetic flux pumping in hybrids	Inductive scenarios	Petty	GA
453	Minimize density pumpout during RMP ELM suppression	ELM control	Fenstermacher	LLNL
454	Synergy between core-localized Alfvén eigenmodes and edge localized TBM fields on fast ion losses.	Energetic particles	Kramer	PPPL
455	TBM mock-up effects on confinement at high β	Stability & disruption avoidance	Snipes	ITER IO

456	Energy transport during electron-dominated heating of ITER baseline scenario H-mode discharge	Inductive scenarios	Taylor	PPPL
457	Prompt torque and zonal flow damping	Turbulence & transport	Burrell	GA
458	Test optimized TBM error field correction at higher values of beta	Stability & disruption avoidance	Reimerdes	CRPP-EPFL
459	Model-based control of the current profile and β_N for steady state scenarios	Steady-state heating & CD	Moreau	Cadarache
460	Quantifying the TBM torque, both in magnitude and radial location	Plasma rotation	Tala	VTT Tech
461	Dependence of momentum transport and intrinsic torque on ρ* and β	Plasma rotation	Tala	VTT Tech
462	Perturbation amplitude linearity test of the RMP ELM suppression 3D plasma response	ELM control	King	ORAU
463	Exploring collisionality impact on the 3D plasma response during RMP ELM suppression	ELM control	King	ORAU
464	ITER relevant 3D plasma response variations with respect to β_N for RMP ELM suppression	ELM control	King	ORAU
465	Explaining the q_{95} resonant nature of RMP ELM suppression through 3D plasma response measurement	ELM control	King	ORAU
466	Extending hybrid discharges to low noninductive fraction through flux-pumping control	Inductive scenarios	King	ORAU
467	Sustainment of q<2 through pseudo wall rotation	Inductive scenarios	King	ORAU
468	H-mode access to q_{95}<2 through 3/2 sustainment and 2/1 preemption	Inductive scenarios	King	ORAU
469	Experimental guidance for the development of a predictive model of the plasma response to an RMP	ELM control	Reiman	PPPL
470	Development of fully noninductive high β EAST scenario	Steady-state heating & CD	Qian	ASIPP
471	The experiment on generalized hybrid scenario with q_{min}>2 at low density and relatively high q_{95}	Inductive scenarios	Qian	ASIPP

472	Effect of divertor geometry & heating scheme on the characteristic widths of heat flux footprint	Divertor & SOL physics	Qian	ASIPP
473	RMP assisted snowflake divertor	Divertor & SOL physics	Schmitz	Juelich
474	3D material migration during RMP ELM suppression	Plasma-material interface	Schmitz	Juelich
475	Helium exhaust with 3D fields	ELM control	Schmitz	Juelich
476	Impact of TBM-induced field ripple in low-torque ITER baseline	Inductive scenarios	Lanctot	GA
477	Establishing MHD mode rotation control with EM torque and better understanding of disruptive process	Stability & disruption avoidance	Okabayashi	PPPL
478	Reduction of thermal disruption due to 2/1 mode in q >1 configuration	Stability & disruption avoidance	Okabayashi	PPPL
479	Major disruption avoidance by providing “magnetic helical insulation” between ST and 2/1 surface	Stability & disruption avoidance	Okabayashi	PPPL
480	Orderly shutdown enhancement of multi-mega joule magnetic energy during the plasma current shut down	Stability & disruption avoidance	Okabayashi	PPPL
481	Spin-up the NTM mode frequency for suppression of NTM by explicitly the EM torque control	Stability & disruption avoidance	Okabayashi	PPPL
482	Disruption study by increasing up to 1 kHz of 3/2 (n=2) mode over internally shielded regime	Stability & disruption avoidance	Okabayashi	PPPL
483	Avoidance of NTM mode rotation frequency near the dangerous mechanical resonance	Stability & disruption avoidance	Okabayashi	PPPL
484	Mitigation: Reduction of toroidal-asymmetry of radiation loss by 3D-magnetic mode rotation control	Stability & disruption avoidance	Okabayashi	PPPL
485	Avoidance of NTM mode rotation frequency near the dangerous mechanical resonance	Stability & disruption avoidance	Okabayashi	PPPL
486	Mitigation: pellet and massive gas injections in helically favorable ways for reducing asymmetry	Stability & disruption avoidance	Okabayashi	PPPL
487	Reduction of required power of ECCD NTM suppression targeting in slowly moving x- and o-point	Stability & disruption avoidance	Okabayashi	PPPL

488	Investigate angular momentum diffusion and pinch using off-axis torque	Plasma rotation	Burrell	GA
489	Discussion of plasma rotation transient process during OFM/ELM-driven RWM with and without feedback	Energetic particles	Okabayashi	PPPL
490	Maintain low-rotation QH-mode with ECH only	Inductive scenarios	Burrell	GA
491	Investigate in-out density asymmetry at large toroidal rotation	Plasma rotation	Burrell	GA
492	Diagnostic spatial cross calibration using edge sweeps in QH-mode	Pedestal structure	Burrell	GA
493	Edge rotation shear threshold for QH-mode access	ELM control	Burrell	GA
494	Further development of QH-mode with strong co-I_P NBI torque	Inductive scenarios	Burrell	GA
495	QH-mode with low torque start-up	Inductive scenarios	Burrell	GA
496	Impact of fast-ions on the RWM stability boundary	Stability & disruption avoidance	Turco	Columbia U
497	Cause(s) for the rotation degradation and tearing instabilities of the ITER baseline scenario	Inductive scenarios	Turco	Columbia U
498	Validation of single-mode model of error field correction for n=2 fields	Stability & disruption avoidance	Lanctot	GA
499	Up/down asymmetric EFC	Stability & disruption avoidance	Lanctot	GA
500	$q_{95}<2$ tokamak operation via dynamic error field correction	Stability & disruption avoidance	Piovesan	Consorzio RFX
501	Energy transport during electron-dominated heating of ITER baseline scenario H-mode discharges	Steady-state heating & CD	Taylor	PPPL
502	Energy transport during electron-dominated heating of ITER baseline scenario H-mode discharges	Turbulence & transport	Taylor	PPPL
503	Validation of M3D nonlinear MHD simulations of ELMs	Pedestal structure	Moyer	UCSD

504	Evolution of mitigation to suppression in RMP H-modes and Validation of nonlinear M3D simulations	ELM control	Moyer	UCSD
505	RMP ELM control at ITER relevant rotation/torque	ELM control	Moyer	UCSD
506	Understanding the synchrotron emission patterns in QRE discharges	Disruption mitigation	Moyer	UCSD
507	Exploring impurity density asymmetries due to NBI fast ions and their effect on impurity transport	Torkil Jensen Award	Reinke	_
508	ITER baseline scenario in a radiating divertor environment with near-zero applied torque	Inductive scenarios	Petrie	GA
509	Vertical positioning and stability control by means of reflectometry	Plasma control	Muscatello	UC, Davis
510	What can lost fast-ions tell us about the H-mode pedestal?	Pedestal structure	Kramer	PPPL
511	Impact of EHO on fast ion losses	Inductive scenarios	Diallo	PPPL
512	Best impurity specie for the radiating divertor in the ITER baseline scenario with near-zero torque	Inductive scenarios	Petrie	GA
513	Investigating the role of inter-ELM fluctuations in the ELM trigger	ELM control	Muscatello	UC Davis
514	LOC/SOC studies	Turbulence & transport	Rice	MIT PSFC
515	Inner wall limiter experiments in support of ITER limiter design and operation for startup, rampdown	Divertor & SOL physics	Stangeby	U Toronto
516	DiMES studies of W, Mo and Al gross and net erosion, material migration to benchmark impurity codes	Plasma-material interface	Stangeby	U Toronto
517	Physics of crescent-shaped synchrotron emission patterns in runaway plateau discharge	Disruption mitigation	Moyer	UCSD
518	Explore RMP ELM suppression mechanism at moderate collisionality	ELM control	Moyer	UCSD
519	RMP ELM-control for Snowflake configurations	Divertor & SOL physics	Soukhanovskii	LLNL
520	Effect of 3D fields on divertor detachment	Divertor & SOL physics	Ahn	ORNL

521	Dependence of confinement and stability on toroidal rotation in high ℓ_i discharges	Steady-state heating & CD	Ferron	GA
522	Combined effect of TBM and NTM fields on fast-ion confinement	Energetic particles	Heidbrink	UCI
523	Combined effect of TBM and sawtooth fields on fast-ion confinement	Energetic particles	Heidbrink	UCI
524	VFI bus voltage control and the true scaled ITER shape at DIII-D	Plasma control	Hyatt	GA
525	Test critical gradient model for fast-ion transport	Energetic particles	Heidbrink	UCI
526	q_{95}< 2 tokamak operation via dynamic error field correction	Stability & disruption avoidance	Garofalo	GA
527	256: SOL width and divertor peak heat flux in QH-mode plasmas with/without n=3 fields	Inductive scenarios	Garofalo	GA
528	Study NRMF driven torque in ECH-only heated plasma (ELMing H-modes)	Plasma rotation	Garofalo	GA
529	Investigate the physics of NTM suppression by large externally applied helical fields	Torkil Jensen Award	Garofalo	GA
530	Studies of arcing on divertor PFC surfaces	Plasma-material interface	Rudakov	UCSD
531	Dust generation from deposited layers and leading edges	Plasma-material interface	Rudakov	UCSD
532	Role of ECH-induced mulitiscale electron thermal transport in H-mode plasmas	Turbulence & transport	Ernst	MIT
533	Between-shots gyrokinetic stability analysis	Turbulence & transport	Ernst	MIT
534	Develop low-torque, high normalized fusion performance QH-mode for ITER baseline scenario	Inductive scenarios	Garofalo	GA
535	Main-ion and impurity neoclassical flows compared with the PERFECT pedestal code	Pedestal structure	Ernst	MIT
536	Low rotation, elevated q_{min} steady-state scenario discharges at high β_N and 210R MSE	Steady-state heating & CD	Ferron	GA
537	Super H-mode: Pedestal evolution and optimization	Pedestal structure	Snyder	GA

538	Reduce fast ion transport in high q_{min}, high beta plasmas	Steady-state heating & CD	Holcomb	LLNL
539	Produce f_{NI} = 1 discharges at q_{min} near 1.5 using off-axis injection and a model guided approach	Steady-state heating & CD	Ferron	GA
540	Establish the incremental confinement of EC power in high β_N steady-state scenario discharges	Steady-state heating & CD	Ferron	GA
541	Support of DIII-D boundary physics experiments	Divertor & SOL Physics	Terry	MIT
542	Investigations of advanced divertor configurations for DIII-D	Divertor & SOL Physics	Terry	MIT
543	Control of high-Z PFC erosion by local gas injection	Plasma-material Interface	Rudakov	UCSD
544	Super H-mode: Scenario development	Steady-state heating & CD	Snyder	GA
545	High beta with NCS and q_{min}>2	Steady-state heating & CD	Garofalo	GA
546	Investigate elongation limit in low ℓ_i discharges with/without applied 3D magnetic fields	Torkil Jensen Award	Garofalo	GA
547	Induced L-H-L transitions in IWL plasmas with applied n=1 C-coil	L-H transition	Battaglia	PPPL
548	Improve the optimized high ℓ_i operating regime through 1/1 and 2/1 instability avoidance	Steady-state heating & CD	Ferron	GA
549	Testing kinetic RWM stabilization theory at marginal stability in high β, TM stabilized plasmas	Stability & disruption avoidance	Sabbagh	Columbia U
550	Probing and controlling the L->H and H->L transitions by small pellet injection	L-H transition	Hahn	NFRI
551	Test compatibility of radiative divertor with QH-mode	Inductive scenarios	Garofalo	GA
552	Modulation of bootstrap current	ELM control	Chen	ORAU
553	Bootstrap current change during RMP ELM suppression	ELM control	Chen	ORAU
554	The impact of increased pressure gradient on scenarios for fully noninductive operation	Steady-state heating & CD	Ferron	GA
555	Measure plasma response to RMPs	ELM control	Chen	ORAU

556	Pedestal optimization with RMP ELM control	Pedestal structure	Snyder	GA
557	Density (Greenwald) limit and the radiation driven islands	Torkil Jensen Award	Kolemen	PPPL
558	Expand the high ℓ_i, β_N>4 operating regime through NTM Stabilization and large sawtooth avoidance	Steady-state heating & CD	Kolemen	PPPL
559	SOL width scaling: Goldston's heuristic drift model vs critical pressure gradient model	Divertor & SOL physics	Kolemen	PPPL
560	NBI-driven poloidal rotation	Plasma rotation	Chrystal	UCSD
561	Interaction of RMP Snowflake divertor	Divertor & SOL physics	Kolemen	PPPL
562	RMP NTM interaction	Stability & disruption avoidance	Kolemen	PPPL
563	The role of energetic particles in ELM-free H-mode plasmas	ELM control	Zhu	UC, Irvine
564	Simulated of burn control using in-vessel coils	Turbulence & transport	Kolemen	PPPL
565	Benign 3/2 NTM formation to avoid 2/1 NTM locking	Stability & disruption avoidance	Kolemen	PPPL
566	Testing of new hardware and software capabilities for NTM control	Plasma control	Kolemen	PPPL
567	Is loss of rotation in low-torque IBS discharges due to solenoid-related error fields?	Inductive scenarios	Pinsker	GA
568	ITER baseline scenario: Expand the operational limit by NTM stabilization and time dependent EFC	Inductive scenarios	Kolemen	PPPL
569	High β, steady-state hybrids	Steady-state heating & CD	Petty	GA
570	Space, time and energy-resolved x-ray measurements for magnetically confined fusion plasmas	Stability & disruption avoidance	Delgado-Aparicio	PPPL
571	Optimal plasma shape for high-β, steady-state hybrid scenario	Steady-state heating & CD	Petty	GA
572	Collisionality scaling of high-β, steady-state hybrids	Steady-state heating & CD	Petty	GA

573	Impact of EHO on fast ion losses	Inductive scenarios	Diallo	PPPL
574	Influence of non-axisymmetric fields (TBMs/RMPs) on fast ion confinement and loss	Energetic particles	Loarte-Prieto	ITER IO
575	Magnetic field limit for glow discharge wall cleaning	Plasma control	Loarte-Prieto	ITER IO
576	Slow Snowflake configuration scans to clarify geometry vs physics	Divertor & SOL physics	Soukhanovskii	LLNL
577	MARFE limits in the Snowflake configuration	Divertor & SOL physics	Soukhanovskii	LLNL
578	N=2 mode rotation technique development using the current-driven loq q RWM onset	Stability & disruption avoidance	Okabayashi	PPPL
579	Mapping of peeling mode stability boundary	Pedestal structure	Nazikian	PPPL
580	Collisionality/density dependence and pedestal optimization with ELM suppression	ELM control	Nazikian	PPPL
581	Heat flux distribution during major disruptions	Stability & disruption avoidance	Loarte-Prieto	ITER IO
582	Energy deposition during runaway electron impact	Stability & disruption avoidance	Loarte-Prieto	ITER IO
583	Dissipation of runaway energy by high-Z impurity injection	Disruption mitigation	Loarte-Prieto	ITER IO
584	n=1 RMP suppression and the role of field penetration vs kink excitation	ELM control	Nazikian	PPPL
585	Compatibility of ELM suppressed regimes by 3D fields with pellet injection for plasma fueling	ELM control	Loarte-Prieto	ITER IO
586	Investigation of optimum pellet injection geometry for pellet triggering minimum throughput/PFC flux	ELM control	Loarte-Prieto	ITER IO
587	Demonstration of integrated ELM-paced pellet fueled H-mode plasma in ITER-relevant range	ELM control	Loarte-Prieto	ITER IO
588	Plasma response in IWL H-mode plasmas	ELM control	Shafer	ORNL
589	Exploration of super H-mode using high density QH-mode	Inductive scenarios	Solomon	PPPL

590	Targeting top of pedestal in RMP ELM-suppressed plasmas with SXR imaging	ELM control	Shafer	ORNL
591	Optimization of edge particle transport in ELM suppressed H-modes including high Z impurity control	ELM control	Loarte-Prieto	ITER IO
592	ECH control of Alfvén eigenmodes	Energetic particles	Loarte-Prieto	ITER IO
593	Demonstrating stiffness of electron heat transport in the presence of strong radiation	Turbulence & transport	Reinke	MIT
594	Aspect ratio scaling of turbulence and transport: DIII-D and NSTX-U comparison	Turbulence & transport	Smith	U Wisconsin
595	ITER steady-state scenario in USN, $+B_T$	Steady-state heating & CD	Park	ORNL
596	q_{95} dependency of beam ion confinement in high q_{min} scenario	Steady-state heating & CD	Park	ORNL
597	Apple-to-apple comparison of ITER steady-state scenarios: high/elevated q_{min}, SS hybrid, and high ℓ_i	Steady-state heating & CD	Park	ORNL
598	Far off-axis NBCD using vertically shifted plasma	Steady-state heating & CD	Park	ORNL
599	Measurement of neoclassical response of off-axis beam ions	Steady-state heating & CD	Park	ORNL
600	Anomalous current diffusion in steady-state hybrid scenario with ELM suppression	Steady-state heating & CD	Park	ORNL
601	Control of tungsten PFC erosion by local gas injection	Plasma-material interface	Wong	GA
602	Rotating field current drive for NTM suppression	Stability & disruption avoidance	Sweeney	Columbia U
603	Dominant poloidal modes for ELM suppression via n=2 upper/lower I-coil phase difference	ELM control	Paz-Soldan	ORISE
604	EF optimization of low-torque low-q_{95} QH-mode plasmas	Inductive scenarios	Paz-Soldan	ORISE

605	Importance of matched poloidal spectra in most sensitive EFC conditions	Stability & disruption avoidance	Paz-Soldan	ORISE
606	Dominant kink-mode poloidal coupling dependence with β_N, q_{95}	Stability & disruption avoidance	Paz-Soldan	ORISE
607	Direct measurement of E-coil contribution to intrinsic EF	Stability & disruption avoidance	Paz-Soldan	ORISE
608	Quiescent runaway electron studies for 2014	Disruption mitigation	Paz-Soldan	ORISE
609	MHD spectroscopy and poloidal coupling of plateau RE plasmas	Disruption mitigation	Paz-Soldan	ORISE
610	Local correction of the TBM error field	Stability & Disruption Avoidance	Paz-Soldan	ORISE
611	Absolute plasma response null measurement by multiple β_N steps	Stability & disruption avoidance	Paz-Soldan	ORISE
612	Investigate the Impact of ECH on Alfvénic activity	Energetic particles	Van Zeeland	GA
613	Testing for parameter space with the best fast ion confinement at high q_{min}	Steady-state heating & CD	Ferron	GA
614	Why does the heat flux increase in the secondary divertor under the β_N = constant constraint?	Divertor & SOL physics	Petrie	GA
615	Increase achievable β_N in high β_P experiment using n=3 β_N feedback (ala burn control)	Steady-state heating & CD	Solomon	PPPL
616	Validation of nonlinear models of ELMs and RMP ELM mitigation	ELM control	Sugiyama	MIT
617	Characterization of core/pedestal density limits for rotating tearing modes	Stability & disruption avoidance	Paz-Soldan	ORISE
618	Controlling VH-mode with RMPs and comparison to NSTX EPH-mode	ELM control	maingi	PPPL
619	ELM divertor footprint and connection to ELM dynamics and effects of turbulence and modes	ELM control	Boedo	UCSD
620	Measurement of heat flux on the divertor using the embedded thermocouple array	Divertor & SOL physics	Donovan	SNL

621	Investigation of sheath power transmission at the DIII-D divertor using surface thermocouples	Divertor & SOL physics	Donovan	Sandia National Lab
622	Identification of entrainment threshold in I-coil amplitude/frequency space	Stability & disruption avoidance	Sweeney	Columbia U
623	Trapped electron mode n_e/T_e fluctuation study	Turbulence & transport	Munsat	U Colorado, Boulder
624	Trapped electron mode study in core	Turbulence & transport	Munsat	U Colorado, Boulder
625	Disruption precursor identification	Disruption mitigation	Munsat	U Colorado, Boulder
626	Validation of ECCD NTM stabilization criteria	Stability & disruption avoidance	Loarte-Prieto	ITER IO
627	Core edge integration for QH-mode plasmas in ITER	Divertor & SOL physics	Loarte-Prieto	ITER IO
628	He H-mode plasmas studies for the ITER non-active operational phase	Inductive scenarios	Loarte-Prieto	ITER IO
629	Transport study using modulation RMP (M-RMP)	ELM control	Xiao	UCSD
630	Sawtooth control via n=1 external magnetic perturbation: extension to H-mode plasmas	Stability & disruption avoidance	Piovesan	Consorzio RFX
631	Optimization of RMP pedestal with feedback control	ELM control	Nazikian	PPPL
632	Mutual alignment of gyrotrons: a new technique based on mirror-steering and anti-phase modulation	Steady-state heating & CD	Volpe	Columbia U
633	Plasma response to small applied rotating fields as an error-field-detection method	Stability & disruption avoidance	Volpe	Columbia U
634	Mitigation: Reduction of toroidal-asymmetry of radiation loss by 3D-magnetic mode rotation control	Disruption mitigation	Okabayashi	PPPL
635	Mitigation: pellet and massive gas injections in helically favorable ways for reducing asymmetry	Disruption mitigation	Okabayashi	PPPL
636	Time-resolved measurement of plasma response spectrum	Stability & disruption avoidance	Hanson	Columbia U
637	RMP effect on ELMs: Separate the effect of density pumpout	ELM control	Kolemen	PPPL

638	β_N control with 3D fields instead of NBI	Inductive scenarios	Kolemen	PPPL
639	Electron thermal transport due to compressional and global AEs on DIII-D and projection to NSTX-U	Turbulence & transport	Crocker	UCLA
640	Fully noninductive, low rotation QH-mode	Torkil Jensen Award	Wade	GA
641	Using magnetic balance to regulate density and impurity accumulation inside double-null plasmas	Divertor & SOL physics	Petrie	GA
642	Gas injection feedback with radiation measurements	Divertor & SOL physics	Kolemen	PPPL
643	Campaign to study physics at the Greenwald limit	Steady-state heating & CD	Kolemen	PPPL
644	Controlled Snowflake divertor study	Divertor & SOL physics	Kolemen	PPPL
645	Access to low torque QH-mode using high β low torque AI target with NRMF	Inductive scenarios	Solomon	PPPL
646	ρ* scaling of intrinsic torque between DIII-D and JET	Plasma rotation	Solomon	PPPL
647	Radiating divertor applied to the ITER baseline scenario at near-zero applied torque	Divertor & SOL physics	Petrie	GA
648	Determining the optimal impurity specie for the radiating divertor in the ITER baseline scenario	Divertor & SOL physics	Petrie	GA
649	Search for high frequency magnetic fluctuations with CPS diagnostic	Turbulence & transport	Rhodes	UCLA
650	ELM mitigation with ECCD	Torkil Jensen Award	Ferraro	GA
651	Achieve QH-mode plasmas with T_e, T_i ~ 10 keV near mid-radius	Turbulence & transport	Schmitz	UCLA
652	QH-mode operation with reduced divertor interaction	Inductive scenarios	Grierson	PPPL
653	High-Z transport in QH-mode plasmas	Plasma-material interface	Grierson	PPPL
654	Effect of sawteeth on QH-mode pedestal (EHO)	Inductive scenarios	Grierson	PPPL
655	ECH effects on QH-mode low or balanced torque discharges in DIII-D	Plasma rotation	Hahn	NFRI

656	Validating critical gradient model for burning plasmas	Energetic particles	Gorelenkov	PPPL
657	Initial n=2 error field correction	Stability & disruption avoidance	Strait	GA
658	Plasma response to n=2 perturbations	Stability & disruption avoidance	Strait	GA
659	n=2 dynamic error field correction	Stability & disruption avoidance	Strait	GA
660	Dependence of non-axisymmetric plasma response on plasma rotation	Stability & disruption avoidance	Strait	GA
661	Massive gas injection into an unstable plasma	Disruption mitigation	Strait	GA
662	NTV collisionality regime test	Plasma rotation	Logan	PPPL
663	Effect of higher mode number error fields on n=1 locking threshold	Stability & disruption avoidance	Logan	PPPL
664	Follow-up studies of fast-ion transport effects on steady-state plasmas	Steady-state heating & CD	Heidbrink	UC, Irvine
665	Feedback control to assess the usefulness for using two impurity species in radiating divertor	Plasma control	Petrie	GA
666	Radiation limit in the Snowflake configuration	Divertor & SOL physics	Reimerdes	CRPP-EPFL
667	Effect of the Snowflake configuration on the SOL width in simple plasmas	Divertor & SOL physics	Reimerdes	CRPP-EPFL
668	GAM eigenmode excitation mechanism and its impact on transport	Turbulence & transport	Wang	UCLA
669	Extrapolation of low-torque ITER baseline scenario with ν^* and ρ^*	Turbulence & transport	Petty	GA
670	Investigate GAM's role in the L-H transition	L-H transition	Wang	UCLA
671	GAM eigenmode 2D structure	Turbulence & transport	Wang	UCLA
672	L-H threshold in hydrogen plasmas	L-H transition	Greenfield	GA
674	Assessing the need for using two impurity species in radiating divertor	Divertor & SOL physics	Petrie	GA

675	Error field correction at low rotation	Stability & disruption avoidance	Solomon	PPPL
676	Robust NTM control	Plasma control	Sauter	CRPP-EPFL
677	Robust NTM control	Stability & disruption avoidance	Sauter	CRPP-EPFL
678	Understanding and testing methods for producing gentle H-L transitions	L-H transition	Eldon	ORAU
679	Safety factor scaling of turbulence and transport in hybrid scenario plasmas	Turbulence & transport	McKee	U Wisconsin
680	Fine scale stepwise q-scan: role of low-order rationales and resonance condition for ELM suppression	ELM control	McKee	U Wisconsin
681	Transport investigation during slow current ramp-up and ramp-down [for ITER]	Inductive scenarios	McKee	U Wisconsin
682	Amplifying the geodesic acoustic mode via resonant radial field amplification: new methods	Turbulence & transport	McKee	U Wisconsin
683	Confinement enhancement via impurity-seeding of H-mode plasmas	Turbulence & transport	McKee	U Wisconsin
684	Isotope mass scaling of turbulence, transport and confinement in H-mode	Turbulence & transport	McKee	U Wisconsin
685	Locked mode control at low (ITER-like) q_{95} and with external C-coils	Stability & disruption avoidance	Volpe	Columbia U
686	“Born-locked” mode control by ECCD and magnetic perturbations	Stability & disruption avoidance	Volpe	Columbia U
687	Add modulated ECCD to f/back or f/fwd entrainment discharges	Stability & disruption avoidance	Volpe	Columbia U
688	Measure beam ion transport due to resonance between applied 3D fields and injected beam ion orbits	Energetic particles	Van Zeeland	GA
689	Assess optimal error field correction by modulating I-coils at incommensurable frequencies	Stability & disruption avoidance	Volpe	Columbia U
690	EFC by ramping β up or q_{95} down or NBI torque down (instead of density down) in 3-4 discharges	Stability & disruption avoidance	Volpe	Columbia U

691	Locked-mode avoidance by magnetic f/back on saddle-loops	Stability & disruption avoidance	Volpe	Columbia U
692	NTMs "on demand", by ECH	Stability & disruption avoidance	Volpe	Columbia U
693	NTMs "on demand", by modulated ECCD	Stability & disruption avoidance	Volpe	Columbia U
694	Image heat load due to prompt and 3D field-induced EP losses	Energetic particles	Van Zeeland	GA
695	Poloidal rotation of plasma column to simulate rotating wall	Plasma control	Volpe	Columbia U
696	Measure change in 3D field-induced EP losses due to screening	Energetic particles	Van Zeeland	GA
697	Electromagnetic torque waves – transport of angular momentum	Plasma rotation	Volpe	Columbia U
698	Dither injection for closed-loop system identification of vacuum and plasma response	Stability & disruption avoidance	Olofsson	Columbia U
699	Feedback control of mode rotation and phase	Stability & disruption avoidance	Olofsson	Columbia U
700	PID-controlled boundary radial field for "spontaneous" mode-unlocking	Stability & disruption avoidance	Olofsson	Columbia U
701	Effect of lithium conditioning on H-mode pedestal profiles and ELM stability	ELM control	Jackson	GA
702	Measurement of hysteresis in RMP-ELM suppression thresholds	ELM control	Paz-Soldan	ORISE
703	Use high β_P operating regime to study fast ion transport	Energetic particles	Holcomb	LLNL
704	Use high β_P operating regime to study fast ion transport	Steady-state heating & CD	Holcomb	LLNL
705	Develop feedback-controlled 3D equilibria	Stability & disruption avoidance	Hanson	Columbia U
706	Physics of the low density branch of the L-H power threshold scaling	L-H transition	Schmitz	UCLA
707	Physics of the low density branch of the L-H power threshold scaling	L-H transition	Schmitz	UCLA

708	444: Identify the optimal impurity for high power high performance plasmas during radiating divertor ops	Steady-state heating & CD	Petrie	GA
709	Physics of EHO control in low-torque QH-mode	Inductive scenarios	Lanctot	GA
710	RWM control using external coils	Stability & disruption avoidance	Hanson	Columbia U
711	Comparision DIII-D and AUG high collisionality ELM response to 3D magnetic perturbations	ELM control	Evans	GA
712	D_2 + few % Ne shattered pellets for disruption mitigation	Disruption mitigation	Commaux	ORNL
713	Control of radiation asymmetries by application of external field on SPI/MGI shutdown	Disruption mitigation	Commaux	ORNL
714	Runaway flattop mitigation by neon shattered pellet injection	Disruption mitigation	Commaux	ORNL
715	Test of the upgraded SPI	Disruption mitigation	Commaux	ORNL
716	Assess the destabilization mechanism for the n=1 tearing mode in steady-state scenario discharges	Steady-state heating & CD	Ferron	GA
717	Role of poloidal flux expansion to address divertor heat flux challenge	Divertor & SOL physics	Hill	LLNL
718	Compare the power threshold for pre-emptive NTM suppression vs catch and subdue	Stability & disruption avoidance	Kolemen	PPPL
719	NTM control upgrade: Capibility to deposit EC at multiple locations	Plasma control	Kolemen	PPPL
720	Real-time error field correction	Plasma control	Kolemen	PPPL
721	q_{min} control	Steady-state heating & CD	Kolemen	PPPL
722	NTM control with ECCD, real-time ray tracing and real-time mirrors	Plasma control	Kolemen	PPPL
723	Physics of the heat flux width	Divertor & SOL physics	Makowski	LLNL
724	Impurity transport in ELM-suppressed regimes	ELM control	Grierson	PPPL
725	What causes density buildup at the pedestal top?	Pedestal structure	Callen	U Wisconsin

726	Test pedestal structure model where paleoclassical transport is dominant	Pedestal structure	Callen	U Wisconsin
727	Scaling of pedestal plasma transport with RMP I-coil current	ELM control	Callen	U Wisconsin
728	3D fields effects on critical gradient and turbulence	Turbulence & transport	Smith	GA
729	Dependence of pedestal structure on collisionality and Z_{eff} in relation to JET results with ILW	Pedestal structure	Osborne	GA
730	Search for fast ion critical gradient	Energetic particles	Petty	GA
731	Turbulent ion thermal response to electron heat flux and T_e/T_i variation	Turbulence & transport	Truong	U Wisconsin
732	Testing ELM destabilization by 3D fields on DIII-D	ELM control	Canik	ORNL
733	Distinguishing between 3D magnetic field structures and transport	ELM control	Canik	ORNL
734	First wall heat flux and erosion due to TBM induced error fields	Plasma-material interface	Gray	ORNL
735	ELM suppression in helium plasmas	ELM control	Evans	GA
736	Erosion/deposition of aluminum with low density He L-mode simple-as-possible plasmas	Plasma-material interface	Chrobak	GA
737	n=1 and n=2 simultaneous DEFC /DFB for routine demonstration of low q << 2 RWM stable regime	Stability & disruption avoidance	Okabayashi	PPPL
738	The investigation of EP-kinetic effects and plasma rotation with low q and low β operation	Stability & disruption avoidance	Okabayashi	PPPL
739	Reduce L-H threshold power in H plasmas using pellet injection	L-H transition	Gohil	GA
740	Respond to locking by ramping I_p down	Stability & disruption avoidance	Volpe	Columbia U
741	Quantifying the improved confinement achieved by NTM spin-up	Stability & disruption avoidance	Sweeney	Columbia U
742	Measurement of viscous torque on locked 2/1 mode	Stability & disruption avoidance	Sweeney	Columbia U
743	Measurement of viscous torque on locked 2/1 mode	Stability & disruption avoidance	Sweeney	Columbia U

744	NBI torque assisted unlocking and spin-up experiments	Stability & disruption Avoidance	Sweeney	Columbia U
745	Transport studies in I-mode plasmas	Pedestal structure	Wolfe	MIT
746	Isotope dependence of P_{thr} and edge turbulence at L-H and H-L transition in DIII-D and JET-ILW	L-H transition	Maggi	IPP Garching
747	Dissipation and control of RE from ITER-like LSN targets	Disruption mitigation	Eidietis	GA
748	Implement finite-state off normal fault response system	Plasma control	Eidietis	GA
749	Neon SPI injection into early CQ to stunt RE formation	Disruption mitigation	Eidietis	GA
750	The role of non-local transport and avalanches in different L-H transition regimes	L-H transition	Schmitz	UCLA
751	Dimensionless Identity Experiments in I-mode with C-Mod and AUG (TC-18)	Pedestal structure	Hubbard	MIT
752	Divertor detachment versus toroidal field and plasma current	Divertor & SOL physics	Leonard	GA
753	q_{95} scaling of the coupled turbulence/ zonal flow during L-H transition	L-H transition	Yan	U Wisconsin
754	Density scaling and X-point position scan of L-H transition power threshold	L-H transition	Yan	U Wisconsin
755	Heat flux footprint with pellet-paced ELMs vs ν*	ELM control	Maingi	PPPL
756	QH-mode edge sweep with helium impurity for comparison to XGC0	Pedestal structure	Battaglia	PPPL
757	Cause(s) for the rotation degradation and tearing instabilities of the ITER baseline scenario	Stability & disruption avoidance	Turco	Columbia U
758	First-principles-driven model-based current profile and internal energy control in H-mode discharges	Plasma control	Schuster	Lehigh U
759	Link between driven plasma response and tearing stability	Stability & disruption avoidance	Hanson	Columbia U
760	Marginal 2/1 island width in IBS	Stability & disruption avoidance	La Haye	GA

761	Rotating magnetic field current-drive (RMFCD)	Torkil Jensen Award	Sweeney	Columbia U
762	ITER baseline scenario: Expand the operational limit by NTM stabilization and time dependent EFC	Stability & disruption avoidance	Kolemen	PPPL
763	Expand the high ℓ_i, β_N>4 operating regime through NTM stabilization	Stability & disruption avoidance	Kolemen	PPPL
764	Multiple periods of NTM suppression	Stability & disruption avoidance	Kolemen	PPPL
765	Island seeding with saw teeth pacing: New method to control tearing modes	Stability & disruption avoidance	Kolemen	PPPL
766	Island seeding with saw teeth pacing: new method to control tearing modes	Plasma control	Kolemen	PPPL
767	Radiation asymmetry measurements in opposite-handed plasmas	Disruption mitigation	Shiraki	ORNL
768	Sheath physics study 2	Divertor & SOL physics	Watkins	SNL
769	Benchmark heat flux with fast TCs	Divertor & SOL physics	Watkins	SNL
770	Calibrated passive FIDA spectrum	Energetic particles	Heidbrink	UCI
771	Distribution function inversion benchmark	Energetic particles	Heidbrink	UCI
772	Unified edge and SOL rotation	Divertor & SOL physics	Boedo	UCSD
773	Model-based control of the current profile and β_N for steady state scenarios	Plasma control	Humphreys	GA
774	Rotating magnetic field current drive (RMFCD)	Steady-state heating & CD	Sweeney	Columbia U
775	High q_{min} transient β_N=5 demonstration	Steady-state heating & CD	Holcomb	LLNL
776	Control/ops evening development time	Plasma control	Humphreys	GA
777	Magnitude of cross-field drifts in the private flux region, divertor asymmetries and detachment	Divertor & SOL physics	Groth	Aalto U, Finland

778	Assessment of main chamber carbon sources	Divertor & SOL physics	Groth	Aalto U, Finland
779	Measurement of the heat flux (∇T) function	Turbulence & transport	Gentle	U of Texas
780	3D coil based β_N control instead of NBI based β_N control	Steady-state heating & CD	Kolemen	PPPL
781	Can RMP ELM control be reliably used in ITER (or a reactor)?	ELM control	Kolemen	PPPL
782	RMP ELM control development	Plasma control	Kolemen	PPPL
783	Development of fully noninductive high β EAST scenario II	Steady-state heating & CD	Garofalo	GA
784	Understanding the NTM stability limits by q-profile modification	Inductive scenarios	Kolemen	PPPL
785	Active determination of angular momentum transfer process between 3D structures: NTM 2/1 and 3/2 mo	Stability & disruption avoidance	Okabayashi	PPPL
786	Determining particle sources/sinks in ITER-like NN discharges during RMP ELM suppression	ELM control	Unterberg	ORNL
787	Optimize radiative divertor and core performance	Steady-state heating & CD	Kolemen	PPPL
788	Optimize radiative divertor and core performance	Divertor & SOL physics	Kolemen	PPPL
789	ITER scenario: Optimize radiative divertor and core performance	Inductive scenarios	Kolemen	PPPL
790	Detachment control for H-mode	Divertor & SOL physics	Kolemen	PPPL
791	Detachment control for H-mode	Plasma control	Kolemen	PPPL
792	Combined core and divertor radiation control: Gas injection feedback with radiation measurements	Plasma control	Kolemen	PPPL
793	q_{min} control	Plasma control	Kolemen	PPPL
794	ITER Scenario: Understanding the NTM stability limits by q-profile modification	Inductive scenarios	Kolemen	PPPL
795	Measure NTV torque profile	Plasma rotation	Volpe	Columbia U
796	Snowflake control	Plasma control	Kolemen	PPPL
797	β_N control with 3D coils	Plasma control	Kolemen	PPPL
798	Density matching with and without ELMs	ELM control	Smith	GA

799	Development for PID-controlled boundary radial field	Plasma control	Olofsson	Columbia U
800	Physics of EHO control in low-torque QH-mode	Torkil Jensen Award	Lanctot	GA
801	Collisionality dependence of pedestal height with RMP	ELM control	Nazikian	PPPL
802	Breakdown optimization with ECH	Plasma control	Hyatt	GA

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