

# Patrick G. O'Shea

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## EMPLOYMENT:

- Current**     **University of Maryland**  
Professor & Chair, Department of Electrical & Computer Engineering  
Executive Director, Center of Applied Electromagnetics  
Distinguished Scholar Teacher  
with affiliate appointments & memberships in:  
Department of Physics  
The Institute for Research in Electronics & Applied Physics,  
The Maryland Nano Center  
The Maryland Energy Research Center
- 2001 - 2005**     Director of the Institute for Research in Electronics & Applied Physics,  
jointly in the A. James Clark School of Engineering, and the College of  
Computer Mathematical and Physical Sciences, University of Maryland
- 2001**     Acting Director, Institute for Plasma Research (renamed Institute for  
Research in Electronics & Applied Physics in mid 2001), University of  
Maryland
- 1998 - 2003**     Associate Professor of Electrical & Computer Engineering, University of  
Maryland
- 1998 - 2001**     Adjunct Associate Professor of Physics, Duke University
- 1994 - 1998**     Assistant Professor of Physics, Duke University
- 1986 - 1998**     **Los Alamos National Laboratory:**
- 1994 - 1998**     Leave of absence at Duke University
- 1990 - 1994**     Project Leader, APEX Free-Electron Laser Facility
- 1986 - 1990**     Chief Accelerator Physicist, Beam Experiments Aboard Rocket Project
- 1986**     Research Associate, Laboratory for Plasma and Fusion Energy Studies  
University of Maryland

## EDUCATION

<b>Academic Institution</b>	<b>Major</b>	<b>Degree/Year</b>
National University of Ireland, University College Cork	Physics	B.Sc. 1979
University of Maryland, College Park, MD	Physics	M.S. 1982
University of Maryland, College Park, MD	Physics	Ph.D. 1986

## HONORS AND AWARDS

- Distinguished Scholar-Teacher, University of Maryland (2009)
- Fellow of the American Association for the Advancement of Science (2007)
- Fellow of the Institute of Electrical and Electronic Engineers (2004)
- Fellow of the American Physical Society (2000)
- *Scholarship in Research* Honoree, University of Maryland (2008-09)
- Member of the Washington Academy of Sciences (2008)
- Marquis Who's Who in America (2008-9)
- Recognized as a University of Maryland "Rainmaker and Research Leader" for high achievement in sponsored research funding (2001- present)
- Directed Energy Professional Society Professional Society Graduate Scholarship (my student, Eric Montgomery) (2008)
- Best student paper, Advanced Accelerator Concepts Workshop (Eric Montgomery), Santa Cruz, CA (2008)
- IEEE National Capital Area Outstanding Service Award (2007)
- Brashear Best Student Paper Award 10<sup>th</sup> Annual Directed Energy Symposium (my students Eric Montgomery, Zhigang (Peter) Pan and Noah Sennet) (2007)
- Best Project in Training in Research and Education in Nonlinear Dynamics (TREND) Undergraduate Summer Program (Zhigang (Peter) Pan ) (2007)
- Alan Berman Research Publication Award from the US Naval Research Laboratory (with my student Nate Moody, and colleagues Kevin Jensen, and Don Feldman) (2007)
- Directed Energy Professional Society Professional Society Graduate Scholarship (Mike Holloway) (2007)

- Southeastern Universities Research Association Jefferson Laboratory Graduate Fellowship (Mike Holloway) (2006)
- Brashear Best Student Paper award 8<sup>th</sup> Annual Directed Energy Symposium (Nathan Moody) (2005)
- Directed Energy Professional Society Professional Society Graduate Scholarship (Jonathan Neumann) (2003 and 2004)
- Directed Energy Professional Society Professional Society Graduate Scholarship (John Harris) (2003 and 2004)
- Brashear Best Student paper award 5<sup>th</sup> Annual Directed Energy Symposium (Jonathan Neumann) (2002)
- Armed Forces Communications and Electronics Association Ralph W. Shrader Master's Degree Scholarship (Jonathan Neumann) (2002)
- Senior member of the Institute of Electrical and Electronic Engineers (2000)
- Distinguished Performance Team Award: Beam Experiment Aboard Rocket, Los Alamos (1988)

## RESEARCH INTERESTS AND ACCOMPLISHMENTS

*Primary area of interest:* applied electromagnetics; exploration, development and application of electromagnetic phenomena in high-brightness, electron and ion beams. The study of particle beams is of importance to several areas of physics and engineering, including: fusion energy, high-energy physics, nanoscience; and light sources such as free-electron lasers and synchrotrons.

### *Highlights*

- Demonstrated space-charge limited current phenomena in the propagation of high-current low energy electron beams in solenoidal and gas focused regimes (1984-85)
- Demonstrated and studied an advanced accelerator concept known as the *laser-controlled collective ion accelerator*. Achieved an accelerating gradient for protons of 30 MV/m (1986)
- Developed record high brightness 1-MeV H<sup>-</sup>, and H<sup>0</sup> beams on *Beam Experiments Aboard Rocket (BEAR)* test stand. (1987-89)
- Demonstrated autonomous operation of a directed energy experiment in space using radio-frequency quadrupole H<sup>-</sup> accelerator. Studied propagation H<sup>0</sup>, H<sup>-</sup>, and H<sup>+</sup> beams in geomagnetic field at an altitude of 200 km (1989)

- Demonstrated a high-current radio-frequency photocathode electron source as a driver for an high-gain infrared free-electron laser - first operation of an RF photoinjector coupled to a linear accelerator (1991).
- Demonstrated operation of electron photoinjector with space-charge emittance compensation whose brightness exceeded that of conventional sources by two orders of magnitude (1992). Experimental confirmation of theory of space charge emittance growth compensation.
- Demonstrated free-electron lasing from 370 nm to 11  $\mu\text{m}$  using low-energy, high-brightness electron beam, and achieved a record short wavelength for a linear accelerator driven FEL (1993)
- Member of team that demonstrated inverse Compton  $\gamma$ -ray production using an FEL (1996)
- Developed a theory of reversible and irreversible emittance growth (1995-98)
- Electron beam production of medical radioisotopes (1997-98)
- Developed the nitrogen-laser driven RF photoinjector (1997-98)

#### **Current projects:**

- Compact electron ring (UMER), an analog computer for beam physics studies in the space charge dominated regime; thermodynamics of beams and energy transfer mechanisms in beam systems.
- Use of low energy electron beams as systems for testing models of galactic dynamics
- Technology development for free-electron sources of coherent radiation including: dispenser photocathodes, pre-bunched FIR/THz compact FEL, e-beam transport, improved efficiency.
- Beam diagnostics using transition and diffraction radiation for phase space mapping; Beam tomographic techniques for phase space mapping.
- Exploration of coherent synchrotron radiation as beam degradation mechanism, beam diagnostic, and as a source of coherent radiation.

## **PROFESSIONAL PUBLICATIONS**

Note: published abstracts and extended abstracts are not included. A hyperlinked list can be found here:

<http://www.ece.umd.edu/~poshea/Publicationslist.htm>

## **ARTICLES IN REFEREED JOURNALS**

**Bold name** = my current or former student or postdoc

1. **Terahertz laser modulation of electron beams**, J.G Neumann, R.B. Fiorito, P.G. O'Shea, H. Loos, B. Sheehy, Z. Wu, *J. Appl. Phys.* **105**, 053304 (2009)
2. **Time-dependent phase space characterization of intense charged particle Beams**, D. Stratakis, R.A. Kishek, R.B. Fiorito, K. Tian, I. Haber, P.G. O'Shea, M. Reiser, and J.C.T. Thangaraj, *Phys. Rev. ST-AB* **12**, 020101 (2009).
3. **Aperture effects and mismatch oscillations in an intense electron beam**, J.R Harris and P.G. O'Shea, *Phys. Plasmas* **15**, 123106 (2008)
4. **Multicomponent measurements of the Jefferson Lab energy recovery linac electron beam using optical transition and diffraction radiation**, M.A. Holloway, R.B. Fiorito, A.G. Shkvarunets, P. G. O'Shea, S.V. Benson, D. Douglas, P. Evtushenko, and K. Jordan *Phys. Rev. ST – AB* **11**, 082801 (2008)
5. **Theory of photoemission from cesium antimonide using an alpha-semiconductor model**, KL Jensen, BL Jensen, EJ Montgomery, DW Feldman, PG O'Shea, and NA Moody, *J. Appl. Phys.* **104**, 044907 (2008);
6. **Negative transconductance in apertured electron guns**, J.R. Harris and PG O'Shea, *J. Appl. Phys.* **103**, 113301 (2008);
7. **Electron emission contributions to dark current and its relation to microscopic field enhancement and heating in accelerator structures**, K L. Jensen, Y. Y. Lau, D. W. Feldman and P. G. O'Shea, *Phys. Rev. ST Accel. Beams* **11**, 081001 (2008)
8. **Application of a general electron emission equation to surface nonuniformity and current density variation** KL Jensen, JJ Petillo EJ Montgomery , ZG Pan , DW Feldman PG O'Shea, NA Moody, M. Cahay, JE Yater, JL Shaw *J. Vacuum. Sc. & Tech B*, **26**, 831 (2008)
9. **Electron Sources for Accelerators**, C. Hernandez-Garcia, M. L. Stutzman, P. G. O'Shea, *Physics Today*, **61**, issue 2, 44 (2008)
10. **Advances in Cesium Dispenser Photocathodes: Modeling and Experiment** E. J. Montgomery, D.W. Feldman, P.G. O'Shea, Z. Pan, N. Sennett, K.L. Jensen, *J. Directed Energy* **3**, 1-12 (2008).
11. **Time-Dependent Imaging of Space-Charge-Dominated Electron Beams**, K. Tian, R.A. Kishek, P.G. O'Shea, R.B. Fiorito, D.W. Feldman, and M. Reiser, *Physics of Plasmas* **15**, 056707 (2008).

12. **Longitudinal density modulation and energy conversion in intense beams** J. R. Harris, J. G. Neumann, K. Tian, and P. G. O'Shea, *Phys. Rev. E*, **76** 026402 (2007)
13. **Tomographic Phase-Space Mapping of Intense Particle Beams Using Solenoids**, D. Stratakis, K. Tian, R.A. Kishek, I. Haber, M. Reiser, and P.G. O'Shea, *Physics of Plasmas (Letters)* **14**, 120703 (2007).
14. **Scaled Models: Space-Charge Dominated Electron Storage Rings** R.A. Kishek, G. Bai, S. Bernal, D. Feldman, T.F. Godlove, I. Haber, P.G. O'Shea, B. Quinn, C. Papadopoulos, M. Reiser, D. Stratakis, K. Tian, C.J. Tobin, and M. Walter, *International Journal of Modern Physics A* **22**, 3838 (2007).
15. **Scaled electron experiments at the University of Maryland**, I. Haber, G. Bai, S. Bernal, B. Beaudoin, D. Feldman, R. Fiorito, T.F. Godlove, R. A. Kishek, P.G. O'Shea, B. Quinn, C. Papadopoulos, M. Reiser, J. Rodgers, D. Stratakis, D. Sutter, K. Tian, C.J. Tobin, M. Walter, and C. Wu, *Nuclear Instruments and Methods A* **577**, 150-156 (2007).
16. **Measurement and Simulation of the time dependent behavior of the UMER source** I. Haber, D. Feldman, R. Fiorito, A. Friedman, D.P. Grote, R.A. Kishek, P.G. O'Shea, B. Quinn, M. Reiser, J. Rodgers, D. Stratakis, K. Tian, J.-L. Vay, and M. Walter, *Nuclear Instruments and Methods A* **577**, 157-160 (2007).
17. **Low Workfunction Surface Coatings for Dispenser Photocathodes in Radio Frequency Photoinjectors**, Nathan A. Moody, Donald W. Feldman, Patrick G. O'Shea, Kevin L. Jensen, Joan E. Yater, Jonathan L. Shaw, and Anne M. Balter, *J. Directed Energy* **2**, 243 (2007).
18. **Field-enhanced photoemission from metals and coated materials**, Kevin L. Jensen, Donald W. Feldman, Nathan A. Moody, and Patrick G. O'Shea, *Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures* **24**, 863, (2006)
19. **Theoretical model of the intrinsic emittance of a photocathode**, K. L. Jensen, P. G. O'Shea, D. W. Feldman, and N.A. Moody, *Applied Physics Lett.* **89**, 224103 (2006)
20. **A photoemission model for low work function coated metal surfaces and its experimental validation**, Kevin L. Jensen, Donald W. Feldman, Nathan A. Moody, and Patrick G. O'Shea, *J. Appl. Phys.* **99**, 124905 (2006) [ winner of the Alan Berman Research Publication Award from the US Naval Research Laboratory]

21. **Fixed-Geometry RMS Envelope Matching of Electron Beams from 'Zero' Current to Extreme Space-Charge**, S. Bernal, H. Li, R.A. Kishek, B. Quinn, M. Walter, M. Reiser, P.G. O'Shea, and C.K. Allen, *Physical Review ST - Accelerators & Beams* **9**, 064202 (2006).
22. **Tomography as a Diagnostic Tool for Phase Space Mapping of Intense Particle Beams**, D. Stratakis, R.A. Kishek, H. Li, S. Bernal, M. Walter, B. Quinn, M. Reiser, and P.G. O'Shea, *Physical Review Special Topics - Accelerators & Beams* **9**, 112801 (2006).
23. **Experimental observations of longitudinal space-charge waves in intense electron beams**, K. Tian, Y. Zou, Y. Cui, I. Haber, R. A. Kishek, M. Reiser, and P. G. O'Shea, *Physical Review. ST Accel. Beams* **9**, 014201 (2006)
24. **Governing factors for production of photoemission-modulated electron beams**, J. R. Harris, J. G. Neumann, and P. G. O'Shea, *J. Appl. Phys.* **99**, 093306 (2006)
25. **A photoemission model for low work function coated metal surfaces and its experimental validation**, Kevin L. Jensen, Donald W. Feldman, Nathan A. Moody, and Patrick G. O'Shea, *J. Appl. Phys.* **99**, 124905 (2006)
26. **UMER: An analog computer for dynamics of swarms interacting via long-range forces**, RA Kishek, G Bai, S Bernal, D Feldman, TF Godlove, I Haber, PG O'Shea, B Quinn, C Papadopoulos, M Reiser, D Stratakis, K Tian, CJ Tobin, M Walter, *Nuclear Instruments and Methods A* **561**: 266 (2006)
27. **Nonlinear Harmonic Generation in Free-Electron Lasers with Helical Wigglers**, H.P. Freund, P.G O'Shea, S. Biedron, *Physical Review Letters*, **94**, 074802 (2005)
28. **Observation of anomalous increase of longitudinal energy spread in a space-charge dominated electron beam**, Y. Zou, Y. Cui, M. Reiser, and P. G. O'Shea, *Physical Review Letters*, **94**, 134801 (2005)
29. **Production of Photoemission-Modulated Beams in a Thermionic Electron Gun**, J.G. Neumann, J.R. Harris, B. Quinn, and P.G. O'Shea, *Review of Scientific Instruments*, **76**, 033303 (2005), Also reprinted in the Virtual Journal of Ultrafast Science **4** (4), April 2005.
30. **Overview of US heavy ion fusion research**, B.G. Logan, F.M. Bieniose, C.M. Celata, E. Henestroza, J.W. Kwan, E.P. Lee, M. Leitner, P.K. Roy, P.A. Seidl, S.

Eylon, J.-L. Vay, W.L. Waldron, S.S. Yu, J.J. Barnard, D.A. Callahan, R.H. Cohen, A. Friedman, D.P. Grote, M. Kireeff Covo, W.R. Meier, A.W. Molvik, S.M. Lund, R.C. Davidson, P.C. Efthimion, E.P. Gilson, L.R. Grisham, I.D. Kaganovich, H. Qin, E.A. Startsev, D.V. Rose, D.R. Welch, C.L. Olson, R.A. Kishek, P. O'Shea, I. Haber, and L.R. Prost, *Nucl. Fusion* **45** 131–137 (2005)

31. **Experimental Tests of the Injection Y on the University of Maryland Electron Ring** Mark Walter, **D. Lamb, S. Bernal**, T. Godlove, I. Haber, R. Kishek, **H. Li**, P. O'Shea, **B. Quinn**, and M. Reiser, *Nuclear Instruments and Methods A* **544** : 374 (2005).
32. **Production of Photoemission-Modulated Beams in a Thermionic Electron Gun**, **J.G. Neumann, J.R. Harris, B. Quinn**, and P.G. O'Shea, *Review of Scientific Instruments*, **76**, 033303 (2005)
33. **Beam Control and Matching the Transport of Intense Beams**, **H. Li, S. Bernal**, T. Godlove, **Y. Huo**, R.A. Kishek, I. Haber, **B. Quinn**, M. Walter, **Y. Zou**, M. Reiser, and P.G. O'Shea, *Nuclear Instruments and Methods A*, **544**, 367 (2005).
34. **Coherent error study in a retarding field energy analyzer** **Y. Cui, Y. Zou**, M. Reiser, R.A. Kishek, I. Haber, **S. Bernal** and P.G. O'Shea *Nuclear Instruments and Methods A*, **544** 527 (2005).
35. **Simulation studies on matching of space-charge-dominated beams for the University of Maryland Electron Ring (UMER)**, **H. Li, S. Bernal**, R.A. Kishek, I. Haber, **Y. Zou**, P.G. O'Shea, and M. Reiser, *Nuclear Instruments and Methods A* 519, 405-411 (2004).
36. **Collective Space-Charge Phenomena in the Source Region**, I. Haber, **S. Bernal**, C. M. Celata, A. Friedman, D. P. Grote, R.A. Kishek, **B. Quinn**, P.G. O'Shea, M. Reiser, and J.-L. Vay, *Nuclear Instruments and Methods A* **519**, 396-404 (2004).
37. **Intense Beam Transport Experiments in a Multi-Bend System at the University of Maryland Electron Ring (UMER)** **S. Bernal, B. Beaudoin, Y. Cui, M. Glanzer, T. F. Godlove, J. Harris, M. Holloway, I. Haber, R.A. Kishek, W-T. Lee, H. Li, D. Lamb, B. Quinn, M. Qurius, M. Reiser, A. Valfells, M. Virgo, M. Walter, M. Wilson, R. Yun, Y. Zou**, and P. G. O'Shea, *Nuclear Instruments and Methods A* 519, 380-387 (2004).

38. **Theoretical Study of Transverse Emittance Growth in a Gridded Electron Gun**, Y. Zou, H. Li, M. Reiser, and P.G. O'Shea *Nuclear Instruments and Methods A* **519**, 432-441 (2004).
39. **Beam Experiments in the Extreme Space-Charge Limit on the University of Maryland Electron Ring (UMER)**, S. Bernal, H. Li, T. Godlove, I. Haber, R.A. Kishek, B. Quinn, M. Reiser, M. Walter, Y. Zou, and P.G. O'Shea *Physics of Plasmas*, **11** 2907-2915 (2004).
40. **Measurement of Beam Energy Spread in a Space-Charge Dominated Electron Beam**, Y. Cui, Y. Zou, M. Reiser, R.A. Kishek, I. Haber, S. Bernal, and P.G. O'Shea *Physical Review Special Topics - Accelerators & Beams* **7**, 072801 (2004).
41. **Design and Operation of a Retarding Field Energy Analyzer with Variable Focusing for Space-Charge Dominated Electron Beams**, Y. Cui, Y. Zou, A. Valfells, M. Walter, I. Haber, R.A. Kishek, S. Bernal, M. Reiser, and P.G. O'Shea *Review of Scientific Instruments*, **75** : 2736-2745 (2004).
42. **The quantum efficiency of dispenser photocathodes: Comparison of theory to experiment** K. L. Jensen, D. W. Feldman and P. G. O'Shea, *Appl. Phys. Letters* **85**, 5448 (2004)
43. **Nonlinear harmonic generation in free-electron laser oscillators** H.P. Freund, P.G. O'Shea, S.G. Biedron, *Nucl. Instr. Meth. A-528* **44** (2004)
44. **Longitudinal space-charge effects in a retarding field energy analyzer**, Y Zou, Y Cui, I. Haber, M. Reiser, P.G. O'Shea, *Phys Rev. ST-AB* **6** Art. No. 112801 (2003)
45. **Optical diffraction-transition radiation interferometry and its application to the measurement of beam divergence** A. Shkvarunets, R. Fiorito, and P.G. O'Shea, *Nuclear Instruments and Methods B*, **201**,Pages 153-160, (2003)
46. **Simulation of prebunching in free-electron lasers**, H. P. Freund, P. G. O'Shea and J. Neumann, *Nuclear Instruments and Methods*, May (2003)
47. **Progress in heavy ion fusion research**, C. M. Celata, F. M. Bieniosek, E. Henestroza, J. W. Kwan, E. P. Lee, G. Logan, L. Prost, P. A. Seidl, J-L. Vay, W. L. Waldron, and S. S. Yu, J. J. Barnard, D. A. Callahan, R. H. Cohen, A.

- Friedman, D. P. Grote, S. M. Lund, A. Molvik, W. M. Sharp, and G. Westenskow, Ronald C. Davidson, Philip Efthimion, Erik Gilson, L. R. Grisham, Igor Kaganovich, Hong Qin, and Edward A. Startsev, S. **Bernal**, Y. **Cui**, D. Feldman, T. F. Godlove, I. Haber, **J. Harris**, R. A. Kishek, **H. Li**, P. G. O'Shea, **B. Quinn**, M. Reiser, A. Valfells, M. Walter, and **Y. Zou**, D. V. Rose and D. R. Welch, *Physics of Plasmas*, **10**, 2064 (2003)
48. **Simulations and experiments with space-charge-dominated beams** , R. A. Kishek, **S. Bernal**, C. L. Bohn, D. Grote, I. Haber, **H. Li**, P. G. O'Shea, M. Reiser, and M. Walter, *Physics of Plasmas*, **10**, 2016 (2003)
49. **Advanced photocathode simulation and theory**, KL Jensen, DW Feldman, PG O'Shea *Nucl. Instrum. Meth. A* **507**: 238-241(2003).
50. **Infrared photoelectron emission from Scandate dispenser cathodes**, KL Jensen, DW Feldman, **M Virgo** P.G. O'Shea *Appl. Phys. Lett.* **83**, 1269-1271 (2003)
51. **Electron Beam Modulation Using a Laser Driven Photocathode**, **JG Neumann**, P. G. O'Shea, **D. Demske**, W. S. Graves, B. Sheehy, H. Loos and G. L. Carr et al. *Nucl. Instrum. Meth. A* , 498 (2003)
52. **Multiple-Beam Free-Electron Lasers**, H.P. Freund, D. Douglas, and P.G. O'Shea, *Nucl. Instrum. Meth. A* **507**, 373 (2003)
53. **Simulation of Prebunching in Free-Electron Lasers**, H.P. Freund, P.G. O'Shea, and **J. Neumann**, *Nucl. Instrum. Meth. A* **507**, 400 (2003).
54. **Compact high-resolution retarding field energy analyzer for space-charge-dominated electron beams** **Y. Zou**, **Y. Cui**, V. Yun, **A. Valfells**, R. A. Kishek, **S. Bernal**, I. Haber, M. Reiser, P. G. O'Shea, and J. G. Wang, *Phys. Rev. ST-AB* **5**, 072801 (2002)
55. **Edge imaging in intense beams** **S. Bernal**, **B. Quinn**, M. Reiser, and P. G. O'Shea, *Phys. Rev. ST-AB*, **5**, 064202 (2002)
56. **Effects of pulse-length and emitter area on virtual cathode formation in electron guns**, **Ágúst Valfells**, D. W. Feldman, **M. Virgo**, P. G. O'Shea, and Y. Y. Lau, *Phys. Plasmas* **9**, 2377 (2002)

57. **A Polychromatic FEL Light Source Using a Single Electron Beam and Multiple Wigglers** H.P. Freund, P.G. O'Shea, *Nuclear Instruments and Methods A* **483**, 449-454 (2002)
58. **A generalized electron emission model for field, thermal, and photo-emission** K. L. Jensen, P.G. O'Shea, D. W. Feldman, *Applied Physics Letters* **81**, 3867-3869 (2002)
59. **End-to-end Simulation: The Front End, I. Haber,** F. M. Bieniosek, C. M. Celata, A. Friedman, D. P. Grote, E. Henestroza, J. -L. Vay, **S. Bernal**, R. A. Kishek, P. G. O'Shea, M. Reiser, W. B. Herrmannsfeldt, *Laser and Particle Beams*, **20**, 599 (2002)
60. **Experiments with Space Charge Dominated Beams for Heavy Ion Fusion Applications,** P.G. O'Shea, R.A. Kishek, M. Reiser, **B. Beaudoin, S. Bernal, Y. Cui, A. Diep, D. Feldman, M. Glanzer, T.F. Godlove, I. Haber, J. Harris, H. Li, J. Neumann, B. Quinn, M. Quirius, M. Snowel, Valfells, A., M. Virgo, M. Walter, R. Yun, Y. Zou,** *Laser and Particle Beams*, **20**, 431 (2002)
61. **Free-Electron Lasers: Status and Applications,** P.G. O'Shea and H.P. Freund, *Science*, **292**, 1853 (2001)
62. **Transverse Space Charge modes in Nonequilibrium Beams,** R.A. Kishek, **S. Bernal**, P.G. O'Shea, M. Reiser, I. Haber, *Nuclear Instruments and Methods A* **464**, 484-492 (2001),
63. **The University of Maryland electron Ring (UMER),** P.G. O'Shea M. Reiser, R.A. Kishek, **S. Bernal, H. Li, M. Pruessner V. Yun, Y. Cui, W. Zhang, Y. Zou,** T. Godlove, D. Kehne, P. Haldemann, *Nuclear Instruments and Methods A* **464**, 646, (2001)
64. **Injector for the University of Maryland Electron Ring,** D. Kehne, T. Godlove, P. Haldemann, **S. Bernal, S. Guharay, R. Kishek, Y. Li, P. O'Shea, M. Reiser, V. Yun, Y. Zou, I. Haber,** *Nuclear Instruments and Methods*, **A464**, 605-609 (2001).
65. **Coherent off-axis undulator radiation from short electron bunches,** C.P. Neuman, W. S. Graves, P.G. O'Shea, *Physical Review ST-AB*, **3** 030701 (2000)
66. **Two-color operation in high-gain free-electron lasers,** H. P. Freund and P.G. O'Shea, *Physical Review Letters*, **84** 2861 (2000)

67. **Energy Transfer in Nonequilibrium Space-Charge-Dominated Beams**, R.A. Kishek, P.G. O'Shea, M. Reiser, *Physical Review Letters*. 85, 4514 (2000)
68. **Design and Field Measurements of Printed-Circuit Quadrupoles and Dipoles**, W.W. Zhang, H. Li, S. Bernal, T. Godlove, R.A. Kishek, P.G. O'Shea, M. Reiser, M. Venturini, V. Yun, *Physical Review ST-AB* 3, 122401 (2000)
69. **Electron Beam Matching and its Influence on the Performance of High-Gain Free-Electron Laser Amplifier Performance**. H.P. Freund and P.G. O'Shea. *Nucl. Instr. Meth*, **A429**, 219 (1999).
70. **A Non-Destructive Electron Beam Diagnostic for a SASE FEL using Coherent Undulator Radiation from a Short Undulator**, C. Neuman, M. Ponds, G. Barnett, J. Madey, P. G. O'Shea. *Nucl. Instr. Meth*, **A429**, 287 (1999).
71. **Reversible and Irreversible Emittance Growth in Charged Particle Beams**, P. G. O'Shea, *Physical Review E*, **57**, 1081 (1998)
72. **The Effect of a Matched Electron Beam on High-Gain Free-Electron Laser Amplifier Performance**, H.P. Freund and P.G. O'Shea, *Physical Review Letters*, **80**, 520 (1998)
73. **Production of Radioisotopes via Direct Electron Activation**, K.J. Weeks and P.G. O'Shea, *Medical Physics*. **25**, 488 (1998)
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## RESEARCH GRANTS AND CONTACTS

Agency	PI Status	Title	Award	Dates
Maryland Industrial Partnerships	PI	Novel Signal Processing Prototypes (with Coil Guitars, LLC)	\$90,000	1/2009-1/10
Office of Naval Research	PI	Research in Technology for High Average Power Free-Electron Lasers	\$1,419,000	8/2007 -8/10
DOE Office of High Energy	PI	Accelerator Research Studies	\$2,640,000	620/06-5/09

Physics				
DOE, Fusion Energy Sciences	Co-PI	Space Charge Dominated Beams for High Energy Density Studies	\$466,000	8/2006-8/08
Advanced Energy Systems Corporation	PI	Green-Sensitive Photocathode Development	\$113,010	7/2006 -3/08
Maryland Procurement Agency	PI	Umbrella Grant for Research Support	\$1,995,797	2006-2012
Office of Naval Research	PI	High Average Power, Ultra Short Pulse Free Electron Laser	\$6,250,000	6/2002-5/08
NASA	Co-PI	Center for Nanomanufacturing and Metrology	\$1,600,000	10/2005-9/06
Army Research Laboratory	PI	Microelectronics Research Cooperative Agreement	\$570,000	2005 – 06
DOE, High Energy Physics	Co-PI	Components for 15 TW Research Laser System	\$300,000	2005-06
DOE, Fusion Energy Sciences	PI	Space Charge Dominated Beams for High Energy Density Studies	\$233,000	8/2005-8/06
Advanced Energy Systems Corporation	PI	Green-Sensitive Photocathode Development	\$27,000	9/2004-12/05
Department of Energy, High Energy Physics	PI	Accelerator Research Studies	\$4,455,000	6/03-5/06
Department of Energy, Fusion Energy Sciences	Co-PI	Heavy Ion Fusion Ignition Accelerator Theory & Simulation	\$405,000	6/03-6/06
Department of Energy, Fusion Energy Sciences	PI	Physics of Space-Charge Dominated Beams for Heavy Ion Inertial Fusion	\$780,000	5/02-5/05
National Science Foundation	Co-PI	Research Experience for Undergraduates Site: Training and Research	\$280,080	4/03-3/06

		Experiences in Nonlinear Dynamics		
Naval Research Laboratory	PI	Free-Electron Laser Research	\$44,000	2002-2002
Department of Energy STTR	PI	Near-field Diffraction Radiation Beam Diagnostics (with TR Research Corporation)	\$21,000	2001-2002
Department of Energy STTR	PI	Optical Phase Space Mapping (with TR Research Corporation)	\$24,000	2001-2002
Army Research Laboratory	-	Compact Free-Electron Laser Research (portion of the umbrella grant for Power Engineering and Electronics Research)	\$90,000	2001-2002
Department of Energy	PI	Supplement to Research on the Physics of Space Charge Dominated Beams for Heavy Ion Fusion	\$69,000	2001-2002
Air Force Office of Scientific Research	Co-PI	Microwave Effects and Chaos in 21st Century Analog and Digital Electronics	\$3,065,000	2001-2005
Department of Energy	PI	Supplement to Accelerator Research Studies Task A	\$100,000	2000-2001
Department of Energy	Co-PI	Supplement to Research on the Physics of Space Charge Dominated Beams for Heavy Ion Fusion	\$80,000	2000-2001
Department of Energy	Co-PI	Accelerator Research Studies Task A and B	\$4,110,000	2000-2003
Naval Research Laboratory	PI	Free-Electron Laser Research	\$50,000	2000-2001
Department of Energy	Co-PI	Supplement to Research on the physics of space	\$100,000	1999-2000

		charge dominated beams for heavy ion fusion		
Department of Energy	Co-PI	Supplement to Accelerator Research Studies Task A	\$136,100	1999-2000
Department of Energy	Co-PI	Accelerator Research Studies Task A supplement,	\$80,000	1999-00
Department of Energy, Office of Energy Research	Co-PI	Research on the Physics of Space-Charge Dominated Beams for Heavy Ion Inertial Fusion	\$480,000	1999-02
Department of Energy	Co-PI	Accelerator Research Studies	\$1,100,000	1999-00
Army Research Office	PI	Augmentation Award for Science and Engineering Research Training	\$275,000	1997-00
Department of Energy	PI	Conference support for 20th International Free-Electron Laser conference	\$5,000	1998-99
Office of Naval Research	Co-PI	Medical Free-Electron Lasers Program, Duke Medical FEL Center - Linac Reliability Upgrade	\$154,000	1998
Army Research Office	PI	NC Central University subcontract, Development of a Smith-Purcell Free-Electron Laser	\$7,616	1997-98
Army Research Office	Co-PI	Defense University Research Instrumentation Program, Accurate Measurement and Control of Optical Phase	\$534,000	1995
US Army SMDC	Project Leader	APEX Free-Electron Laser Project	Approx \$3.5M per annum	1991-1993

## INVITED PRESENTATIONS AND LECTURES

Note: presentations made by others, and contributed papers at conferences on which I was a co-author are **not** included.

1. XIV International Free-Electron Laser Conference, Santa Fe, August 1991, "Demonstration of Lasing on the APEX Photoinjector-Driven Free-Electron Laser"
2. Advanced Accelerator Concepts Workshop, Port Jefferson, New York, May 1992, "High-Brightness Photoinjector Studies"
3. High Average Power Laser Review Board, Albuquerque, NM, June, 1992, "APLE Prototype Experiment FEL"
4. JASON FEL Review Board, Mitre Corporation, La Jolla, CA, June 1992, "Recent Developments in Free-Electron Lasers",
5. XV International Free-Electron Laser Conference, Kobe, Japan, August, 1992, "Infrared Lasing at the APEX Free-Electron Laser"
6. Colloquium, Dept. of Physics, University College Cork, October 1992, "Free-Electron Lasers"
7. Colloquium, Shanghai Institute of Optics and Fine Mechanics, China, September 1992, "Photoinjector-Driven FELs"
8. Colloquium, Continuous Electron Beam Facility, Newport News VA, April 1993, "Bright Electron Beams"
9. SPIE Conference on Electron Beam Sources of High-Brightness Radiation, San Diego, July 1993, "Operational Experience with the APEX FEL"
10. XVI International Free-Electron Laser Conference, The Hague, Netherlands, August 1993, "Ultraviolet lasing with the APEX FEL"
11. High Average Power Lasers Review Board, Phillips Laboratory, Albuquerque, NM, February 1994, "Free-Electron Laser Technology Status".
12. XVII International Free-Electron Laser Conference, Stanford University, August 1994, "Electron Sources for Single Pass X-ray FELs"

13. Applications of High-Brightness High-Current Electron Sources Workshop, UCLA, Los Angeles, January 1995, "High-Brightness Electron Sources, Status and Prospects"
14. SPIE conference on Laser Power Beaming, San Jose CA, February 1995. "Critical Issues for High-Current Photocathode Guns"
15. International Symposium on Optical Science, Engineering, and Instrumentation, San Diego, California, July 1995, "Entropy and Emittance Growth".
16. University of Milan, INFN, Italy, May 1995: "Free-Electron Lasers"
17. US Particle Accelerator School, UC San Diego, January 1996, "Free-Electron Lasers" (one week graduate course)
18. Symposium on Lasers and Accelerators, American Physical Society, Division of Physics of Beams Annual meeting, Indianapolis Indiana, May 1996, "Impact of Free-Electron Lasers on Accelerator Development"
19. Symposium on Beam Instrumentation, American Physical Society, Division of Physics of Beams Annual meeting, Indianapolis Indiana, May 1996, "Longitudinal Distribution of Bunched Beams - An Overview of Measurement Techniques"
20. Argonne National Laboratory, Advanced Photon Source, July 10, 1996, "Exploring High-Gain Saturated FEL Amplifiers"
21. Workshop on Infrared FEL Commissioning, Thomas Jefferson National Accelerator Laboratory, July 25, 1996, "Lasing Lessons Learned in the IR and UV".
22. Workshop on High-Average Power FELs, Thomas Jefferson National Accelerator Laboratory, September 1996, "High-Average Power FEL Concepts".
23. Argonne National Laboratory, High-Energy Physics Division, December, 1996 "Bright Electron Beams for High Energy Colliders and X-ray FELs",
24. Office of Naval Research Medical Free-Electron Laser Workshop, Stanford University, May 16, 1997, "Review of Hardware Development for Free-Electron Lasers"

25. American Nuclear Society Annual Meeting, Albuquerque, Nov. 1997, Topical Meeting on Nuclear Applications of Accelerator Technology "Free-Electron Laser Technology and Applications"
26. University of California at Los Angeles, Department of Physics Colloquium, October 1997, "Bright Electron Beams",
27. Oak Ridge National Laboratory, December 1997, "High Brightness Electron Beams"
28. Advanced Accelerator Concepts Workshop, Baltimore MD, July 1998. "Report of the Particle Beam Sources Working Group"
29. 2nd ICFA Advanced Accelerator Workshop, the Physics of High Brightness Beams, UCLA November 1999, "Review of Photoinjectors"
30. 13th International Symposium on Heavy Ion Inertial Fusion, San Diego, March 2000, "The University of Maryland Electron Ring"
31. Advanced Accelerator Concepts Workshop, Santa Fe, June 2000, "The University of Maryland Electron Ring - An Extreme Beam"
32. International FEL Conference, Durham NC, August 2000, "Longitudinal Beam Diagnostics for Free-Electron Lasers"
33. Massachusetts Institute of Technology, Bates Linear Accelerator Center, March 2001, "Beam Physics Research in a University Setting"
34. US Navy Workshop on Ship Self-Defense, Newport News, VA June 2001, "Review of Free-Electron Laser Projects Worldwide"
35. IEEE Particle Accelerator Conference, June 2001. "First Results From the University Maryland Electron Ring"
36. Naval Research Laboratory, Dec 2001, "Space Charge Dominated Beams",
37. Center for Advanced Studies of Accelerators, Jefferson Laboratory Nov 2001, "Space Charge Dominated Beams"
38. American Physical Society, Division of Physics of Beams, annual meeting Albuquerque, April 2002 "Experiments with Space Charge Dominated Beams"

39. DEPS Annual Symposium, Monterey, CA, November 2002 “Free-Electron Lasers” – short course.
40. Argonne National Laboratory, September 2003, “Longitudinal Physics Effects in High-Current Photoinjectors
41. Applied Physics Laboratory, Maryland, US Navy-FEL Workshop, July, 2003 “Injector Technology Status”,
42. Colloquium, Physics Department, University of Colorado, Boulder Nov 2003 “Free Electron Lasers”,
43. DEPS Annual Symposium, Albuquerque NM, November 2003. “Free-Electron Lasers” – short course.
44. Greater Baltimore Technology Council, Baltimore, MD April 2004 “Nanotechnology from Science Fiction to Reality”,
45. University of Florida, Department of Astronomy, Dynamics Symposium, Nov 2004. “Laboratory Experiments in Galactic Dynamics”
46. Eastern Shore Business group, Easton, MD, Dec 2004. “Nanotechnology”.
47. Lockheed-Martin Center for Innovation, Suffolk, VA Oct 2005. “Nanotechnology at the University of Maryland”
48. February Fourier Talks Symposium, College Park, MD, February 2006. “Nanotechnology”
49. Keynote Speaker, IEEE Power Engineering Society Annual Gala, Baltimore MD, November 2007 “The Entrepreneurial Connection in Engineering”
50. Advanced Accelerator Concepts Workshop, Santa Cruz, CA, July, 2008 “Advances in Photoinjector Technology”
51. Naval Postgraduate School, Monterey, CA, Jan 2009, “Free-Electron laser Research”
52. National Science Foundation, Directorate for Computer & Information Science & Engineering, Research Experience for Undergraduate Conference, Arlington VA, March 2009 “Department Chair’s Perspective on REU Sites”

## PROFESSIONAL SERVICE, COMMITTEES, PANELS AND BOARDS

1. National Academy of Science Panel on Scientific Assessment of High-Power Free-Electron Laser Technology (2007-2008)
2. Technical Evaluation Team, Office of Naval Research, Free-Electron Laser Innovative Naval Prototype (2008)
3. Scientific Advisory Board, First International Particle Accelerator Conference, Kyoto, Japan (2009-2010)
4. Organizing Committee, Advanced Accelerator concepts Workshop, Annapolis Maryland (2009-2010)
5. Scientific Advisory Board, European Particle Accelerator Conference, Genoa, Italy (2008)
6. Organizing Committee, Advanced Accelerator Concepts Workshop, Santa Cruz, CA, 2008
7. Provost's Committee on Entrepreneurial Program Finance (2008)
8. Chair, review committee for evaluation of the Chair of the Department of Chemistry & Biochemistry, University of Maryland (2007)
9. Chair, Electrical & Computer Engineering Department Heads Association, Mid-Atlantic Regional Meeting (2007)
10. Chair, Beam Dynamics and Electromagnetic Field Section of the Program Committee for the IEEE Particle Accelerator Conference (2007).
11. Chair, Electron Injectors Group Office of Naval Research/Joint Technology Office FEL TAWG, Brookhaven National Laboratory (2007)
12. Member Committee of Visitors US Department of Energy, High Energy Physics (2007)
13. Maryland Technology Enterprise Institute Ventures, Board of Advisors (2006- )
14. Elected member, Administrative Committee IEEE Nuclear and Plasma Sciences Society (international election by society members)(2003- 2006)

15. Fellowship Committee American Physical Society (2004-2006)
16. Organizing Committee, Advanced Accelerator Concepts Workshop, Lake Geneva WI, 2006
17. Founding Chair, University Nano Science and Engineering Committee (2004 - 2007).
18. Advisory Board of the Advanced Test Facility, Brookhaven. (2003-2006)
19. Scientific Advisory Board, European Particle Accelerator Conference, Edinburg, Scotland (2006)
20. Department of Energy Lehman Review Panel, LCLS, Stanford Linear Accelerator Center (2006)
21. Chesapeake Nanotech Initiative, Working Group on Cluster Analysis, (2005)
22. Organizing Committee, Advanced Accelerator Concepts Workshop, New York, 2004
23. Committee of Visitors, US Department of Energy Office of Science, Division of High Energy Physics (2004)
24. Facility Advisory Committee, Stanford Linear Accelerator Center Linac Coherent Light Source (2004- 2008)
25. Scientific Advisory Board, European Particle Accelerator Conference, Lucerne Switzerland, (2004)
26. Elected Member of the University of Maryland Senate (2004-2005)
27. Member of the Engineering and Public Policy MS degree planning committee (2004).
28. Chair, Search Committee for Assistant Dean for External Relations, and Director of Strategic Initiatives, and Director of Individual Giving, School of Engineering (2004-2006).
29. Steering committee for NASA Technology Briefs Nano-2004 Conference, Baltimore, MD Nov, 2004
30. Moderator, Resources & Partnership Opportunities NASA Tech Briefs Nano 2004, Nov 2004. Conference Baltimore, MD

31. Chair, Multi-particle Beam Dynamics Section of Program Committee, IEEE Particle Accelerator Conference (2005)
32. Organizing committee for 2003 IEEE Particle Accelerator Conference, Portland OR, (2001-2003)
33. Search Committee for Director of the Center for Advanced Studies of Accelerators, Thomas Jefferson National Accelerator Facility (2001)
34. Organizing committee Advanced Accelerator Concepts Workshop, Santa Barbara CA, 2002
35. Chair, NAVSEA/ONR Free Electron Laser High Brightness, High Average Current Injector Assessment Panel (2002)
36. Chair, Search Committee for Chair of the Department Materials Science and Engineering (2002-2003)
37. Chair, Workshop on Laboratory Experiments in Galactic Dynamics, University of Maryland, (2002)
38. Consultant to DTI Associates, Washington DC on free-electron lasers (2002-2005)
39. Program Committee for International Committee on Future Accelerators Conference on the Physics and Applications of High Brightness Electron Beams, Sardinia, Italy 2002
40. Department of Energy Review Panel, for High-Energy Physics Program, Stanford Linear Accelerator Center, 2002
41. Scientific Advisory Board, European Particle Accelerator Conference, Paris, France, June 2002
42. Salary Committee, Electrical and Computer Engineering Department (2001- 2002)
43. President's Council for Security and Counter Terrorism Studies (2001-2002)
44. Program Committee 2001 IEEE Particle Accelerator Conference, Chicago, June 2001.
45. Chair, Sources and Injectors session, IEEE Particle Accelerator Conference, Chicago, June 2001

46. Review Panel Department of Energy, for High-Energy Physics Program, Argonne National Laboratory, 2001
47. Chair, Working Group on Accelerators and Sources, US Navy Workshop on Ship Self-Defense, Newport News, VA 2001
48. School of Engineering, Promotion and Tenure Procedures Review Committee (2001)
49. Electrical and Computer Engineering Department Promotion and Tenure Committee (2000-2002)
50. USDOE review committee for high energy physics accelerator programs at Lawrence Berkeley National Laboratory (2000)
51. Organizing Committee Advanced Accelerator Concepts Workshop, Santa Fe, 2000.
52. Chair Search Committee for Electrical and Computer Engineering Department, U. Maryland (2000-2001)
53. Electrical and Computer Engineering Department Council (2000-2005)
54. Strategic Planning Committee, Institute for Plasma Research (2000)
55. Executive Committee, Institute for Plasma Research (2000)
56. Chair, Institute for Plasma Research Faculty Assembly (1999-2000)
57. Consultant to EG&G External Review Team for the US Department of Energy Spallation Neutron Source Project, 1998-99.
58. Chairman of the Sources and Injectors Section, Program Committee 1999 IEEE Particle Accelerator Conference, New York, March 1999.
59. Technical Advisory Board for the Stanford Linear Accelerator Laboratory Linear Coherent Light Source Free-electron Laser Project (1999- continuing)
60. Program Committee, 2nd ICFA Advanced Accelerator Workshop, the Physics of High Brightness Beams, UCLA November 1999.
61. Program Committee, LASE '99 Symposium on Free-Electron Laser Challenges, San Jose CA, January 1999.

62. Technical Area Working Group (TAWG) on FELs, Office of Naval Research (1999-continuing),
63. Chairman and co-organizer of the Particle Beam Sources Working Group, Advanced Accelerator Concepts Workshop, Baltimore, July 1998.
64. USDOE review committee for high energy physics accelerator programs at University of California at Los Angeles October 1998
65. Chair and organizer, LASE '97 Conference on Free-Electron Laser Challenges, San Jose CA, February 1997.
66. Member of the Education Committee of the Division of Physics Beams, American Physical Society 1997 – 99
67. Chair of the Sources and Injectors Section, Program Committee, 1997 IEEE Particle Accelerator Conference, Vancouver, Canada, May 1997.
68. Chair of the Hardware Development Working Group, Office Of Naval Research Medical Free-Electron Laser Conference, Stanford University, May 1997.
69. Program Committee for the International Symposium on Optical Science, Engineering and Instrumentation, conference on Electron beam/X-Ray Sources and Applications, San Diego, July 1997.
70. Program Committee for the 1997 International Free-Electron Laser Conference, Beijing, Peoples Republic China, August 1997.
71. Working group secretary International Committee on Future Accelerators, Beam Dynamics Workshop, U. Indiana Oct., 1995
72. Chair, Workshop on the US Free-Electron Laser Coordinated Amplifier Research Program, held at Duke University, June 7-8, 1996.
73. FEL Review Committee, Thomas Jefferson National Accelerator Facility, July 24-25, 1996
74. International Program Committee for the 1996 International Free-Electron Laser Conference, Rome, Italy, August 1996.
75. Program Committee, 1995 International Free-Electron Laser Conference, New York, August 1995

76. Program Committee, SPIE conference on Electron Beam Sources of High-Brightness Radiation, San Diego, July 1995
  77. Nominating Committee of the Division of Physics of Beams, American Physical Society (1995 - 1997)
  78. Session Chair SPIE conference on Electron Beam Sources of High-Brightness Radiation, San Diego, July 1995
  79. Session Chair, Workshop on Polarized Gamma-Ray Beam for Nuclear Physics Studies, Durham NC, December 1994
  80. Delegation from US DOD to the French Atomic Energy Commission on free-electron lasers, Paris, February 1992
  81. External Review Board for the Grumman/Princeton FEL Project, 1992.
  82. Co-Chair of the High-Brightness Electron Source Working-Group at the Advanced Accelerator Concepts Workshop, Port Jefferson, NY, 1992
  83. Chair, Free-Electron Laser Review Board, Boeing Aerospace, Seattle, 1990
  84. External Review Board, Radio Frequency Quadrupole Program, Chalk River Nuclear Laboratories, Canada, July 1988.
- **Journal Referee for:** Science, Physical Review, Physical Review Letters, Physical Review Special Topics - Accelerators and Beams, Applied Physics Letters, Journal of Applied Physics, IEEE Transactions, Nuclear Instruments and Methods in Physics Research, Journal of Physics, The Industrial Physicist, Physica

## GRADUATE STUDENT SUPERVISION

\* = current student

1. **Michelle Ponds** (M.S. 1996, Physics, Duke) Project: "Theory of coherent off-axis undulator radiation".
2. **Justin Lancaster** (M.S. 1999, (non-thesis) Physics, Duke) Project: Nitrogen Laser Driven Photoinjector (advised 1996-1998 - transferred to Prof. Oh on my departure from Duke)

3. **Charles Neuman**(M.S. 1997, ECE, Duke) Project: "Simulation of SASE with the Paladin Undulator" (Ph.D. 2001, Physics, Duke), Project: Coherent Off-Axis Undulator Radiation
4. **Yun Zou** (Ph.D. 2000, ECE Maryland) "Resistive Wall Instability and Development of Beam Diagnostics for UMER".
5. **Hui Li** (M.S. 2001, with thesis, Ph.D. 2004, ECE Maryland), "Control and Transport of Intense Electron Beams"
6. **Yupeng Cui**, (M.S. 2001, with thesis, Ph.D. 2004, ECE Maryland), "Experimental Study of Longitudinal Energy Spread in Space-Charge-Dominated Beams"
7. **Yijie Huo** (MS with thesis, 2004 ECE Maryland) "Experimental Study of Laser Produced Electron Beam"
8. **Jonathan Neumann** (M.S. 2002, with thesis, Ph.D. 2005, ECE Maryland), "Electron beam Modulation using a Laser-Driven Photocathode" Awards: Ralph W. Shrader Master's Degree Scholarship 2002 (\$3000), Brashear Best Student Paper Award, Directed Energy Symposium (2002); Directed Energy Professional Society Scholarship 2003 (\$10,000) and 2004 (\$7,500)
9. **David Demske** (M.S. 2005 ECE Maryland), Project: "Photocathode and drive laser"
10. **John Harris** (M.S. 2002, with thesis, PhD 2005 ECE Maryland), Project: "Longitudinal Effects and Focusing in the University of Maryland Electron Ring" Awards: Directed Energy Professional Society Scholarship 2003 (\$10,000) and 2004 (\$7,500)
11. **Nathan Moody** (MS with thesis, 2004, PhD. 2006 ECE Maryland) "Fabrication and Measurement of Cesium Metal Photocathodes". Awards: Directed Energy Professional Society Scholarship 2005 (\$10,000); Brashear Best Student Paper Award, Directed Energy Symposium (2006); Co-winner of the Alan Berman Research Publication Award from the US Naval Research Laboratory (with Jensen, Feldman and O'Shea) (2007)
12. **David Gillingham** (Ph.D. 2007, Physics, Maryland), Project: "Coherent Synchrotron Radiation in Free-Electron Lasers" Co-advised with Tom Antonsen
13. **Kai Tian** (MS 2004, with thesis, PhD 2008, ECE, Maryland) Project: "Longitudinal Energy Spread in Intense Beams"

14. **Diktys Stratakis** (Ph.D. 2008 ECE Maryland), Project: "Tomographic Measurement of Space Charge Dominated Beams" Invited oral presentation at the International IEEE Particle Accelerator Conference (2007). It is a great honor for a student to give an invited talk at this the major conference in the field.
15. **Gang Bai** (MS 2006 with thesis, ECE, Maryland) Project: "Control of Intense Beams in UMER"
16. **Matt Virgo\*** (M.S. 2002 with thesis, continuing to PhD, ECE Maryland), Project: "Photocathodes for Accelerator Applications", continuing Ph.D., degree expected 2009.
17. **Christos Papadopoulos\*** (MS 2006, PhD Student, Physics, Maryland, co-advised with Rami Kishek) Project: "Halo formation in Intense Beams"
18. **Michael Holloway\*** (MS with thesis 2007, current Ph.D, student, ECE, Maryland), PhD Project "RF effects in electronics" Awards: Southeastern Universities Research Association Jefferson Laboratory Graduate Fellowship 2006 (\$13,000), Directed Energy Professional Society Scholarship 2007 (\$10,000)
19. **J. Charles Tobin Thangaraj \*** (MS with thesis 2006, current Ph.D. Student, ECE Maryland) Project: "Perturbations in space charge dominated beams" Awards: Distinguished Performance Award at the International Accelerator School for Linear Colliders, Italy (2007). Member of the Clark School of Engineering "Future Faculty Program" – only a small fraction of our best students are admitted to this program.
20. **Eric Montgomery\*** (MS 2008, current Ph.D. student, Physics Maryland) Project: "Dispenser Photocathode" Awards: Best student paper, Advanced Accelerator Concepts Workshop, Santa Cruz, CA (2008), Brashear Best Student Paper Award, Directed Energy Symposium (2007), Directed Energy Professional Society Scholarship 2008 (\$10,000); 2nd place in the University of Maryland Graduate Research Interaction Day (2008)
21. **Chao Wu** (PhD 2009, ECE, Maryland) co-advised with Eyad Abed, Project: "Control of Intense Electron Beams"
22. **Brian Beaudoin\*** (MS with thesis 2008, current Ph.D. student, ECE Maryland) Project: "Longitudinal Focusing of an Intense electron Beam"
23. **Daniela Moody\*** (current PhD student, ECE, Maryland) Project: "Application of Wavelets to Broadband Transient Signal Classification"

24. **Zhigang (Peter) Pan\*** (1<sup>st</sup> year PhD Student, Physics) Project: “Photocathode Simulation and Modeling” Winner Best Project “ Award: Training in Research and Education in Nonlinear Dynamics (TREND) Fair (2007)
25. **Eric Voorhies\*** (2<sup>nd</sup>, PhD student, Physics) Project “Energy Spread in Intense Beams”
26. **Hao Zhang\*** (1<sup>st</sup> year PhD student, ECE, co-advised with Rami Kishek) Project: Beams for Heavy Ion Fusion Drivers

## UNDERGRADUATE AND HIGH SCHOOL RESEARCH STUDENTS

1. **John Harris** (Physics 1997-2000, continued to get Ph.D. in my group in 2005) HV modulator development
2. **Jonathan Neumann** (ECE 1999-2000, continued to get Ph.D. in my group in 2005) Free-electron laser
3. **Matt Holland** (ECE 2000) Emittance measurement software
4. **Bryan Quinn** (ECE 2000-2001, now a Director of Technical Operations in the ECE Department) Beam position monitor
5. **Navid Rahimi** (ECE 2000) UMER control system
6. **Christopher Graboski** (ECE 2000) UMER electronics
7. **Matt Glanzer** (ME 2000-2003) UMER mechanical systems
8. **Brian Beaudoin** (ECE 2000-3, now a Ph.D student in my group) UMER electronics
9. **An Diep** (ECE 2001-present) UMER electronics
10. **Michael Quirius** (ME 2000-2003) UMER mechanical systems
11. **Damon Lamb** (ECE 2002-2004) UMER diagnostic and control systems
12. **Corey Merdler** (ME, 2003), Free-electron laser
13. **Allison Gregory** (ECE 2003) UMER electronics
14. **Yuan Zhi** (ECE 2004) UMER induction pulser
15. **Michael Holloway** (ECE 2003-2004), now a Ph.D student in my group) UMER injection pulser
16. **Kuangwen Hsieh**, (ECE 2004) UMER electronics
17. **Muhammad Ikram** (ECE 2003-2004) UMER induction pulser
18. **Tommy Tso** (ECE 2003) UMER induction pulser
19. **John Wyrwas** (ECE 2004) UMER electronics

20. **Wing Lee** (ECE 2003-2004) UMER Electronics
21. **Genna Davidson** (2005) UMER electronics
22. **Sean Casey** (Dickinson College, summer 2005) Transition radiation
23. **Chris Jordan** (ME 2005) UMER Mechanical Systems
24. **Waseem Malik** (ECE 2005, currently a PhD student in ECE) Photocathode
25. **Anne Balter** (Oglethorpe University 2005, 6) Cesium Photocathode
26. **Christopher Dunay**, (ECE, 2006) Photocathode
27. **Peter Alpert** (Physics, 2006, 2008) Photocathode Drive laser
28. **Zhigang (Peter) Pan** (UM Baltimore County 2007) Photocathode
29. **Tom Langford** (PHYS 2007) UMER physics
30. **Noah Sennett** (Montgomery Blair High School High School, 2007) Photocathode physics
31. **David Dunn** (Montgomery Blair High School High School, 2007), UMER Beam Position Monitors
32. **Jessica Leung** (Rensselaer Polytechnic Institute, 2008) Photocathodes.

## Classroom Teaching

When	Course number	Title	Teaching Evaluation Grade (out of 4)
Fall 1999	ENEE 204	Basic Circuit Theory (sophomore course)	3.7 (Dept. ave. = 3.2)
Spring 2000	ENEE 686	Charged Particle Technology (graduate course)	3.8 (Dept. ave. = 3.6)
Spring 2000	ENEE 698D	Electrophysics Seminar (graduate course)	N/A
Fall 2000	ENEE 204	Basic Circuit Theory (sophomore course)	3.4 (Dept. ave. = 3.1)

Spring 2001	ESEE 686	Charged Particle Technology (graduate course)	3.8 (Dept. ave. = 3.4)
Spring 2002	ESEE 204	Basic Circuit Theory (sophomore course)	3.5 (Dept. ave. = 3.1)
Spring 2003	ESEE 204	Basic Circuit Theory (sophomore course)	3.6 (Dept. ave. = 2.8)
Spring 2004	ESEE 204	Basic Circuit Theory (sophomore course)	3.4 (Dept. ave. = 2.9)
Spring 2005	ESEE 686	Charge Particle Technology (graduate course)	4.0 (Dept. ave. = 3.5)
Fall 2006	ESEE 204	Basic Circuit Theory (sophomore course)	3.8 (Dept. ave. = 3.3)
Fall 2007	ESEE 181	Exploring Electronics (freshman course)	3.6 (Dept. ave = 3.3)
Fall 2008	ESEE 181	Exploring Electronics (freshman course)	3.2 (Dept ave = 3.1)
<b>Overall</b>	-	<b>Average Teaching Evaluation Score</b>	<b>3.6 (Dept ave. = 3.2)</b>