Center for Energy Research

CER

5 year Review of the Organized Research Unit
Fiscal Year 2006 thru 2010

The University of California, San Diego
Center for Energy Research
457B EBU II

GENERAL INFORMATION
The Center for Energy Research is an organized research unit at UC San Diego aimed at coordinating and promoting energy research and education. The Center provides a venue for interdisciplinary interactions among UCSD faculty, researchers, students and the public. Members of CER perform basic and applied research in the fields of fusion energy, solar energy, combustion, and related disciplines. The center also serves as a focal point for studies of socio-economic and environmental aspects of energy production and use.

URL http://cer.ucsd.edu/
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Admin Fax (858) 822-2120
Admin Mailcode 0417
Admin Location 457B EBU II
Year Established 2000
Org Codes 413025 Core (instruction, research, public service)
418825 Core (instruction, research, public service)
418890 Core (instruction, research, public service)
438825 Academic support (academic department administration)
788825 Financial aid, graduate

Home Unit Codes 152

STAFFING

ADVISORY COMMITTEE

(0)

DIRECCTORS

(6)

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George Tynan  Mechanical and Space Engineering  7/1/2006  6/30/2008
Forman Williams  Mechanical and Aerospace Engineering  7/1/2005  6/30/2006

**AFFILIATED FACULTY**

(15)

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**RESEARCHERS**
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**POST DOCS**

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**STAFF**

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Sandy Rosas  _____Assistant II  2/28/2010  current
Colin Scholtz  Assistant IV  1/12/2010  current
Raymond Seraydarian  Engineer, Development, Assoc  7/1/1997  current
John David Spalding  Assistant IV  7/1/2005  9/18/2005
Patricia Stewart  Management Servs Officer III  7/1/2003  9/1/2006
Jeremy Stromose  Engineer, Development, Jr  8/01/2007  5/31/2009
Nazli Taheri  Assistant IV  6/13/2005  12/31/2005
Vickie Tencer  Management Servs Officer III  11/20/2006  1/31/2009
Freddy Torres  Assistant IV  6/29/2006  9/30/2006
Alexander Tronchin- James  Assistant IV  10/13/2004  9/30/2005
Utako Ueda  Assistant IV  3/20/2006  5/5/2008
Utako Ueda  Staff Research Assoc I  5/29/2008  7/23/2008
Xueren Wang  Engineer, Development, Assoc  11/1/2006  current
Po-Chin Alan Yang  Assistant IV  8/2/2005  9/30/2005

STUDENTS

(64)

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**VISITORS**

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<td>3,556,670</td>
<td>2,444,523</td>
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Permanent Budget

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<td>418825</td>
<td>103,600</td>
<td>103,600</td>
<td>105,411</td>
<td>111,556</td>
<td>153,716</td>
<td>577,883</td>
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<tr>
<td>Total</td>
<td>103,600</td>
<td>103,600</td>
<td>105,411</td>
<td>111,556</td>
<td>153,716</td>
<td>$577,883</td>
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Transfers

<table>
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<td>418825</td>
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<td>21,511</td>
<td>1,786</td>
<td>(44,767)</td>
<td>115,626</td>
<td>165,135</td>
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<tr>
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<td>0</td>
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<tr>
<td>Total</td>
<td>70,979</td>
<td>26,550</td>
<td>1,786</td>
<td>(44,767)</td>
<td>115,626</td>
<td>$170,175</td>
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Contract and Grant Allocations - Unit Code: 152

Direct and Indirect Costs by Year - Unit Code: 152

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<th>2009</th>
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## Sponsor Category Totals - Unit Code: 152

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## User Reported Income

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<th>418890</th>
<th>438825</th>
<th>788825</th>
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<tr>
<td>Additional Transfers - FY 2010</td>
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<td>(38,156)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(38,156)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>Conferences - FY 2009</td>
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<td>Gifts - FY 2006</td>
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<td>125</td>
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</table>
Other income - FY 2007  74,854  1,779  380  0  0  77,013
Other income - FY 2008  0  37,032  188  0  0  37,220
Other Income - FY 2009  0  0  116  0  0  116
Other income - FY 2010  0  1,129  38  0  0  1,166
other transfers - FY 2009  0  180,694  0  0  0  180,694
Service Agreements  0  0  0  0  0  0

| Totals   | 74,854 | 526,293 | 847 | 0 | 0 | $ 601,993 |

**EXPENSE**

**Expense Summary**

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<tr>
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<th>438825</th>
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<th>Total</th>
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<tr>
<td>Academic Salaries</td>
<td>8,979,957</td>
<td>1,532,168</td>
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<td>183,979</td>
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**Expense By Program**

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<th>2009</th>
<th>2010</th>
<th>Total</th>
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<td>5,994,054</td>
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<td>Grad-Fees</td>
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<td>27,715</td>
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PUBLICATIONS

JOURNALS (310)


B. Jones, C. J. Garasi, D. J. Ampleford, C. Deeney, T. A. Mehlhorn, S. N. Bland, S. V. Lebedev, J. P.


C. Meliani, M. Rudolph, R. Doerner et al., "Bandwidth potential of cascode HBT-based TWAs as a


localized mode suppression by resonant magnetic perturbations in DIII-D," Nuclear Fusion 50 (3) (2010).


Harilal SS, O'Shay B, Tao Y, Tillack MS "Ion debris mitigation from tin plasma using ambient gas, magnetic field and combined effects" (2006).


S. Gunter, C. Angioni, M Apostoliceanu, C. Antanasiu, M. Balden et all "Overview of ASDEX Upgrade results - development of integrated operating scenarios for ITER" Nuclear Fusion vol 45 (10), S98-S108


S. Mordijck, L. W. Owen, and R. A. Moyer, "Increased particle transport due to resonant magnetic perturbations modelled with a vacuum field line tracing code and a 2D fluid code," Nuclear Fusion 50 (3) (2010).


S.M. Kaye, M.G. Bell, R.E. Bell, S. Bernabei, J. Bialek, J. Boedo et all, "Progress towards high performance plasmas in the National Spherical Torus Experiment (NSTX)" Nuclear Fusion Vol 45 (10), S168-S180 (2005)


CONFERENCE PAPERS (208)


G. Collins IV, S. C. Bott, R. E. Madden, F. N. Beg, "Quantitative Analysis of the Ablation of X-Pinches at


R. Doerner, M. J. Baldwin, J. Roth, K. Schmid, A. Wiltner, "Plasma Interactions with Mixed Beryllium-


T. E. Evans, M. J. Schaffer, R. A. Moyer, M. E. Fenstermacher, "ELM suppression by resonant magnetic


T. Yabuuchi, J. A. King, M. Hatakeyama, N. Nakannii, B. S. Paradkar, M. S. Wei, H. Habara, K. Mima, R.


Y. Tao, M. S. Tillack, K. L. Sequoia, R. A. Burdt, and F. Najmabadi, "Dynamics of laser-produced Sn-


WEB PUBLICATIONS (0)

BOOKS (2)


OTHER (294)


Invited Lecture/Talk F. Beg, "Generation and transport of high intensity laser-generated hot electrons in fast ignition relevant targets", Lawrence Livermore National Laboratory, California, September 17, 2008.


Invited Lecture/Talk F. Najmabadi, "Impact of advances in fusion physics & technology on the attractiveness of tokamak power plants", 22nd annual meeting of Japan Society of Plasma Science & Nuclear Fusion Research, Tokyo, Japan, December 1, 2005.

Invited Lecture/Talk F. Najmabadi, "Key physics and technology issues compact stellarator power plants", 18th International Toki Conference, Toki, Japan, December 9-12, 2008.


Invited Lecture/Talk S.C. Bott, "Investigations of the Ablation Phase of Low Wire Number Arrays at 200


Oral Presentation / Poster M. J. Baldwin, D. Nishijima, R. P. Doerner, R.P. Seraydarian, J. Hanna, G. De Temmerman, Y. Ueda, K. Schmid, K. and J. Roth, "PISCES-B mixed material PSI experiments and their implications for ITER", 1st NIFS-CRC International Symposium and 1st Korea-Japan Workshop on Edge-


Oral Presentation / Poster F. He, M. S. Wei, F. Beg, S. Krasheninnikov, R. Stephens, D. Welch, "Study of the laser plasma interaction and energetic electron beam production using the LSP code", IEEE
International Conference on Plasma Science, Traverse City, Michigan, June 4-8, 2006.


Oral Presentation / Poster J. Kleissl, "The influence of orographic flows on PICO-NARE trace-gas measurement", Fall Meeting of the American Geophysical Union (AGU), San Francisco, CA, 2005.


Oral Presentation / Poster M. S. Wei, F. N. Beg, R. B. Stephens, T. Yabuuchi, "Spectrum of escaping fast


Science and 23rd Symposium on Fusion Engineering. San Diego, CA, May 31-June 5, 2009. SP3C-41


Oral Presentation / Posters M. S. Wei et al., "Electron transport in warm dense plasma", 8th Fusion Science Center Meeting, UCLA, Los Angeles, CA. August 1, 2009.


Oral Presentation / Posters R. A. Moyer, DIII-D National Fusion Facility Tour for undergraduate physics class from University of San Diego, November 15, 2008.

Oral Presentation / Posters R. A. Moyer, DIII-D National Fusion Facility Tour for undergraduate physics class from University of San Diego, October 30, 2008.

Oral Presentation / Posters R. A. Moyer, DIII-D National Fusion Facility Tour for undergraduate physics class from University of San Diego, San Diego, CA, November 21, 2009.


Oral Presentation / Posters R. A. Moyer, T. L. Rhodes, C. L. Rettig, R. J. Groebner, E. J. Doyle, J. A.


Plenary Talk / Panel J. Kleissl, "Effect of hilly urban morphology on dispersion characteristics in the urban boundary layer", International Conference on the Urban Climate, Yokohama, Japan, June 2009.


Reports Y. Tao, M. S. Tillack, S. S. Harilal, B. O'Shay and F. Najmabadi, "Characterizing and optimizing


**EVENTS**

<table>
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<tr>
<th>SEMINARS (105)</th>
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<tr>
<td><strong>Title:</strong> Characterization of D-T Cryogenic Layer Formation in a Beryllium Capsule Using X-ray Phase Contrast Imaging</td>
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<tr>
<td><strong>Date:</strong> 2005-07-13</td>
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<tr>
<td><strong>Presenter(s):</strong> David S. Montgomery</td>
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<tr>
<td><strong>Location:</strong> General Atomics</td>
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<tr>
<td><strong>Title:</strong> Universal range scaling of dissipation elements</td>
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<td><strong>Date:</strong> 2005-08-08</td>
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<td><strong>Presenter(s):</strong> Norbert Peters</td>
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<tr>
<td><strong>Location:</strong> EBU-II Room 479, UC San Diego</td>
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<tr>
<td><strong>Title:</strong> Ignition Propagation in Constant Volume Chambers with Inhomogeneities</td>
</tr>
<tr>
<td><strong>Date:</strong> 2005-08-10</td>
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<td><strong>Presenter(s):</strong> John Hewson</td>
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<td><strong>Location:</strong> EBU-II Room 479, UC San Diego</td>
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<tr>
<td><strong>Title:</strong> Nonlinear theory of ablative Rayleigh-Taylor instabilities in the limit of an infinitely large density ratio. Application to ICF.</td>
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<td><strong>Presenter(s):</strong> Paul Clavin</td>
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<td><strong>Location:</strong> EBU-II Room 479, UC San Diego</td>
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<tr>
<td><strong>Title:</strong> Fronts in High-Temperature Laminar Gas Jets</td>
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<td><strong>Date:</strong> 2005-08-15</td>
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<td><strong>Presenter(s):</strong> Antonio Luis Sanchez Perez</td>
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<td><strong>Location:</strong> EBU-II Room 479, UC San Diego</td>
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<td><strong>Title:</strong> Laser-Induced Plasmas: A Fresh Look at a Hot Topic</td>
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<td><strong>Date:</strong> 2005-08-17</td>
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<td><strong>Presenter(s):</strong> Steven G. Buckley</td>
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<tr>
<td><strong>Location:</strong> EBU-II Room 479, UC San Diego</td>
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<tr>
<td><strong>Title:</strong> Premixed flame propagation in Hele-Shaw cells</td>
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Date: 2005-08-19
Presenter(s): P. D. Ronney
Location: EBU-II Room 479, UC San Diego

Title: On the outflow from, and inflow into, a circular pipe
Date: 2005-08-22
Presenter(s): Amable Linan
Location: EBU-II Room 479, UC San Diego

Title: Prague Asterix Laser System - PALS: Overview of Latest Activities
Date: 2005-08-23
Presenter(s): Milan Kalal
Location: EBU-II Room 479, UC San Diego

Title: Effect of Dilation on scalar dissipation in turbulent premixed flames
Date: 2005-08-24
Presenter(s): Ken Bray and N. Swaminathan
Location: EBU-II Room 479, UC San Diego

Title: Experimental Investigation of the Initial Stage of Nanosecond Exploding Wires
Date: 2005-10-05
Presenter(s): Gennady Sarkisov
Location: EBU-II Room 479, UC San Diego

Title: Target Fabrication at Universities - What for?
Date: 2005-10-12
Presenter(s): N. Renard-Le Galloudec
Location: EBU-II Room 479, UC San Diego

Title: Spectral Condensation as a Paradigm for the L-H Transition and the Role of Geodesic Transfer
Date: 2005-10-31
Presenter(s): Michael Shats
Location: EBU-II Room 479, UC San Diego

Title: Electrostatic Turbulence and Structures in a simple magnetized plasma
Date: 2005-10-31
Presenter(s): Stefan Mueller
Location: EBU-II room 584 UC San Diego

Title: Electron Wave Amplification Phenomena in the Combined Electron/Ion Beam System of an Electrostatic Ion Thruster and the Resulting RF Radiation
Date: 2005-11-08
<table>
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<tr>
<th>Presenter(s)</th>
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<th>Date</th>
<th>Presenter(s)</th>
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<td></td>
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<td>Analysis of time-resolved non-LTE L-shell spectra from Ti-doped aerogels</td>
<td>2006-01-17</td>
<td>Christina Back</td>
<td>UCSD, 479 EBU-II</td>
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<td>Studies of zonal flow - drift wave interactions in the DIII-D tokamak and numerical simulation</td>
<td>2006-01-24</td>
<td>Christopher Holland</td>
<td>UCSD, 479 EBU-II</td>
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<td>The Spatio-temporal Dynamics of Edge Localized Modes on the DIII-D and MAST Takamaks</td>
<td>2006-01-31</td>
<td>Ghassan Antar</td>
<td>UCSD, 479 EBU-II</td>
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<td>Results and Analysis from Ti K Imaging Radiography of Plastic Microshell Implosions</td>
<td>2006-02-03</td>
<td>James A. King</td>
<td>EBU-II room 584 UC San Diego</td>
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<td>Experimental Characterization of an Energetic Electron Beam in High Current X-pinchar Plasma</td>
<td>2006-02-07</td>
<td>Dmitri Fedin</td>
<td>UCSD, 479 EBU-II</td>
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<td>Disruption mitigation experiments using noble gas jets in DIII-D</td>
<td>2006-02-14</td>
<td>Eric Hollmann</td>
<td>UCSD, 479 EBU-II</td>
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<td>Edge Localized Mode Control in DIII-D Using Magnetic Perturbation-Induced Pedestal</td>
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Transport Changes

Date: 2006-02-21
Presenter(s): Rick Moyer
Location: UCSD, 479 EBU-II

Title: Overview of the Pulsed Power Inertial Confinement Fusion Program
Date: 2006-02-24
Presenter(s): John Porter
Location: General Atomics

Title: Fill Tube Experiments on Z
Date: 2006-02-24
Presenter(s): Mark Herrmann
Location: General Atomics

Title: Time dependent Thermo-mechanical Moduling including Phase Changes in Direct Drive Inertial Fusion Energy Targets
Date: 2006-02-28
Presenter(s): Kurt Boehm
Location: UCSD, 479 EBU-II

Title: Spectroscopic Measurements from the X-ray Bursts of 4-Wire Manganin X-pinches
Date: 2006-03-06
Presenter(s): K. M. Chandler
Location: EBU-II Room 479, UC San Diego

Title: A target engagement system for inertial fusion of energy
Date: 2006-03-07
Presenter(s): Lane Carlson
Location: UCSD, 479 EBU-II

Title: Studying X-Pinch Plasmas and Controlling the Radiation Characteristics
Date: 2006-03-07
Presenter(s): M. D. Mitchell
Location: EBU-II Room 479, UC San Diego

Title: MHD Simulations of Disruption Mitigation by Noble Gas Injection on Alcator C-MOD
Date: 2006-03-10
Presenter(s): Valerie Izzo
Location: EBU-II Room 479, UC San Diego

Title: Numerical Modeling of Laser Isochoric Heating of Hot Dense Matter
Date: 2006-03-10
Presenter(s): Yasuhiko Sentoku
Location: EBU-II room 584 UC San Diego

Title: Studying Laboratory Models for Astrophysical Jets
Date: 2006-03-16
Presenter(s): Andrea Ciardi
Location: EBU-II room 584 UC San Diego

Title: Use of four channel convex spectrometer to measure L-shell spectra and X-pinches
Date: 2006-04-04
Presenter(s): Elena Baronova
Location: UCSD, 479 EBU-II

Title: Optimization of laser-produced plasmas for EUV lithography
Date: 2006-04-11
Presenter(s): S. S. Harilal
Location: UCSD, 479 EBU-II

Title: Molybdenum and carbon angular sputtering distributions under low energy on bombardonment
Date: 2006-04-18
Presenter(s): Eider Oyarzabal
Location: UCSD, 479 EBU-II

Title: Plasma-Material interactions with mixed-material surfaces
Date: 2006-05-09
Presenter(s): Russ Doerner
Location: UCSD, 479 EBU-II

Title: Experimental Study of the Effective Thermal Conductivity and Interface Thermal Conductance of a Lithium Titanate Pebble Bed
Date: 2006-06-16
Presenter(s): Ali Abou-Sena
Location: EBU-II room 584 UC San Diego

Title: Ion-acoustic turbulence in helicon plasmas
Date: 2006-07-06
Presenter(s): K. P. Shamrai
Location: EBU-II 479

Title: Microtarget fabrication at the Rutherford Appleton Laboratory
Date: 2006-10-04
Presenter(s): Martin Tolley and Christopher Spindloe
Location: EBU-II 479

Title: Ionoluminescence and its application to fusion plasmas
Date: 2006-10-11
Presenter(s): David Jimenez Rey
Location: EBU-II 479

Title: X (-pinch) marks the spot for fusion
Date: 2006-10-18
Presenter(s): David Haas
Location: EBU-II 479

Title: Edge Localized Mode Control in DIII-D using Magnetic Perturbation-Induced Pedestal Transport Changes
Date: 2006-10-20
Presenter(s): Plasma Physics Group Seminar
Location: UCSD

Title: MHD analysis of the ARIES-CS DCLL blanket
Date: 2006-10-25
Presenter(s): Chiara Mistrangelo
Location: EBU-II 479

Title: Techniques for improving the radiative properties of underdense laser-produced plasma
Date: 2006-11-15
Presenter(s): Kevin Sequoia
Location: EBU-II 479

Title: Interferometric tracking for inertial fusion
Date: 2006-11-22
Presenter(s): Jon Spalding
Location: EBU-II 479

Title: Acceptance criteria for the ITER divertor vertical target
Date: 2006-11-29
Presenter(s): Stephanie Fouquet
Location: EBU-II 479

Title: Picosecond X-ray Diffraction from Shock-Compressed Crystals
Date: 2006-12-05
Presenter(s): Justin Wark
Location: General Atomics

Title: Microscopic characterization of dense plasmas using x-ray scattering
Date: 2007-02-07
Presenter(s): Gianluca Gregori
Location: EBU-II 479

Title: A theory of spontaneous toroidal rotation and some thoughts on neoclassical poloidal rotation in tokamaks
Date: 2007-02-14
Presenter(s): M. G. Haines
Location: EBU-II 479

Title: The Wire-Array Z-Pinch; an Efficient X-ray Source for ICF and a New Ion Heating Mechanism
Date: 2007-02-16
Presenter(s): Malcolm Haines
Location: EBU-II 584

Title: Dipole RF Power from Laser Plasmas with No Dipole Moment
Date: 2007-02-21
Presenter(s): Frank Felber
Location: EBU-II 479

Title: Diagnostics to Investigate the Runaway Electron Energy Distribution Function during Disruptions in DIII-D Tokamak
Date: 2007-02-28
Presenter(s): Alex James
Location: EBU-II 479

Title: Mass Production of Inertial Fusion Energy Fuel Pellets
Date: 2007-03-14
Presenter(s): Kurt Boehm
Location: EBU-II 479

Title: Astrophysical Jet Experiments with Laser-Produced Plasmas
Date: 2007-03-16
Presenter(s): Chris Gregory
Location: EBU-II 479

Title: Creation of Hot Dense Matter in Short Pulse Laser Interactions with Tamped Foils
Date: 2007-03-21
Presenter(s): Sophia Chen
Location: EBU-II 479

Title: Shock convergence and mix dynamics in inertial confinement fusion
Date: 2007-04-04
Presenter(s): Ryan Rygg
Location: EBU-II 479

Title: Modular Helium Reactor Design, Technology and Applications
Date: 2007-04-12
Presenter(s): Arkal Shenoy
Location: EBU-II 479

Title: Production of Hydrogen from Nuclear and Solar Energy
Date: 2007-04-19
Presenter(s): Ken Schultz
Location: EBU-II 479

Title: Novel diagnostics for WDM: application to shock compressed targets
Date: 2007-04-23
Presenter(s): Alessandra Ravasio
Location: EBU-II 479

Title: The deep burn destruction of nuclear waste transuranics using the gas cooled reactor
Date: 2007-05-03
Presenter(s): Francesco Venneri
Location: EBU-II 479

Title: Tensegrity Energy Harvesting Structures
Date: 2007-05-10
Presenter(s): Robert Skelton
Location: EBU-II 479

Title: Fusion Energy: Need, Promise, Progress and Politics
Date: 2007-05-14
Presenter(s): Stephen Dean
Location: CSE 4140

Title: Inertial fusion energy by fast ignition
Date: 2007-05-17
Presenter(s): Mike Key
Location: EBU-II 479

Title: A Thermo Chemical Process for the Conversion of Biomass to Mixed Alcohol
Date: 2007-05-24
Presenter(s): Robert Cattolica
Location: EBU-II 479

Title: The Path to Magnetic Fusion Energy: Crossing the Next Frontier
Date: 2007-05-25
Presenter(s): Rob Goldston and Jon Menard
Location: CMRR Auditorium

Title: Energy applications of nanotechnology
Date: 2007-05-31
Presenter(s): Prabhakar Bandaru
Location: EBU-II 479

Title: Energy in Context: Global and Local Energy Issues
Date: 2007-06-07
Presenter(s): Al Sweedler
Location: EBU-II 479

Title: Geothermal Energy: Extracting Heat from Hot Dry Rock Masses
Date: 2007-06-08
Presenter(s): Sia Nemat-Nasser
Location: EBU-II 479

Title: Experimental Investigation of shock heating and heat front penetration in planar targets relevant to direct drive internal confinement fusion
Date: 2007-07-20
Presenter(s): Hiroshi Sawada
Location: UCSD, 584 EBU-II

Title: High Energy Density Physics Summer School
Date: 2007-07-29
Presenter(s): Farhat Beg
Location: University of San Diego

Title: The Development and Application of Extreme Ultra-Violet Lasers
Date: 2007-08-28
Presenter(s): Greg Tallents
Title: Core Plasma and Dry Wall Chamber Design for Fast Ignition Laser Fusion Reactor FALCON-D
Date: 2007-08-28
Presenter(s): Takuya Goto
Location: UCSD, 459 EBU-II

Title: Morphological Diversity Extraction and Exploiting Sparsity in Inertial Confinement Fusion Research
Date: 2007-10-22
Presenter(s): Bedros Afeyan
Location: UCSD, 584 EBU-II

Title: An Overview of the Dynamic Hohlraum X-Ray source at Sandia National Lab
Date: 2007-11-28
Presenter(s): Thomas Sanford
Location: UCSD, 479 EBU-II

Title: Fuel Cells: Clean Energy Technology for Power Generation
Date: 2008-01-17
Presenter(s): Nguyen Minh
Location: CER conference room

Title: Fast Ignition Physics and FIREX Laser Review
Date: 2008-01-24
Presenter(s): Kazuo Tanaka
Location: CER conference room

Title: Fuel Assembly for Direct-Drive Inertial Confinement Fusion and Shock Fast-Ignition
Date: 2008-02-12
Presenter(s): C. D. Zhou
Location: CER conference room

Title: Bubble tin targets for LPP EUV light source
Date: 2008-02-25
Presenter(s): Keiji Nagai
Location: CER conference room

Title: Laboratory Craters: Modeling Experiments for Meteorite Impact Craters?
Date: 2008-02-28
Presenter(s): Tara Desai
Location: CER conference room

Title: Generation of 1 to 100 GeV monoenergetic electron beams via laser wakefield acceleration
Date: 2008-04-02
Presenter(s): Michail Tzoufras (UCLA)
Location: CER conference room

Title: Laser Matter Interactions and Applications
Date: 2008-04-21
Presenter(s): Ying Tsui
Location: CER conference room

Title: Efficient and compact short pulse MOPA system for Laser-Produced-Plasma Extreme-UV sources employing RF-discharge slab-waveguide CO2 amplifiers
Date: 2008-04-25
Presenter(s): Krzysztof Nowak
Location: CER conference room

Title: CO2 laser-produced Sn-plasma source for high-volume manufacturing EUV lithography
Date: 2008-04-25
Presenter(s): Yoshifumi Ueno
Location: CER conference room

Title: Fast Ignition Research at LLNL
Date: 2008-05-19
Presenter(s): Pravesh Patel
Location: CER conference room

Title: Pulsed power driven plasmas for High Energy Density Physics Studies
Date: 2008-05-22
Presenter(s): Simon Bott
Location: CER conference room

Title: 3D resistive MHD modeling of wire array Z-pinch
Date: 2008-05-27
Presenter(s): Christopher Jennings
Location: CER conference room

Title: X rays and relativistic electron beams from the interaction of a relativistic-intensity laser with solid-density plasmas at kilohertz repetition rates
Date: 2008-06-09
Presenter(s): Aghapi Mordovanakis
Location: CER conference room
Title: Modeling of Finite-Temperature Dense Matter in High Energy Density Physics  
Date: 2008-07-11  
Presenter(s): Hyun Chung  
Location: EBU-II Room 479, UC San Diego

Title: International HHFC Workshop on Readiness to Proceed from Near Term Fusion Systems to Power Plants  
Date: 2008-12-10  
Presenter(s): Rene Raffray  
Location: UC San Diego

Title: Guidance and Compression of an ultrashort laser pulse in a capillary discharge-produced plasma channel  
Date: 2009-03-20  
Presenter(s): Takeshi Higashiguchi  
Location: EBU-II Room 479, UC San Diego

Title: Laser induced breakdown spectroscopy of Zinc, Cadmium and Mercury Plasma Parameters Produced by teh 1064 nm, 532 nm and 355 nm of Nd:YAG Laser  
Date: 2009-03-26  
Presenter(s): Nek Shaikh  
Location: EBU-II Room 479, UC San Diego

Title: Defocusing effect in laser-cone coupling for fast ignition  
Date: 2009-04-21  
Presenter(s): John Pasley  
Location: EBU-II Room 479, UC San Diego

Title: Study of ultra-intense laser produced plasmas via computer simulation  
Date: 2009-07-17  
Presenter(s): Brian Chrisman  
Location: EBU-II Room 479, UC San Diego

Title: Measurement and modeling of laser ablation of tin droplet for clean EUV source  
Date: 2009-08-03  
Presenter(s): Akira Endo  
Location: EBU-II Room 479, UC San Diego

Title: Electron transport studies via rear side optical emission and nonlinear pulse evolution in laser-driven wakefields  
Date: 2009-08-03
Presenter(s): Claudio Bellei  
Location: EBU-II Room 479, UC San Diego

Title: Competition Between the Resistive Weibel Instability and the Electrothermal Instability in Fast Ignition  
Date: 2009-11-19  
Presenter(s): M.G. Haines  
Location: EBU-II Room 459, UC San Diego

Title: Development and Application of 3D-DIVIMP (HC) Monte Carlo Impurity Modeling Code  
Date: 2009-11-19  
Presenter(s): Yarong Mu  
Location: EBU-II Room 479, UC San Diego

Title: Dense Transient Plasmas with Neutral Gas Center: Laser-Produced and Z-Pinches  
Date: 2009-12-02  
Presenter(s): F. Veloso  
Location: EBU-II Room 479, UC San Diego

Title: Experimental and Simulation Studies of Femtosecond Laser Induced Plasma Discharge in Small Gaps and Material Surface Processing  
Date: 2009-12-03  
Presenter(s): J. Chen  
Location: EBU-II Room 479, UC San Diego

Title: Applied Plasma Physics and Fusion Energy Seminar  
Date: 2010-02-03  
Presenter(s): Bedros Afeyan  
Location: EBU-II Room 479

Title: Joint ESYS/CER Seminar  
Date: 2010-02-22  
Presenter(s): Charles Hall  
Location: Natural Sciences Building, Room 1205

Title: Applied Plasma Physics and Fusion Energy  
Date: 2010-04-26  
Presenter(s): John P. Verboncoeur  
Location: EBU-II Room 479

Title: Micro-Scale Nuclear Power Sources  
Date: 2010-04-29
**LECTURES (2)**

**Title:** Energy Trends and Technologies for the Coming Decades  
**Date:** 2007-03-07  
**Presenter(s):** Steven Koonin  
**Location:** Calit2 Auditorium

**Title:** Expanding Your Horizons  
**Date:** 2009-02-28  
**Presenter(s):** Dr. Rick Moyer  
**Location:** University of San Diego

**CONFERENCES (6)**

**Title:** Plasma Facing Components US Program Review  
**Date:** 2005-02-28  
**Presenter(s):** George Tynan  
**Location:** Yosemite Room, UCSD

**Title:** US/Japan Workshop on Power Plant Studies and Advanced Technologies with EU participation  
**Date:** 2006-01-24  
**Presenter(s):** Farrokh Najmabadi  
**Location:** UC San Diego

**Title:** H2-Automotive Workshop  
**Date:** 2006-03-13  
**Presenter(s):** Kalyanasundaram Seshardi
**Location:** Radisson Hotel, La Jolla, CA

**Title:** UCSD Energy Consortium
**Date:** 2007-03-06
**Presenter(s):** Farrokh Najmabadi
**Location:** UC San Diego

**Title:** The 5th U.S. Combustion Meeting
**Date:** 2007-03-25
**Presenter(s):** Various Speakers
**Location:**

**Title:** ARIES Town Meeting on Edge Plasma Physics and Plasma Material Interactions in the Fusion Power Plant Regime
**Date:** 2010-05-20
**Presenter(s):** Mark Tillack
**Location:** UC San Diego

**OTHER (2)**

**Title:** TITAN US/Japan Workshop and Steering Committee Meeting
**Date:** 2009-02-09
**Presenter(s):** Drs. Dai Kai Sze and Mark Tillack
**Location:** UC San Diego

**Title:** HEDP Workshop 2010
**Date:** 2010-06-28
**Presenter(s):** Farhat Beg
**Location:** UC San Diego

**NARRATIVE**

**Director's Statement - 5 Year**

**Center for Energy Research Five-year Review -- Director Statement**

**I. Vision:**

With the industrialization of the emerging nations, the world demand for energy will increase many fold in the next 50 years. The standard of living and the quality of life at the local, regional, national and global levels are strongly affected by the availability of adequate supply of energy and the choice of energy systems. As such, development of economical, secure, and environmentally responsible energy technologies to support this demand is a major challenge of the 21st century. This important challenge is now universally recognized.
Substantial research and development is required to develop new technologies for energy generation, distribution, and efficient utilization. In addition, it is necessary to train and educate the next generation of energy professionals. By their very nature, universities are ideally suited to carry out the fundamental research and education needed to create the knowledge base for the development of sound energy systems. As such, our mission statement is

**Creating solutions to the growing challenges of energy supply and use in the society**

Our vision and agenda for CER is to build an **internationally recognized center of excellence in energy research and education** by
a) Creating an organization to foster interdisciplinary research,
b) Develop visibility & recognition for UCSD as a leading institution in energy studies
c) Develop educational programs in energy technologies.

We have used the following **metrics** to measure our progress in each area (corresponding objectives are given in parenthesis)
1. Research funding (a, b)
2. Number of proposal submissions and their success rate (a, b)
3. Expansion of our research portfolio (a, b, c)
4. Winning prized awards such as centers of excellence (a, b, c)
5. Number of publications in scholarly journals, and plenary and invited lectures (b)
6. Awards and Honors (b, c)
7. Number of PhD students and PhD’s awarded each year (c)
8. Number of undergraduate and graduate students performing research which is NOT toward their degrees (c)
9. Hosting national events and conferences, as well as seminars and special lectures (a, b, c)
10. Outreach (a, b, c)

**II. Summary of our Accomplishments**

This report summarizes our activities during the past four years (per ORA's direction, the report is limited to the term of the current Director). Our achievements during this period have been remarkable, especially considering the state of CER in 2006. In summary, during the past four years:

1. The grant funding has increased from under $4.9M per year to $8.5M in this year (averaged)
2. We submitted 123 proposals. 90 Proposals were funded for a total of $43M.
3. Our research portfolio has expanded to include solar energy and fuel cells. We also attempted to establish programs in bio fuel and energy storage.
4. We were awarded the co-lead of the California Energy Commission's Solar Energy Collaborative.
5. In the 2009 competition for DOE/NSF Plasma science centers, we were awarded the leadership of two such centers and partnership in the third (only three centers were awarded).
6. We have published 262 articles in scholarly journals.
7. We have had 163 conference papers.
8. We have had 14 plenary and 72 invited lectures in prestigious national and international conferences.
9. We have supported 35 PhD students with 6 PhD degrees awarded per year (on average), including students from Physics, Chemistry, Materials Science, as well as Mechanical and Aerospace Engineering (MAE) and Electrical and Computer Engineering (ECE) Departments.
10. We supported 15 undergraduate and graduate students (Masters) who have performed paid research for our programs (not toward any degree).
11. CER members have won 12 awards from professional societies for their technical accomplishments.
12. We have established and continued an outreach program in science education for K-12.
In addition to the above, we have planted many seeds that will ensure further growth in the next few years. While we are pleased with our progress toward our goals in the past four years, we believe that our potential for growth as an institution remains quite high and are eagerly working to further our achievements.

* This report only lists accomplishments of active members of CER, i.e., only activities of faculty, scientists and students who are paid by grants administered by CER,. It does NOT include affiliated members nor activities of CER members who were funded under grants not administered by CER.

III. History of the ORU

The UCSD Energy Center was founded in the Fall of 1972 under the leadership of Professor Sanford Sol Penner. It was formally designated as an organized research unit on July 1, 1974. This ORU was given a new name, the Center for Energy and Combustion Research (CECR) in 1986 due to the focus of its research on combustion. Professor Forman Williams, whose research specialty is combustion, succeeded Prof. Penner as the Director in 1990. During the 1990s, there was a substantial growth in fusion research at UCSD: UCSD was the host of the international team for the ITER project (a multi-billion dollar international experiment to construct a fusion burning plasma experiment); UCSD became the host of US ITER home team under the direction of Dr. Charles Baker; and Professor Robert Conn, an internationally recognized expert in fusion energy, was appointed as the Dean of the School of Engineering.

These research activities were coordinated under the Fusion Energy Research Program, a cost-center reporting to the Dean of Engineering. In July of 2000, CECR was combined with Fusion Energy Research Program and was renamed the Center for Energy Research. Prof. Forman Williams remained as the CER Director and Dr. Charles Baker was appointed as the Deputy Director.

Although the two programs were combined to form CER, the ORU operated as two completely independent divisions during the next few years with a focus on maintaining status quo. This led to a deteriorating work environment, which forced some productive members to leave CER and disenfranchising others. As a measure, the annual research funding of CER dropped from about $8.5M per year in the 2000-2001 period to less than $5M per year in the 2005-2006 period. Some of these issues were raised in the 15-year CER review in 2005.

Following the 15-year CER review in 2005, the Senate recommended the search for a new Director. Because the CER Director resisted this recommendation, the Vice Chancellor formed a search committee for a new Director for CER. Following the recommendations of the search committee, I was named the Director effective July 2006. In protest, Professor Williams moved his grants (about $300K per year) from CER to the MAE Department, making the transition to the new leadership difficult.

While my major goal in accepting this position has been and continues to be expansion of our research portfolio, it became evident early on that a major part of my effort and those of the CER leadership should be devoted to develop an environment to foster interdisciplinary research, to ensure that existing programs continue, to re-organize CER administration and put its fiscal situation on a sound footing. We have been quite successful in re-organizing CER and turning the ORU into a dynamic research institution as is evident by our growth in the past few years.

IV. Research Activities
IV.1. PISCES Program

As the US and world Magnetic Fusion Energy (MFE) programs move into the burning plasma era, there are a number of plasma material interaction (PMI) issues and edge and scrape-off layer (SOL) boundary plasma issues that impact the design and performance of plasma-facing components (PFCs) in the ITER burning plasma experiment now under construction. The PISCES program is addressing several research topics that directly impact the success of the ITER program. These topics include studies of the effects of ELMs/disruptions on divertor and first wall structures, tritium retention effects in mixed materials and investigating various removal techniques, development of improved measurements and understanding of plasma transport to targets and walls. At the UCSD CER, we have several steady-state linear plasma sources that allow CER scientists to recreate the conditions found in the boundary region of these large fusion experiments. Careful laboratory studies then allow CER scientists to advance our understanding of boundary plasmas and its interaction with material walls. The overall objective of the CER PISCES program is to perform basic plasma-materials interaction and boundary plasma research needed for ITER PFC design validation and performance predictions.

In order to successfully meet this program objective, the PISCES Program uses the PISCES-B facility, located in EBU-II at UCSD, to perform controlled plasma experiments using ITER candidate materials. This facility is uniquely capable of using beryllium in mono-material and mixed material PMI experiments, and thus provides the focal point of the US-European Union European Fusion Development Association (EU EFDA) collaboration, which is focused upon ITER PFC R&D needs. As a part of this collaboration, the ability to apply thermal transients in these PMI experiments using pulsed lasers was recently added. The program is now prepared to perform controlled PMI studies of Be, C, W mono-materials as well as studies of Be-C, Be-W, C-W and ternary material combinations in both steady-state and ELM-like thermal transient PMI conditions. The program also takes advantage of a number of other laboratory plasma devices at UCSD to develop new PMI experimental capabilities, develop new edge plasma diagnostics and data analysis techniques, study the essential elements of turbulent cross-field SOL plasma transport, and perform fundamental PMI and divertor plasma physics studies.

The PISCES group carries out this work within the CER, which provides a suitable multidisciplinary environment. To date, the group has sponsored the research activities of over 10 MS and PhD students, and currently hosts 4 PhD students from the MAE and Physics Departments at UCSD. In addition, over 10 full-time professional research staff, including one faculty member, 2 research scientists, and 7 project scientists and postdoctoral scholars, and 3 full-time technical support staff are supported by the group. PISCES also hosts a full-time research scientist from the European Union; this individual carries out work of joint interest to both PISCES and the E.U. magnetic fusion program.

IV.2. Advanced Design Studies (ARIES) Program

Advanced Design Studies of reference fusion power plants have been and remain an essential tool in guiding fusion research. By simulating the operation of a fusion power plant, these studies synthesize the new and disparate scientific results into a self-consistent and integrated vision of a fusion system, and identify the scientific problems that carry greatest leverage for fusion research and important gaps in the present knowledge base. A typical three-year study requires detailed analyses of plasma operation (e.g., equilibrium and stability, current-drive, transport, fueling, edge-plasma and divertor), plasma support technologies (e.g., superconducting magnets, RF sources and launchers, pellet injection system), and fusion power systems (e.g., tritium breeding and power recovery, shielding, RAMI).

As such, advanced integrated design studies are performed by national teams from universities, national laboratories and industry (typically 30-40 scientists). UCSD leads the Advanced Design program and receives ~$1M in annual funding. Under UCSD leadership, U.S. effort in this area has become preeminent
in the world. Our studies have had a major impact in guiding the US and world fusion research. For example, the major scientific direction for tokamak research – Advanced Tokamak operation – is based on the fundamental issues identified by the Advanced Design Program research. Similarly, high-leverage directions for research were identified for stellarator, spherical torus and reversed-field configurations. The Advanced Design program has also had a great impact on technology research such as: pioneering work in the use of silicon carbide composites as major structural elements in the power plant and invention of the current leading concepts for tritium breeding and power recovery.

Through the work in the universities (currently 2/3 of the resources), the program provides valuable training for many fusion energy science researchers.

During the past four years, the UCSD program in Advanced Design within CER has sponsored research activities of 6 MS and PhD students. Currently, 5 full-time professional researchers and 3 graduate students (2 MS and one PhD) are supported.

Because of US preeminence in the world in this area, we routinely host scientists from major laboratories, including Forschungszentrum Karlsruhe, Gmbh, AEA Culham Laboratories, and the National Institute for Fusion Science, Japan.

IV.3. DIII-D Collaboration

The Center for Energy Research at UCSD is the largest university collaborator in the DIII-D National Fusion Facility research program, located at General Atomics in San Diego (DIII-D is the largest fusion experiment in the U.S.). Twelve CER scientists provide 8.25 FTE of research support to the DIII-D program through several confinement systems, plasma theory, and plasma technology grants from the Department of Energy (DoE) and through subcontracts from General Atomics. This research is focused on characterization and predictive understanding of the transport of particles, heat, and momentum from the plasma core through the edge/pedestal and scrape-off layer, to the plasma-facing components. Several issues critical to the success of ITER and other next-step burning plasma experiments are addressed by this research, including control or mitigation of the deleterious effects of magnetohydrodynamic (MHD) instabilities, to fundamental physics of plasma turbulence and transport.

The CER DIII-D collaboration leverages DoE resources from other on-campus research programs at UCSD, including: the PISCES and CSDX experimental research programs, the Center for Momentum Transport and Flow Organization in Plasmas and Magnetofluids, and the Plasma Surface Interactions Science Center. To carry out this research, UCSD operates an extensive array of diagnostics at DIII-D, including: 3 toroidal and 2 poloidal soft xray (SXR) arrays; 1 fast radiated power bolometer; 2 fast reciprocating Langmuir probe arrays; 2 fast framing cameras; and a set of hard xray (HXR) detectors for monitoring runaway electron interactions with the main chamber wall. In addition UCSD operates the Divertor and Midplane Material Exposure Systems (DiMES) for study of plasma-material interactions under sub-contract from General Atomics. The CER DIII-D collaboration also conducts plasma theory and numerical simulation research in order to develop predictive understanding of plasma transport processes in magnetically confined plasmas. This research includes: development and application of synthetic diagnostics for validation of plasma turbulence and transport codes against experimental measurements; modeling of the plasma response to externally applied magnetic perturbations used to suppress edge-localized-mode (ELM) instabilities, and nonlinear extended MHD stability and transport modeling of ELM and disruption dynamics and control.

This research program is staffed by 1 faculty, 4 research scientists, 4 project scientists, 1 postdoctoral scholar, and 2 graduate students. In addition to research, the CER collaboration at DIII-D has served the US Fusion program as an effective training vehicle for young scientists: to date, four Ph.D. graduate
students and nine postdoctoral scholars have performed their early career research in this program, with the majority (ten) continuing in permanent research positions either at UCSD or elsewhere in the US Fusion Program.

IV.4. High-Energy Density Physics

The High Energy Density Physics Program at UCSD has been pursuing experimental research on fast ignition (FI) inertial confinement fusion (ICF), laser matter interactions, wire array z-pinch, x-pinches and neutron sources. The program has a strong simulation component and has access to Particle-in-Cell (LSP and PICLS), radiation-hydrodynamic (Hydra and h2d) and 3D resistive Magnetohydrodynamic (MHD) codes. These codes are used to design and interpret experiments carried out both at National Laboratories and other user facilities, and also in the HEDP laboratory at UCSD. These codes are run on a 300 nodes cluster owned by the group and based at the UCSD Super Computer Center. The program presently comprises two senior researchers, four post-doctoral fellows, nine graduate students and two undergraduate students.

The HEDP program has been involved in the study of relativistic electron beam transport through solid and warm dense targets. The relativistic electron beam is produced in high intensity laser matter interactions. The collimation and efficient transport of the beam is critical to the success of FI.

Fast ignition is a special approach to ICF in which the energy to heat the fuel comes from a separate laser, rather than from the implosion process. This allows for the fuel to be heated more efficiently. It is quite inefficient to heat fuel by the process of implosion. There are a number of approaches to FI that are under current study. The one that HEDP group is primarily involved in, is that known as ‘Re-entrant cone guided FI’ (see Fig.). In this approach a small gold cone is imbedded into the side of the spherical fuel capsule, providing a clear pathway to the central region where the compressed fuel globule is formed. The ultraintense laser that ignites the fuel is fired into the cone. Where it interacts with the cone tip an enormous number of extremely energetic electrons are generated. These electrons fly out into the fuel; heating it to the temperatures required for fusion.

The cone-guided implosion concept

The HEDP group also studies all aspects of x-pinches, z-pinches and wire arrays driven by compact pulsed
power devices. These experiments are of interest both in themselves as highly dynamic plasma objects and high flux, compact x-ray sources, and also in their application to ICF and Inertial Fusion Energy (IFE). The study of ablation of wires in these various configurations is a subject of particular interest to the research community, in light of its strong effect on the evolution of the plasma structure. The scaling of the ablation process with drive current and materials will determine the confidence in very high current (>60MA) driver designs for ICF. The HEDP group designs and conducts experiments to dissect specific areas of the ablation process. These are carried out on an 80kA Marx driven pulser, and the 250kA GenASIS linear transformer driver (LTD). The data from these studies enables to more fully understand the fundamental properties of ablated plasma structures, and determine the physical mechanisms driving their behavior. Furthermore, the HEDP group studies supersonic jet formation extensively for its application to astrophysical phenomenon and their interaction with the interstellar medium and other objects. High velocity outflows are formed in several classes of object, particularly in the development of stars (Young Stellar Objects, or YSOs).

The UCSD HEDP program is well recognized internationally and nationally and collaborates with General Atomics, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Naval Research Laboratory, Sandia National Laboratory, Laboratory for Laser Energetics, Ohio State University, Rutherford Appleton Laboratory in the UK, Imperial College London, Technological Educational Institute of Crete in Greece, Nanyang Technical University in Singapore, Osaka University in Japan, and the University of Milan in Italy.

IV.5. Plasma-Surface Interaction Plasma Science Center

Plasma-surface interactions (PSI) pose an immense scientific and technological challenge to magnetic confinement fusion. A Department of Energy Plasma Science Center has been awarded to develop a coordinated approach to this highly coupled multiscale PSI problem. UCSD, University of Tennessee and MIT are co-centers involved in experimental and computational investigations aimed at better understanding the response of the material surface when exposed to the harsh environment surrounding confined plasma and its feedback controlling the boundary condition of the incident plasma. The PSI Science Center research themes include: surface and film dynamics, synergistic effects of radiation and plasma damage, plasma fuel retention, sheath physics and material erosion and transport.

This Center focuses on a new approach to PSI science – an approach that both exploits access to state-of-the-art lab PSI experiments and modeling, as well as confinement devices. The organizing principle is to develop synergistic experimental and modeling tools that treat the truly coupled multi-scale aspect of the PSI issues in confinement devices.

IV.6. The Center for Momentum Transport and Flow Organization (CMTFO)

The Center for Momentum Transport and Flow Organization in Plasmas and Magnetofluids (CMTFO) is a multi-institutional Plasma Science Center sponsored by the U.S. Department of Energy Office of Fusion Energy Sciences. It is led by Professors G.R. Tyan (UCSD-MAE Department and also affiliated with the Center for Energy Research (CER)) and P.H. Diamond (UCSD-Physics Department and also affiliated with the Center for Astrophysics and Space Science (CASS)). Collaborators include Prof. Zhihong Lin (UC Irvine Physics), Professor C.B. Forest (UW Madison Physics), Prof. P.W. Terry (UW-Madison Physics), Prof. N. Brumell (UC Santa Cruz Applied Mathematics), Prof. T. Munsat (Colorado Boulder Physics), Dr. H. Ji (Princeton Plasma Physics Laboratory). Total funding for the Center is approximately $6.3M over a 5 year period; over 15 postdocs and graduate students are currently supported by the Center. Funding was awarded to the Center in late 2009 after a national competitive review.
The CMTFO brings together astrophysical and magnetic fusion theorists, experimentalists and computationalists to focus on the problem of how small scale stochastic flows can self-organize and form large-scale coherent ordered flows in magnetized plasmas and astrophysical systems. Working across a range of experiments extending from liquid metal magnetohydrodynamics (MHD) and small laboratory plasmas to large magnetic confinement devices, Center researchers are examining the link between turbulent momentum transport and large scale flow self-organization using newly developed diagnostic and data analysis techniques, and are investigating and testing emerging theoretical and computational models. The computational tools range from nonlinear turbulent MHD codes to collisionless gyrokinetic plasma simulations. Center activities will be focused using a set of cross-cutting scientific themes relevant to systems as diverse as magnetic fusion plasmas, the solar tachocline and ionized accretion disks, and will seek to identify the underlying principles that govern self-organization of plasma and magnetofluid flows.

IV.7. Laser-produced plasma light sources

The physics and applications of laser-produced plasmas are active areas of research in the Center for Energy Research. At present, support comes from several private companies that are developing next-generation lithography light sources for the semiconductor industry, including KLA-Tencor, Cymer Inc. Komatsu/EUVA (Japan) as well as the University of California under the Industry-University Cooperative Research Program.

Two distinctive applications are being explored: (1) exposure tools for high volume manufacturing (HVM) using pulsed CO2 lasers, and (2) light sources for actinic metrology and mask inspection using pulsed Nd:YAG lasers. For HVM, the critical concerns include high power, which requires high conversion efficiency from laser light to in-band EUV emissions near 13.5 nm, and control and mitigation of plasma debris that can reduce the lifetime of critical (and expensive) optics. For metrology applications, size and stability of the light-emitting region is more critical. Lasers with very small focal spot are used to illuminate tiny droplet targets, producing plasmas with emitting region only 10's of microns in size.

Research is carried out in the on-campus Laser Plasma and Laser Matter Interactions Laboratory, which houses several high-energy lasers at wavelengths from deep UV to far infrared, together with extensive diagnostics for time and space-resolved measurements of laser produced plasmas. Studies are performed on laser-plasma hydrodynamics, atomic processes, and charged particle acceleration and transport.

IV.8. Inertial Confinement Fusion Technology

Our program in inertial confinement fusion (ICF) technology has focused on theoretical and experimental studies of optics for high-power lasers, material behavior in extreme environments to develop armor for ICF vessels, gas-dynamics simulation of the ICF vessel environment between shots and ICF cryogenic targets (thermal response, injection, and tracking).

Most of the research was performed under the High Average Power Laser Program, which is a coordinated, focused multi-lab effort to develop the science and technology for a Laser Inertial Fusion Energy (Laser IFE). The program is led by the Naval Research Laboratory and includes a team of scientists from national labs, universities, and industry, and was funded at about $25M per year.

UCSD was the largest university research member funded under this program at about $1.25M per year. The HAPL program supported 5 faculty and senior researchers, 7 PhD students, and 2 engineers at UCSD. In addition, the HAPL program enabled us to expand the UCSD Laser Plasma and Laser-matter Interactions Laboratory to become a major laboratory with over $2M in capital equipment. The expertise
and the infrastructure that we have developed through the HAPL program has enabled us to expand into other fields such EUV lithography as well as many recent proposals in laser-plasma interactions and material behavior under extreme conditions.

The HAPL program was terminated in 2009. Since then, research in this area is continuing under contracts with Lawrence Livermore National Laboratory and General Atomics but at a reduced scope and size (approximately $150K per year).

IV.9. Solar Energy

Regional Solar Energy Consortium: I led development of a Regional Consortium among UCSD, San Diego State University, and San Diego Gas and Electric to formulate joint research and a proposal in solar energy area in 2006. The Consortium was formed under a Nov. 21, 2006 Memorandum of Understanding (signed by the respective Dean of Engineering of UCSD and SDSU as well as the Director of Research of SDG&E). We held a workshop on March 6, 2007 among Consortium members which including several faculty from UCSD (from various Departments as well as CER), faculty from SDSU, representatives of SDG&E, and several outside invitees including the former head of the California Energy Commission. Following the workshop, I developed an initial proposal to initiate solar energy forecasting as the lead program for the consortium. Both UCSD and SDSU Deans of Engineering agreed to provide some seed funding to initiate this effort, develop capabilities, and look for major sponsors for future years. While SDG&E representatives were quite enthusiastic about the scope of the proposal, they declined to provide any internal resources, citing Company policies. This resulted in consortium activities to be put on hold. Fortunately, Dean Siebel provided his share of funding which provided Prof. Jan Kleissl (MAE Faculty, currently an Associate Director of CER) the seed funding necessary to develop this area.

California Solar Energy Collaborative: In 2007, we started discussions with the California Energy Commission (CEC) for UCSD to lead the California Solar Energy Collaborative. CEC funds these collaboratives to help the Commission to promote new energy options and act as a catalyst to bring industry, researchers, and government agencies together. At the time, CEC had collaboratives in biomass and wind energy, both housed at UC Davis. This proposal was approved and funded by the Commission as of Spring 2009.

Prof. Edward Yu of Electrical and Computer Engineering joined CER and agreed to become the Technical Director of the California Solar Collaborative (if approved) and was appointed an Associate Director of CER effective July 1, 2009. Prof. Yu had a substantial research program funded by the Department of Energy under the Solar America Program.

In response to Department Energy request for proposals, Prof. Yu led the development of a large proposal for an Energy Frontier Center. This was a 5-year, $18M proposal to establish a Center for Comprehensive Utilization of Solar Power. In addition to CER personnel, this proposal included faculty from Chemistry, Physics, MAE and ECE Departments (virtually every UCSD faculty with a strong research interest in solar energy) as well as several collaborators in other universities. This proposal, however, was not funded although reviewers’ comments all praised the quality of the proposed work.

In Winter 2010, Prof. Yu announced his decision to move to the University of Texas at Austin and resigned as the Associate Director of CER as well as the technical Director of the California Solar Collaborative. This was a great setback for our effort to expand solar research.

At present, our solar energy effort focuses on two fronts:

a) California Solar Energy Collaborative: which is led by Prof. Jan Kleissl of MAE and Prof. Joseph Ford of ECE Departments.
b) Solar Energy Forecasting: Prof. Jan Kleissl in collaboration with the UCSD operations (and Mr. Byron Washom, the Director of Strategic Energy Initiatives) was awarded a $1M program for his research in solar energy forecasting in 2009.

IV.10. Solid-Oxide Fuel Cell Research

Because CER did not receive the requested FTEs to expand in new energy areas, we have focused on recruiting researchers in the energy area through non-faculty academic (i.e., Research Scientist) and/or executive titles. This is a difficult approach to recruit senior personnel.

In 2009, we were fortunate to be able to recruit Dr. Nguyen Minh, the former head of the General Electric Fuel Cell Division to join us at UCSD and lead a fuel-cell research effort. Dr. Minh is an internationally recognized expert in fuel cells. In Spring 2010, Dr. Minh officially joined UCSD and was appointed as an Associate Director of CER and Head of the Fuel Cell program. Dr. Minh has already received a grant from the California Energy Commission and has submitted several proposals for a total of $6M to the Department of Energy. Dr. Minh is also preparing a Patent Disclosure through UCSD.

Research in this area focuses on fundamental research in fuel-cell components as well as developing innovative concepts that will reduce the cost, improve the durability, and increase the efficiency of fuel cell systems (such as new materials, new architectures, or new modes of operation for fuel cells) including liquid-fueled (non-hydrogen) fuel cells, and regenerative or reversible fuel cells. The fuel cell program at present includes a post-doc and two graduate students. We are in the process of recruitment in anticipation of success of our proposals.

IV.11. Other Research

We have also made efforts to expand CER research portfolio to include other energy technologies:

Bio-fuels: CER participated in developing a proposal from UCSD in response to a British Petroleum call for proposals to establish a bio-fuel center with an annual funding of $50M. Prof. Steve Buckley, Associate Director of CER at the time, led the development of the CER part of the proposal. Unfortunately, UCSD did not win the British Petroleum bio-fuel center. Our effort in bio-fuels was put on hold because Prof. Buckley, who was leading the effort in this area, took a leave of absence from the university in 2008 and resigned from UCSD the following year.

Energy Storage: We recruited a nationally recognized export, Dan Rastler, in energy storage from the Electric Power Research Institute. Mr. Rastler led an effort to develop a $2M proposal from UCSD (in collaboration with UCSD operations and Mr. Byron Washom, the Director of Strategic Energy Initiatives) under an ARPA-E request for proposals. Because we did not receive any FTE from the campus and the position had to be funded with soft money, the plan was for Mr. Rastler to move to UCSD once the proposal is funded. Unfortunately, our ARPA-E proposal in energy storage was not funded and Mr. Rastler decided to remain at EPRI.

V. Research Facilities

The PISCES laboratory includes two steady-state linear devices (reflex arc plasmas using LaB6 cathodes). Plasma parameters are ne=1017-1019/m3 and Te=2-40 eV. The heat fluxes on the sample ranges from 1-10 MW/m2. The PISCES-B device includes a beryllium enclosure (see figure below). The
laboratory house sophisticated in-situ and ex-situ surface analysis capabilities. The PISCES facility houses over $7M in capital equipment.

The CSDX laboratory is used to study drift wave turbulence-zonal flow (DWT-ZF) interactions and intrinsic rotation in a simple plasma configuration. This is a linear plasma device is operated with a 13.56 MHz 1500W RF helicon wave source that uses an antenna surrounding a 10 cm diameter glass belljar. The device has an overall length of 2.8m and a diameter of 0.2m.
The Laser Matter and Laser Plasma interactions Laboratory includes many 1-μm and 10-μm lasers, and comprehensive time & space resolved diagnostics. This laboratory houses over $2M in capital equipment.

The High Energy Density Physics (HEDP) Laboratory uses two pulsed power machines (80kA in 50ns and 250 kA in 150ns) to generate plasmas from fine wires. These plasmas can be hot and dense (Te ~ 1 keV, ne > 1020 cm-3) and used for direct investigation of HEDP conditions or point-projection radiography, or of modest parameters (Te ~10 eV, ne ~1018 cm-3), but highly supersonic.
**Off-campus facilities**: Members of the Center for Energy Research maintain very close ties with our partners at General Atomics (GA), which is located immediately north of campus. Collaborations exist in both magnetic and inertial fusion energy research. Many of our students and staff utilize facilities at GA in the performance of their research. Two examples of these facilities are the DIII-D tokamak and the IFE target technology laboratory, shown below. Research is also performed off-site, especially at major laser facilities throughout the world, such as Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Naval Research Laboratory, Sandia National Laboratory, Laboratory for Laser Energetics at Rochester University, Rutherford Appleton Laboratory in the UK, Imperial College London, and Osaka University in Japan.

**DIII-D** is the largest U.S. magnetic fusion facility: an advanced tokamak and divertor research device for addressing plasma confinement and control issues, a testbed for demonstrating and developing fusion technology components, and a proving ground for applied physics theories and diagnostic instrumentation. It is operated as a national user facility, with extensive national and international collaborations.
The Inertial Fusion Energy Target Laboratory houses facilities for studying target fabrication, injection and tracking for future applications in fusion energy experiments and commercial facilities. The target engagement experiment, shown in the figure below, is used to develop and demonstrate technologies needed to enable multiple high-energy laser beams to intercept a high-speed fusion target in flight, with sufficiently high precision to enable fusion to occur.
VI. Vision for the Future

Our vision and agenda for CER today is the same as those we put together 4 years ago: to build an internationally recognized center of excellence in energy research and education. We have made major progress in each area, and envision continued growth and progress along these same lines:

Expansion of Research: Our annual research funding has increased by about $1M each year with a corresponding increase in the number of proposals, particularly in interdisciplinary areas. We have had an encouraging proposal success rate of 74%. Our research portfolio has expanded to include solar energy and fuel cells with solid programs in each area.

Visibility and Recognition: Not only has our scientific productivity been high (262 journal and 163 conference publications), but the quality of the research also has been recognized as is witnessed by 14 Plenary and 72 Invited lectures.

In terms of popular media, Google search for "Energy Research San Diego" returns CER as the top pick and search for "Energy Research California" returns CER as the fourth top pick, ahead of UC Berkley California Energy Institute, Lawrence Berkeley National Laboratory and Electric Power Research Institute. CER members have made appearances on KPBS as well as been interviewed by local, state, and national media.

Educational Programs: We have had on average 30 PhD students continuously. In particular, we have
expanded the interdisciplinary aspects of our educational programs. At present four students from the Physics Department are performing their research in CER under supervision of two MAE faculty and 2 MAE students under supervision of an ECE faculty.

In addition to PhD research, typically 10-15 undergraduate and graduate (MS) students perform research in CER on a paid basis (but not toward any degree).

**Foster interdisciplinary research:** One area that requires special attention is the expansion of our collaborations with other faculty and researchers at UCSD as well as scientists outside the university. To this end, we have developed two new initiatives:

1) **Annual UCSD Energy Research Review:** Plans are under way to host a one-day event for energy researchers at UCSD. This includes oral presentations, break-out sessions, and posters. The first of such events is planned for April 2011.

2) **CER Advisory Committee:** We are planning to form an advisory committee consisting of senior energy experts from industry, national labs, and university to help us in achieving our goals as well as developing contacts to expand our collaborations and our research portfolio. We are planning to form this committee in 2011.

Given the progress in the past four years, we believe that we are on the correct path and are planning to build upon our success and move forward.

**VII. Needs**

**Funding:**

In the 2009-2010 fiscal year, CER sponsored research funding totaled $11M (including $3M in indirect costs). This represents an averaged annual funding of about $8.5M ($2.3M in indirect costs) as some proposals were funded for multiple years. We currently receive $150k in permanent funding and $80k in opportunity funds from ORA. The total CER operating funds for operation ($230k) represents 1.76% of our total research. As a fraction of research funding, CER operating funds are the **lowest among ORUs by a substantial factor**.

While we have implemented every measure to improve the productivity of our administration, the CER operating funds are NOT even sufficient to provide pre-and post-award administration. To face this shortcoming, CER PIs contribute to the operation of the ORU through their gift and start-up funds. However, this represents a double-taxation and is a major hindrance in attracting new members and/or fielding new proposals.

Our experience shows that an operating fund of ~5% of average annual funding is necessary for the successful operation of an ORU. For our current level of funding ($8.5M per year), the needs include:

- Fund Managers for pre- and post-award administration: 3 FTE
- Clerical support for post-award administration 1.5 FTE
- Outreach, event planning, etc. 0.5 FTE
- MSO 0.5 FTE

Additional operating funds are needed for 3 students to provide additional clerical support for awards, for office supplies (for a staff of 80), for hosting events, for publications, for recruiting students, for outreach to K-12, etc.

Note that the above level of operating funds does not include the expected growth in fuel cell research (we expect our averaged annual funding to surpass $10M in the coming year).
Space:

CER is located in Engineering Building II (EBUII). EBUII also houses the MAE department. CER growth in the past few years has created a shortage of space both for laboratory and staff offices. Similarly MAE department has grown substantially during the past few years. While the MAE Department and CER have worked closely to resolve space issues, there is a shortage of laboratory and office space in EBUII in general and for CER in particular. For example, our laser/plasma and laser/material interaction laboratory is located in EBUI (ECE department space) and the HEDP laboratory is located in EBUII (MAE department space). Virtually every staff office is fully utilized (and overcrowded).

Our immediate space need is to find laboratory and staff space for the fuel cell program. In the longer term (2-3 years), the overcrowding of EBUII and lack of laboratory space should be resolved when the new nano-Engineering building is completed. At present, we are in discussion with campus administration regarding these issues.

FTE:

It is extremely difficult to expand into new research areas without any additional FTEs. We need to provide incentives for scientist to join CER. For our established areas of research, the existing scientists, infra-structure, and reputation are generally sufficient. However, we have little to offer in order to recruit a senior scientist to join CER (or any ORU for that matter) if there is no existing program. CER problems with its operation fund and space make recruiting even more difficult (these issues appear as "penalties" for joining CER).

Given the UC budgetary problems, expansion of extramural research is an avenue to expand UC scientific base, UC research reputation, graduate education as well as generating indirect cost recovery. Initiatives such as providing space, start-up funds (formulated as return of a substantial fraction of indirect-cost in the first few years), recognition (senate membership) for non-faculty researchers as well as strengthening the ORU system can greatly help university in the long run.

Awards, Honors, Committee Service - FY 2006

AWARDS
Beg, Farhat:
Junior Faculty Award (US Department of Energy), 2005

HONORS
Doerner, Russell:
Invited (as only 2 US participants) to review PISCES mixed-material research at annual European PFC Task Force meeting, 2005

PATENT
Putvinski, S, Umstadter, K, and Meekins, M
Tao, Y and Tillack, M
Ohkawa, T and Umstadter, K
“System and Method of Vaporizing a Metal”, Filed, July 2005.

CONFERENCE LEADERSHIP
Beg, Farhat
Session Area Organizer (short pulse lasers and particle beams), International Conference on Plasma Science, Traverse City, Michigan, June 2006.
EDITORIAL LEADERSHIP
Najmabadi, Farrokh
Editorial Advisory Board, Fusion Science and Technology, 2000 to current

Tillack, Mark
Member, Editorial Advisory Board of the journal Fusion Engineering and Design, 1995 to current

OUTREACH
Mayers, Richard:
UCSD Point of Conact, DIII-D National Fusion Facility, 2003 to current
UCSD K-14 Outreach Council, 2003 to current
Coordinator, Fusion Group, CER educational outreach activities, 2003 to current

Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current

Umstadter, Karl
San Diego Science Fair Judge, 2003 to current

SERVICE
Baldwin, Matthew:
Contributed material on request to the ITER Physics Basis, 2005

Beg, Farhat
Program Chair, High Energy Density Physics Summer School at UC Berkeley, August 2005.

Boedo, Jose:
Contributor and founder of a SETI data processing group (setiathome.berkeley.edu), 2005 to current
Member of the International Advisory Committee for the European Physical Society Meeting, Satellite Workshop in Electric Fields and Transport held in various European cities, 2005 to current
Deputy Leader, Boundary Physics, National Spherical Torus Experiment, Princeton Plasma Physics Laboratory, 2005 to current
Deputy Leader, Boundary Physics, DIII-D, General Atomics, San Diego, 2005 to current

Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current
Member, American Nuclear Society Fusion Energy Division Executive Committee, 2004 to 2007.
Faculty Advisor, Tau Beta Pi, 2003 to 2009.
District Director, Tau Bet Pi, 2003 to 2006.
National Coordinator, Advanced Design Studies, DOE Office of Fusion Energy Sciences Virtual Laboratory for Technology, 1998 to current
Member, National Stellarator Program Planning Committee, 1998 to 2007
Member, International Atomic Energy Agency (IAEA) International Advisory Committee on Technical Meetings on Fusion Power Plant Design and Technology, 2004 to current

Tillack, Mark
UCSD coordinator for the Oak Ridge Institute for Science and Education (ORISE)
Fusion Science Fellowship, 2004 to current
UCSD coordinator for the International Atomic Energy Agency (IAEA) coordinated research program, “Pathways to Energy from Inertial Fusion (IFE) - an Integrated Approach”, 2006 to 2010
Chair, Fusion Standing Committee, IEEE Nuclear and Plasma Science Society, 2006 to 2009
Member, IEEE Nuclear and Plasma Science Society Administrative Committee, 2006 to 2009
Member, Scientific Advisory Board, Inertial Fusion Science and Applications – IFSA, 1999 to current
Tynan, George
Member, US Burning Plasma Organization Advisory Council, 2006 to current
Member, ALCATOR C-MOD Physics Advisory Committee, 2003 to 2005
University Fusion Associates:
  Member, 1999 to current
  Executive Committee: 2006 to current

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**Awards, Honors, Committee Service - FY 2007**

**AWARDS**

Najmabadi, Farrokh:
IEEE Fusion Technology Award presented at 22nd Symposium on Fusion Engineering

Spalding, Jon:
American Nuclear Society “Best Student Paper” award presented at the 17th Topical Meeting on Fusion

Umstadter, Karl
UC Discovery Industry University Cooperative Research Program Fellowship Recipient, June 2007

**HONORS**

Doerner, Russell:

**PATENT**

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**CONFERENCE LEADERSHIP**

Beg, Farhat
Session Area Organizer (short pulse lasers and particle beams), International Conference on Plasma Science, Traverse City, Michigan, June 2006.

**EDITORIAL LEADERSHIP**

Najmabadi, Farrokh
Editorial Advisory Board, Fusion Science and Technology, 2000 to current

Tillack, Mark
Member, Editorial Advisory Board of the journal Fusion Engineering and Design, 1995 to current

**OUTREACH**

Moyers, Richard
UCSD Point of Contact, DIII-D National Fusion Facility, 2003 to current
UCSD K-14 Outreach Council, 2003 to current
Coordinator, Fusion Group, CER educational outreach activities, 2003 to current

Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current

Umstadter, Karl
San Diego Science Fair Judge, 2003 to current

Wei, Mingsheng
Simple Machine Event Captain for San Diego Science Olympiad, 2006

SERVICE

Beg, Farhat
Member, Program Committee, Division of Plasma Physics, The American Physical Society, 2006.

Boedo, Jose:
Contributor and founder of a SETI data processing group (setiathome.berkeley.edu), 2005 to current
Member of the International Advisory Committee for the European Physical Society Meeting, Satellite Workshop in Electric Fields and Transport held in various European cities, 2005 to current
Deputy Leader, Boundary Physics, National Spherical Torus Experiment, Princeton Plasma Physics Laboratory, 2005 to current
Deputy Leader, Boundary Physics, DIII-D, General Atomics, San Diego, 2005 to current

Najmabadi, Farrokh
Faculty Advisor, Eta Kappa Nu, 2004 to 2006.
Member, American Nuclear Society Fusion Energy Division Executive Committee, 2004 to 2007.
District Director, Tau Bet Pi, 2003 to 2006.
Faculty Advisor, Tau Beta Pi, 2003 to 2009.
Member, Review Panel of Helmholtz Association (German National Laboratories) Nuclear Fusion Program, November 2006.
National Coordinator, Advanced Design Studies, DOE Office of Fusion Energy Sciences Virtual Laboratory for Technology, 1998 to current
Member, National Stellarator Program Planning Committee, 1998 to 2007
Leader of the U.S. delegation to and participant of the Japan/U.S. workshop on fusion power plant studies and related advanced technologies with European Union participation (University of Kyoto, Japan, February 5-7, 2007.
Member, International Atomic Energy Agency (IAEA) International Advisory Committee on Technical Meetings on Fusion Power Plant Design and Technology, 2004 to current

Tillack, Mark
Project Scientist and Specialist Review Panel, (PSSRP), 2006 to 2009
Member of the Materials Science and Engineering Program, April 2007 to current
UCSD coordinator for the Oak Ridge Institute for Science and Education (ORISE) Fusion Science Fellowship, 2004 to current
UCSD coordinator for the International Atomic Energy Agency (IAEA) coordinated research program “Pathways to Energy from Inertial Fusion (IFE) - an Integrated Approach”, 2006 to 2010
Vice President for Communications, Fusion Power Associates, April 2007 to current
Chair, Fusion Standing Committee, IEEE Nuclear and Plasma Science Society, 2006 to 2009
Member, IEEE Nuclear and Plasma Science Society Administrative Committee, 2006 to 2009
Member, Scientific Advisory Board, Inertial Fusion Science and Applications – IFSA, 1999 to current

Umstadter, Karl
UCSD Laser Safety Committee – Campus Laser Expert, 2006 to current
UCSD Entrepreneur/50K Competition Advisor, 2007 to current
Lead for UCSD-Peoples Republic of China (PRC) Fusion Research Collaboration, 2007 to current
Industry Research Liaison to Office Of Corporate Relations, 2007 to 2009
Local Committee for 2009 SOFE/ICOPS Meeting, 2007 to 2009

Tynan, George
Member, US Burning Plasma Organization Advisory Council, 2006 to current
University Fusion Associates: Member, 1999 to current
Executive Committee: 2006 to current
Vice-President, 2007 to 2009

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**Awards, Honors, Committee Service - FY 2008**

**AWARDS**
Beg, Farhat
2008 IEEE/NPSS Early Achievement Award

Ma, Tammy
2008 UCSD All-Grad Symposium Best Talk Award

Najmabadi, Farrokh
2007 IEEE/NPSS Fusion Technology Award

Umstadter, Karl
UC Discovery Industry University Cooperative Research Program Fellowship Recipient, June 2008

**HONORS**

**PATENT**
Tao, Y and Tillack,

**CONFERENCE LEADERSHIP**
Beg, Farhat

Tillack, Mark
General Chair, 23rd IEEE/NPSS Symposium on Fusion Engineering, June 2009

EDITORIAL LEADERSHIP
Najmabadi, Farrokh
Editorial Advisory Board, Fusion Science and Technology, 2000 to current

Tillack, Mark
Member, Editorial Advisory Board of the journal Fusion Engineering and Design, 1995 to current

OUTREACH
Moyers, Richard
UCSD Point of Contact, DIII-D National Fusion Facility, 2003 to current
UCSD K-14 Outreach Council, 2003 to current
Coordinator, Fusion Group, CER educational outreach activities, 2003 to current

Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current

Umstadter, Karl
San Diego Science Fair Judge, 2003 to current

Wei, Mingsheng
Simple Machine Event Captain for San Diego Science Olympiad, 2007

SERVICE
Beg, Farhat
Member of the panel to review the impact and quality of Journal of Physics of Plasmas, 2007.
Chair, Local Organizing Committee, 2nd High Energy Density Physics Summer School, San Diego 2007.
Member, Advisory Committee for proton oncology, UCSD School of Medicine, 2008
Member, Fusion Energy Science Advisory Committee on High Energy Density Laboratory Plasmas, Department of Energy, 2008

Boedo, Jose
Contributor and founder of a SETI data processing group (setiathome.berkeley.edu), 2005 to current
Member of the International Advisory Committee for the European Physical Society Meeting, Satellite Workshop in Electric Fields and Transport held in various European cities, 2005 to current
Deputy Leader, Boundary Physics, National Spherical Torus Experiment, Princeton Plasma Physics Laboratory, 2005 to current
Deputy Leader, Boundary Physics, DIII-D, General Atomics, San Diego, 2005 to current

Najmabadi, Farrokh
Vice Chair, Chair Elect, American Nuclear Society Fusion Energy Division, 2007-2008.
Member, American Nuclear Society Fusion Energy Division Executive Committee, 2004 to 2007.
Faculty Advisor, Tau Beta Pi, 2003 to 2009.
Member, DOE Fusion Energy Sciences Advisory Committee (FESAC) Panel on Strategic Planning, 2007
Member, DOE VLT Review Panel for US ITER Test Blanket Program, 2007
National Coordinator, Advanced Design Studies, DOE Office of Fusion Energy Sciences Virtual Laboratory for Technology, 1998 to current
Member, National Stellarator Program Planning Committee, 1998 to 2007
Member, International Atomic Energy Agency (IAEA) International Advisory Committee on Technical Meetings on Fusion Power Plant Design and Technology, 2004 to current

Tillack, Mark
Project Scientist and Specialist Review Panel, (PSSRP), 2006 to 2009
Member of the Materials Science and Engineering Program, April 2007 to current
UCSD coordinator for the Oak Ridge Institute for Science and Education (ORISE) Fusion Science Fellowship, 2004 to current
UCSD coordinator for the International Atomic Energy Agency (IAEA) coordinated research program “Paths to Energy from Inertial Fusion (IFE) - an Integrated Approach”, 2006 to 2010
Vice President for Communications, Fusion Power Associates, April 2007 to current
Chair, Fusion Standing Committee, IEEE Nuclear and Plasma Science Society, 2006 to 2009
Member, IEEE Nuclear and Plasma Science Society Administrative Committee, 2006 to 2009
Member, Scientific Advisory Board, Inertial Fusion Science and Applications – IFSA, 1999 to current

Umstadter, Karl
UCSD Laser Safety Committee – Campus Laser Expert, 2006 to current
UCSD Entrepreneur/50K Competition Advisor, 2007 to current
Lead for UCSD-Peoples Republic of China (PRC) Fusion Research Collaboration, 2007 to current
Industry Research Liaison to Office Of Corporate Relations, 2007 to 2009
Local Committee for 2009 SOFE/ICOPS Meeting, 2007 to 2009
Poster Sessions Chair and Publications Co-Chair 2008 to 2009
Member of UCSD CADRE, 2007 to current

Tynan, George
Member, US Burning Plasma Organization Advisory Council, 2006 to current
University Fusion Associates: Member, 1999 to current
Executive Committee: 2006 to current
Vice-President, 2007 to 2009

Awards, Honors, Committee Service - FY 2009

AWARDS
Kleissl, Jan
UCSD Sustainability Award
Trendsetters Award by Public Works Magazine

Tillack, Mark
2008 Technical Accomplishment Award from the American Nuclear Society's Fusion Energy Division

HONORS
Bartal, Teresa
Named Lawrence Livermore Scholar

Hollmann, Eric
Paper Nucl. Fusion 45, 1046-1055 (2005) on shortlist (top 10) for year's best paper in Nuclear Fusion
Nominated for 2008 Fusion Award

Kleissl, Jan
Research on Water Conservation distributed by the Associated Press and featured in LA Times and numerous California and national newspapers, Nebraska radio

Ross, Steven
Named Lawrence Livermore Scholar

Rudakov, Dmitry
Nominated for 2008 Fusion Award

PATENT

CONFERENCE LEADERSHIP

Beg, Farhat

Bott, Simon
Chair of the 8th International Workshop on the Physics of Wire Array Z-pinches, 2009

Doerner, Russell
Program Committee, 19th PSI Conference

Najmabadi, Farrokh

Tillack, Mark
General Chair, 23nd IEEE/NPSS Symposium on Fusion Engineering, June 2009

EDITORIAL LEADERSHIP

Najmabadi, Farrokh
Editorial Advisory Board, Fusion Science and Technology, 2000 to current.

Tillack, Mark
Member, Editorial Advisory Board of the journal Fusion Engineering and Design, 1995 to current.

OUTREACH

Kleissl, Jan
Taught K-12 Teacher Workshop at San Diego Supercomputing Center on Water Conservation. 
Exhibitor at the Greater San Diego Science and Engineering Fair

Moyers, Richard
UCSD Point of Contact, DIII-D National Fusion Facility, 2003 to current 
UCSD K-14 Outreach Council, 2003 to current 
Coordinator, Fusion Group, CER educational outreach activities, 2003 to current

Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current

Umstadter, Karl
San Diego Science Fair Judge, 2003 to current

SERVICE

Beg, Farhat
Member, Advisory Committee for proton oncology, UCSD School of Medicine, 2008
Member, Fusion Energy Science Advisory Committee on High Energy Density Laboratory Plasmas, Department of Energy, 2008

Boedo, Jose
Contributor and founder of a SETI data processing group (setiathome.berkeley.edu), 2005 to current
Member of the International Advisory Committee for the European Physical Society Meeting, Satellite Workshop in Electric Fields and Transport held in various European cities, 2005 to current
Deputy Leader, Boundary Physics, National Spherical Torus Experiment, Princeton Plasma Physics Laboratory, 2005 to current
Deputy Leader, Boundary Physics, DIII-D, General Atomics, San Diego, 2005 to current

Bott, Simon
Program Committee, 7th International Conference on Dense Z-pinches, 2008

Kleissl, Jan
Session chair for UCSD Undergraduate Research Conference

Najmabadi, Farrokh
Faculty Advisor, Tau Beta Pi, 2003 to 2009.
Chair, American Nuclear Society Fusion Energy Division, 2008 to 2009.
Member, DOE Fusion Energy Sciences Advisory Committee (FESAC), 2008 to 2009.
Leader of the U.S. delegation to and participant of the Japan/U.S. workshop on fusion power plant studies and related advanced technologies with European Union participation, University of Tokyo, Japan, March 16-18, 2009.
Member, International Atomic Energy Agency (IAEA) International Advisory Committee on Technical Meetings on Fusion Power Plant Design and Technology, 2004 to current.

Tillack, Mark
Project Scientist and Specialist Review Panel, (PSSRP), 2006 to 2009
Member of the Materials Science and Engineering Program, April 2007 to current
UCSD coordinator for the Oak Ridge Institute for Science and Education (ORISE) Fusion Science Fellowship, 2004 to current
UCSD coordinator for the International Atomic Energy Agency (IAEA) coordinated research program “Pathways to Energy from Inertial Fusion (IFE) - an Integrated Approach”, 2006 to 2010
Vice President for Communications, Fusion Power Associates, April 2007 to current
Chair, Fusion Standing Committee, IEEE Nuclear and Plasma Science Society, 2006 to 2009
Member, IEEE Nuclear and Plasma Science Society Administrative Committee, 2006 to 2009
Member, Scientific Advisory Board, Inertial Fusion Science and Applications – IFSA, 1999 to current

Umstadter, Karl
UCSD Laser Safety Committee – Campus Laser Expert, 2006 to current
UCSD Entrepreneur/50K Competition Advisor, 2007 to current
Lead for UCSD-Peoples Republic of China (PRC) Fusion Research Collaboration, 2007 to current
Industry Research Liaison to Office Of Corporate Relations, 2007 to 2009
Local Committee for 2009 SOFE/ICOPS Meeting, 2007 to 2009
Poster Sessions Chair and Publications Co-Chair 2008 to 2009
Member of UCSD CADRE, 2007 to current

Tynan, George
Member, US Burning Plasma Organization Advisory Council, 2006 to current
University Fusion Associates: Member, 1999 to current
Executive Committee: 2006 to current
Vice-President, 2007 to 2009
President, 2009 to 2011
Awards, Honors, Committee Service - FY 2010

AWARDS
Nishijima, Daisuke
2009 Significant Technical Accomplishment Award from the US Department of Energy, Office of Fusion Science

Beg, Farhat
Fellow of the American Physical Society, 2009

Najmabadi, Farrokh

HONORS
Beg, Farhat
Senior Member, Institute of Electrical and Electronics Engineers (IEEE), 2009

Izzo, Valerie
2009 Nuclear Fusion Award nomination

PATENT

CONFERENCE LEADERSHIP
Bott, Simon
Chair of the 8th International Workshop on the Physics of Wire Array Z-pinches, 2009

Doerner, Russell
Program Committee, 19th PSI Conference

Najmabadi, Farrokh

EDITORIAL LEADERSHIP
Beg, Farhat
Guest Editor, Special Issue of IEEE Transactions on Plasma Science, April 2010

Bott, Simon
Guest Editor of IEEE Transaction on Plasma Science 4th Special Issue on Z-Pinch Plasmas, 2010

Najmabadi, Farrokh
Editorial Advisory Board, Fusion Science and Technology, 2000 to current.

Tillack, Mark
Member, Editorial Advisory Board of the journal Fusion Engineering and Design, 1995 to current

OUTREACH
Moyers, Richard
UCSD Point of Contact, DIII-D National Fusion Facility, 2003 to current
UCSD K-14 Outreach Council, 2003 to current
Coordinator, Fusion Group, CER educational outreach activities, 2003 to current
Najmabadi, Farrokh
IEEE Nuclear & Plasma Sciences Society Distinguished Lecturer, 2005 to current.

Umstadter, Karl
San Diego Science Fair Judge, 2003 to current

Wei, Mingsheng
Assistant Event Captain for Junkyard Challenge of the San Diego Science Olympiad, 2010

SERVICE
Beg, Farhat
Member of the Panel on Relativistic Plasmas and Intense Beams, Research Needs Workshop on High Energy Density Plasmas, Nov. 15 to 18, 2009.
Panel Member, San Diego IEEE Senior Member Selection Panel, Jan. 2010.
Member, International Organization Committee, 5th Fast Ignition Workshop, Shanghai, China, 2010

Boedo, Jose
Contributor and founder of a SETI data processing group (setiathome.berkeley.edu), 2005 to current
Member of the International Advisory Committee for the European Physical Society Meeting, Satellite Workshop in Electric Fields and Transport held in various European cities, 2005 to current
Deputy Leader, Boundary Physics, National Spherical Torus Experiment, Princeton Plasma Physics Laboratory, 2005 to current
Deputy Leader, Boundary Physics, DIII-D, General Atomics, San Diego, 2005 to current

Bott, Simon
Scientific Secretary, International Conference on Plasma Science and Symposium on Fusion Energy (ICOPS-SOFE), 2009

Izzo, Valerie
Program Committee, Sherwood Fusion Theory Conference, 2009
ReNeW Workshop participant and panelist, 2009

Kleissl, Jan
Session chair for UCSD Undergraduate Research Conference
Faculty Advisor to Students for a Sustainable World

Najmabadi, Farrokh
Member, International Atomic Energy Agency (IAEA) International Advisory Committee on Technical Meetings on Fusion Power Plant Design and Technology, 2004 to current.
Coordinator and participant of the Joint meeting of U.S./Japan Workshop on Power Plant Studies and Advanced Technologies with EU participation, University of California, San Diego, February 23 to 24, 2010.
Chair, Board of Directors, Fusion Power Associates, 2009 to current.

Tillack, Mark
Project Scientist and Specialist Review Panel, (PSSRP), 2006 to 2009
Member of the Materials Science and Engineering Program, April 2007 to current
UCSD coordinator for the Oak Ridge Institute for Science and Education (ORISE) Fusion Science
Fellowship, 2004 to current
UCSD coordinator for the International Atomic Energy Agency (IAEA) coordinated research program “Pathways to Energy from Inertial Fusion (IFE) - an Integrated Approach”, 2006 to 2010
Member of American Nuclear Society, Fusion Energy Division Executive Committee, 2010 to 2013
Vice President for Communications, Fusion Power Associates, April 2007 to current
Chair, Fusion Standing Committee, IEEE Nuclear and Plasma Science Society, 2006 to 2009
Member, IEEE Nuclear and Plasma Science Society Administrative Committee, 2006 to 2009
Member, Scientific Advisory Board, Inertial Fusion Science and Applications – IFSA, 1999 to current
Member, EUV Source Technical Working Group for the EUV Litho “EUV Source Workshop”, 2010 to current

Umstadter, Karl
UCSD Laser Safety Committee – Campus Laser Expert, 2006 to current
UCSD Entrepreneur/50K Competition Advisor, 2007 to current
Lead for UCSD-Peoples Republic of China (PRC) Fusion Research Collaboration, 2007 to current
Industry Research Liaison to Office Of Corporate Relations, 2007 to 2009
Local Committee for 2009 SOFE/ICOPS Meeting, 2007 to 2009
Poster Sessions Chair and Publications Co-Chair 2008 to 2009
Member of UCSD CADRE, 2007 to current

Tynan, George
Member, US Burning Plasma Organization Advisory Council, 2006 to current
University Fusion Associates: Member, 1999 to current
Executive Committee: 2006 to current
Vice-President, 2007 to 2009
President, 2009 to 2011

Wei, Mingsheng
Session Organizer for the 37th IEEE International Conference on Plasma Science, Norfolk, Virginia, June 20 -24, 2010
Organizer for the 1st Student and Post-doctoral HEDP workshop, San Diego, June 28 – 30, 2010
Panel member of the LLNL NIF/Jupiter User Group meeting, Sep. 2009
Panel member of the DOE NNSA/OFES HEDLP Research Needs Workshop, Nov. 2009

Appendix

Appendix: Funded CER Grants (7/06 -6/10)

Title: Characterization of Foam Targets for Inertial Confinement Fusion Experiment
PI: F. Beg
Agency: General Atomics
Funding: $ 10,000

Title: Management of the TITAN program
PI: D. K. Sze
Agency: Oak Ridge National Laboratory
Funding: $ 277,000

Title: UCSD ITER Design Review Effort
PI: R. Raffray
Agency: Oak Ridge National Laboratory
Funding: $54,000

Title: UCSD GA Beryllium Target Coating Technology
PI: R. Doerner
Agency: General Atomics
Funding: $97,000

Title: DiMes Experimental Program
PI: R. Moyer, D. Rudakov
Agency: General Atomics
Funding: $61,000

Title: PISCES Program: Plasma Boundary Science, Materials Interactions, and Collaborations,
PI: G. Tyan, F. Najmabadi, R. Doerner
Agency: DOE
Funding: $5,700,000
Period of Performance: 12/2006 to 12/2009

Title: DIII-D Edge Physics, Disruptions, and Radiative Processes
PI: R. Moyer, J. Boedo, G. Tyan
Agency: DOE
Funding: $2,400,000
Period of Performance: 12/2006 to 12/2009

Title: Modeling and Numerical Simulation in Support of DIII-D
PI: G. Tyan
Agency: General Atomics
Funding: $132,000

Title: Supplemental task for PISCES Program,
PI: G. Tyan
Agency: DOE
Funding: $100,000

Title: Advanced Design Program,
PI: F. Najmabadi, M. Tillack, R. Raffray
Agency: DOE  
Funding: $ 2,805,000  

Title: A Concept Exploration Program in Fast Ignition Inertial Fusion  
PI: F. Beg  
Agency: General Atomics  
Funding: $ 65,000  

Title: Supplemental tasks for DIII-D Edge Physics, Disruptions, and Radiative Processes  
PI: R. Moyer  
Agency: DOE  
Funding: $ 73,000  
Period of Performance: 1/2007 to 1/2008

Title: Study of Pulsed-Power-Driven High Energy Density Plasmas  
PI: F. Beg  
Agency: Cornell University  
Funding: $ 30,000  

Title: Study of Pulsed-Power-Driven High Energy Density Plasmas  
PI: F. Beg  
Agency: Cornell University  
Funding: $ 30,000  

Title: Fast Ignition Studies of Inertial Confinement Fusion  
PI: F. Beg  
Agency: General Atomics  
Funding: $ 45,000  

Title: Advanced Concept Exploration for Fast Ignition  
PI: F. Beg  
Agency: General Atomics  
Funding: $ 150,000  

Title: High-energy Density Physics and applications  
PI: F. Beg  
Agency: DOE  
Funding: $ 25,000  
Period of Performance: 8/2007 to 8/2008
Title: Laser-produced Plasma Ion Energy and Expansion Dynamics for EUV Lithography
PI: M. Tillack, Y. Tao
Agency: UC Discovery Grant
Funding: $ 67,000

Title: Laser-produced Plasma Ion Energy and Expansion Dynamics for EUV Lithography
PI: M. Tillack, Y. Tao
Agency: Cymer Inc.
Funding: $ 80,000

Title: UCSD GA Beryllium Target Coating Technology
PI: R. Doerner
Agency: General Atomics
Funding: $ 100,000
Period of Performance: 10/2007 to 9/2008

Title: Management of the TITAN program
PI: D. K. Sze
Agency: Oak Ridge National Laboratory
Funding: $ 554,000

Title: DiMes Experimental Program
PI: R. Moyer, D. Rudakov
Agency: General Atomics
Funding: $ 102,000

Title: UCSD-PISCES TITAN Project (US Task 1-1)
PI: R. Doerner
Agency: General Atomics
Funding: $ 578,000
Period of Performance: 12/2007 to 3/2010

Title: Supplemental task for PISCES Program,
PI: G. Tynan, F. Najmbadi
Agency: DOE
Funding: $ 85,000
Period of Performance: 12/2007 to 12/2008

Title: Supplemental tasks for DIII-D Edge Physics, Disruptions, and Radiative Processes
PI: R. Moyer
Agency: DOE
Funding: $22,000
Period of Performance: 1/2008 to 1/2009

Title: Supplemental tasks for the Advanced Design
PI: F. Najmabadi, M. Tillack
Agency: DOE
Funding: $80,000
Period of Performance: 1/2008 to 12/2008

Title: Modeling and Numerical Simulation in Support of DIII-D
PI: G. Tynan
Agency: General Atomics
Funding: $127,000
Period of Performance: 2/2008 to 2/2009

Title: Fast Ignition Inertial Fusion Studies
PI: F. Beg
Agency: General Atomics
Funding: $38,000
Period of Performance: 3/2008 to 7/2009

Title: Support of Laser-Plasma Accelerator Development
PI: G. Tynan
Agency: Lawrence Livermore National Laboratory
Funding: $28,000
Period of Performance: 4/2008 to 9/2008

Title: Modeling Plasma Response to Non-Axisymmetric Magnetic Perturbations in Tokamaks
PI: R. Moyer
Agency: DOE
Funding: $846,000

Title: Advanced Concept Exploration for Fast Ignition
PI: F. Beg
Agency: General Atomics
Funding: $839,000

Title: Boundary Physics Studies in NSTX
PI: J. Boedo, G. Tynan
Agency: Princeton Plasma Physics Laboratory
Funding: $29,000
Period of Performance: 6/2008 to 12/2008
Title: Systematic Study of Fast Electron Transport & Magnetic Collimation in Hot Plasmas
PI: F. Beg
Agency: DOE
Funding: $ 66,000
Period of Performance: 9/2008 to 10/2009

Title: Supplement for Laser-produced Plasma Ion Energy & Expansion Dynamics for EUV Lithography
PI: M. Tillack, Y. Tao
Agency: UC Discovery Grant
Funding: $ 29,000
Period of Performance: 9/2008 to 1/2009

Title: Supplement for Laser-produced Plasma Ion Energy & Expansion Dynamics for EUV Lithography
PI: M. Tillack, Y. Tao
Agency: Cymer Inc.
Funding: $ 42,000
Period of Performance: 9/2008 to 1/2009

Title: UCSD GA Beryllium Target Coating Technology
PI: R. Doerner
Agency: General Atomics
Funding: $ 110,000
Period of Performance: 10/2008 to 9/2009

Title: Characterization and Optimization of the Density Profile of Confined CO2 Laser-produced plasma
PI: M. Tillack, Y. Tao
Agency: Extreme Ultraviolet Lithography Systems
Funding: $ 45,000
Period of Performance: 10/2008 to 3/2009

Title: D-III D Fusion Technology Research - DiMES and MiMES
PI: R. Moyer, D. Rudakov
Agency: General Atomics
Funding: $ 106,000

Title: Management of the TITAN program
PI: D. K. Sze
Agency: Oak Ridge National Laboratory
Funding: $ 286,000
Period of Performance: 12/2008 to 12/2009

Title: Laser Plasma Source Technology for EUV Mask Inspection
PI: M. Tillack
Agency: KLA Tencor Corp.
Funding: $50,000
Period of Performance: 12/2008 to 3/2009

Title: Support of Laser-Plasma Accelerator Development
PI: G. Tynan
Agency: Lawrence Livermore National Laboratory
Funding: $63,000

Title: Shock Temperatures from Neutron Resonance Spectroscopy
PI: F. Beg
Agency: Lawrence Livermore National Laboratory
Funding: $47,000

Title: Target Thermo-mechanical Behavior During Injection in the Life Engine
PI: R. Raffray
Agency: Lawrence Livermore National Laboratory
Funding: $240,000
Period of Performance: 1/2009 to 12/2010

Title: Strategic Planning Research for Integration of California Renewable Energy
PI: F. Najmabadi, E. Yu
Agency: California Energy Commission (through UCOP)
Funding: $23,000

Title: Modeling and Numerical Simulation in Support of DIII-D
PI: G. Tynan
Agency: General Atomics
Funding: $127,000
Period of Performance: 2/2009 to 2/2010

Title: Edge Physics Studies on the NSTX Spherical Tokamaks
PI: J. Boedo
Agency: DOE
Funding: $660,000
Period of Performance: 3/2009 to 3/2012

Title: Assessment of Proton Deflectometry for Exploding Wire Experiments
PI: F. Beg, M. Wei
Agency: NSF
Funding: $742,000
Title: Resolving the Issue: The Dynamics of Magnetized Astrophysical Jets  
PI: F. Beg  
Agency: University of Rochester  
Funding: $579,000  

Title: Laser-Produced Plasma Light Source for EUV Lithography  
PI: M. Tillack, Y. Tao  
Agency: UC Discovery Grant  
Funding: $230,000  

Title: Supplemental tasks for DIII-D Edge Physics, Disruptions, and Radiative Processes  
PI: R. Moyer, J. Boedo, G. Tynan  
Agency: DOE  
Funding: $190,000  
Period of Performance: 4/2009 to 1/2010

Title: Characterization and Optimization of the Density Profile of Confined CO2 Laser-Produced Sn Plasma for an EUVL Source  
PI: M. Tillack, Y. Tao  
Agency: Extreme Ultraviolet Lithography Sys.  
Funding: $45,000  

Title: Laser-produced plasma light source for EUV lithography  
PI: M. Tillack, Y. Tao  
Agency: KLA Tencor Corp.  
Funding: $200,000  

Title: Assessment of Proton Deflectometry for Exploding Wire Experiments  
PI: F. beg, S. Bott  
Agency: NSF  
Funding: $15,000  

Title: UCSD Support for Fusion Simulation Project Planning Activity  
PI: G. Tynan  
Agency: DOE  
Funding: $162,000  

Title: ARRA: Validation of Plasma Turbulence Models  
PI: G. Tynan
Title: Validation of Plasma Turbulence Models  
PI: G. Tynan, C. Holland  
Agency: DOE  
Funding: $ 1,245,000  

Title: Bridging the PSI Knowledge Gap: A Multi-Scale Approach  
PI: R. Doener  
Agency: DOE  
Funding: $ 2,625,000  
Period of Performance: 7/2009 to 6/2014

Title: Center for Momentum Transport & Flow Self-Organization in Plasmas  
PI: G. Tynan, P. Diamond  
Agency: DOE  
Funding: $ 2,883,000  
Period of Performance: 7/2009 to 6/2014

Title: Strategic Planning Research for Integration of California Renewable Energy  
PI: F. Najmabadi, J. Kliessl  
Agency: California Energy Commission (through UC Davis)  
Funding: $ 305,000  

Title: Fast Science Center for Extreme States of Matter & Fast Ignition Physics  
PI: F. Beg  
Agency: University of Rochester  
Funding: $ 950,000  
Period of Performance: 8/2009 to 7/2014

Title: Fast Ignition Inertial Fusion Studies  
PI: F. Beg, M. Wei  
Agency: General Atomics  
Funding: $ 610,000  
Period of Performance: 8/2009 to 7/2014

Title: ARRA: Assessment of Proton Deflectometry for Exploding Wire Experiments  
PI: F. Beg  
Agency: DOE  
Funding: $ 81,000  
Period of Performance: 8/2009 to 8/2010
Title: Direct Solid Oxide Fuel Cells  
PI: N. Minh  
Agency: California Energy Commission  
Funding: $ 95,000  
Period of Performance: 8/2009 to 7/2010

Title: Ion Fast Ignition  
PI: F. Beg  
Agency: General Atomics  
Funding: $ 547,000  
Period of Performance: 8/2009 to 8/2013

Title: Liquid tin target system for EUV lithography research  
PI: M. Tillack  
Agency: Komatsu Ltd. (Japan)  
Funding: $ 56,000  

Title: Assessment of tritium removal from co-deposited beryllium layers by flash heating  
PI: R. Doerner  
Agency: ITER Organization (France)  
Funding: $ 230,000  
Period of Performance: 10/2009 to 9/2010

Title: UCSD GA Beryllium Target Coating Technology  
PI: R. Doerner  
Agency: General Atomics  
Funding: $ 110,000  
Period of Performance: 10/2009 to 0/2010

Title: D-IIID Fusion Technology Research - DiMES and MiMES  
PI: R. Moyer, D. Rudakov  
Agency: General Atomics  
Funding: $ 107,000  
Period of Performance: 11/2009 to 10/2010

Title: Management of the TITAN program  
PI: D. K. Sze  
Agency: Oak Ridge National Laboratory  
Funding: $ 282,000  
Period of Performance: 12/2009 to 12/2010

Title: Indirect drive IFE target tracking and engagement  
PI: M. Tillack  
Agency: General Atomics
Title: PISCES Program: Plasma Boundary Science, Materials Interactions, and Collaborations  
PI: G. Tynan, F. Najmabadi, R. Doerner  
Agency: DOE  
Funding: $5,880,000  
Period of Performance: 12/2009 to 12/2012

Title: Advanced Design Program,  
PI: F. Najmabadi, M. Tillack  
Agency: DOE  
Funding: $3,000,000  
Period of Performance: 1/2010 to 12/2012

Title: DIII-D Edge Physics, Disruptions, and Radiative Processes  
PI: R. Moyer, J. Boedo, G. Tynan, E. Hollmann  
Agency: DOE  
Funding: $2,400,000  
Period of Performance: 1/2010 to 1/2013

Title: Ion Fast Ignition  
PI: F. Beg  
Agency: General Atomics  
Funding: $43,000  
Period of Performance: 1/2010 to 8/2010

Title: Modeling and Numerical Simulation in Support of DIII-D  
PI: G. Tynan  
Agency: General Atomics  
Funding: $142,000  
Period of Performance: 2/2010 to 2/2011

Title: Modeling Plasma Response to Non-Axisymmetric Magnetic Perturbations in Tokamak Boundaries  
PI: R. Moyer  
Agency: DOE  
Funding: $20,000  

Title: Advanced Concept Exploration for Fast Ignition  
PI: F. Beg  
Agency: General Atomics  
Funding: $425,000  
Title: Diagnostic for rapid characterization of TRISO fuel pellets using soft x-rays
PI: E. Hollmann
Agency: Far-Tech Inc.
Funding: $34,000