Brian Beaudoin, Ph.D.

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Education

University of Maryland, College Park, MD	Electrical Engineering	M.S. 2008
University of Maryland, College Park, MD	Electrical Engineering	Ph.D. 2011

Employment Summary

2018 – present University of Maryland, College Park Campus, Associate Research Professor
2017 – 2018 Fermi National Accelerator Laboratory, Visiting Scientist on a URA Award, Illinois Accelerator Research Center (IARC) at Fermilab
2016 – 2017 Rutgers University, Visiting Assistant Scientist, Department of Physics and Astronomy
2014 – 2016 Fermi National Accelerator Laboratory, Visiting Scientist on a URA Award, Fermilab Accelerator Science and Technology (FAST) facility.
2014 – 2018 University of Maryland, College Park Campus, Assistant Research Scientist
2011 – 2014 University of Maryland, College Park Campus, Postdoctoral Research Associate
2003 – 2006 U.S. Naval Research Laboratories, Infrared Counter Measures Engineer
SW Washington, DC

SUMMARY

A highly versatile professional offering 20 years of diverse hands-on laboratory management and experience. Research experience includes: working with various microwave equipment from vector network analyzers to power meters; working with high vacuum systems; working with high voltage DC and pulsed powered sources; designing and building electron and ion sources for particle accelerator and microwave vacuum electronic devices. Experience also includes, collecting and analyzing experimental data as well as writing, evaluating, and producing detailed reports on a variety of projects. Viewed as a crucial "go-to" resource providing scientific support and consultation to peers and leadership within the institute. Regularly entrusted to collaborate with senior management in planning for future project proposals. Published over 70 manuscripts that have appeared in peer-reviewed journals, conference proceedings, and scientific international presentations and abstracts. Regularly represents the institute as part of collaborations with fellow researchers and scientists from various organizations, national laboratories as well as academia.

Expertise in both windows and Linux computing environments using Finite Element Method (FEM) codes such as High-Frequency Structure Simulator (HFSS), Maxwell and COMSOL. Significant experience analyzing experimental data and simulation results using python and MATLAB. Experience with Solidworks and Inventor for submission of projects to machine shops

for construction. Experience with educating students in both Research Experience for Undergraduates (REU) program and the classroom/laboratory environments.

Total Funding as PI ($1.5M), Co-PI ($24.6M)

CORE STRENGTHS

Scientific Grant Development & Preparation · Grant and Team Management · Writing Yearly/Monthly Reviews · Designing and Building of Hardware · Paper Authoring · Scientific Information Analysis · Public Speaking & Presentation Delivery · Teaching · Budgeting & Laboratory Cost Controls

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SIGNIFICANT REASEARCH PROJECTS

Research is ongoing

- **Centrifugal Mirror Fusion Experiment (Funded by ARPA-E/Department of Energy):** The objective of this program is to apply an innovative approach to fusion, using a linear magnetic mirror geometry. The innovation, based on the underlying plasma physics, is to rotate the mirror plasma azimuthally at supersonic speeds. The supersonic rotation influences three aspects of the mirror physics: (i) The radial centrifugal force will confine the plasma axially given the magnetic field generated with superconducting Magnetic Resonance Imaging (MRI) magnets; (ii) the velocity shear will stabilize the ideal Magnetohydrodynamics (MHD) interchange instability; (iii) at sufficiently high Mach numbers, the rotation will open-up a pathway to Deuterium-Tritium (DT) fusion energy.
  My Tasks for this project: I am the Principal Investigator (PI) on the subcontract that goes to UMD from UMBC. I mentor the students on various aspects of vacuum technology, pulsed power and high voltage electronics to RF/microwave electronics. I'm working with the PI from UMBC to develop the plasma ignition tools that will be used to initiate the ionization of the rotating plasma.
  Project dates: 07/07/2020-06/07/2024
  Total Funding: UMBC ($4.2M+$1M plus up), UMD-IREAP ($1.2M)

- **Precision Alignment Techniques for Millimeter Wave Sources (Funded by STTR/Navy):** The Navy's objective is to produce affordable microwave vacuum electronic devices, the research in this program is focused on demonstrating repeatable mm-wave circuit stack assemblies (cathode to collector) of sources that demonstrate a 10X improvement in precision alignment over existing techniques.
  My Tasks for this project: I am a Co-Principal Investigator on this project. I mentor the students and teach them how to use various microwave equipment such as the vector network analyzer. In the last phase of the project, I am designing and building the experimental setup that is used to test and measure the power efficiency of the microwave vacuum electronic device to verify the success of the precision alignment techniques. This

requires high voltage pulsed power designing and fabrication. This also requires bringing a cooling system to cool various aspects of the experiment such as the solenoidal guiding field.
Project dates: 21/07/2020-15/10/2023
Total Funding: UMD-IREAP ($531k)

- **Ultra-Broadband Directional Infrared Radiation in the Atmospheric Window (Funded by Office of Naval Research):** The objective of this program is the development of a source of broadband infrared radiation for applications such as Infrared Counter Measures (IR-CM) and remote IR chemical/biological warfare (CBW) detection.
  My Tasks for this project: I am a Co-Principal Investigator on this project. I mentor the students on setting up and using lasers as well as laser safety. I'm designing to aspects of the system. I'm using a high-power (800mJ/100ns) CO^2 laser to study the ionization of air on metallic surfaces and the RF radiation of energy. I'm also using the same laser to create a broad-band source of laser radiation using specifically designed hollow core fibers that can excite Orbital Angular Momentum (OAM) modes of IR radiation in these fibers.
  Project dates: 07/04/2020-06/04/2023
  Total Funding: UMD-IREAP ($504k)

- **Bulk Electrets Seedling (Funded by Defense Advanced Research Projects Agency):** The objective of this program is to understand the factors which effect thermal stability, quantify the mobility of the charge carriers, and to develop a greater understanding of the factors which affect the discharging rate(s) of bulk electrets.
  My Tasks for this project: I am a key scientist on this project. I mentor the students on measuring RF/microwave radiation with various wide-band antennas and high-bandwidth oscilloscopes.
  Project dates: 08/14/2021-08/15/2023
  Total Funding: UMD-MSE ($1.6M)

- **Accelerator Technologies Feasibility Evaluation and Training Development (Funded by Los Alamos National Laboratory-National Nuclear Security Administration):** The objective of this program is to experimentally design a low power test RF structure to demonstrate a fast increase in the first harmonic current in a bunched electron beam.
  My Tasks for this project: I am a key scientist on this project to become PI shortly when the award is renewed with LANL. I am developing the experimental test stand with the assistance of a LANL scientist.
  Project dates: 05/30/2019-09/30/2023
  Total Funding: UMD-MSE ($295k)

- **Demonstrations of Flat/Round Transformations of Magnetized, Angular Momentum Dominated Electron Beams (Funded by Department of Energy):** The objective of this program is to carry out an experimental demonstration of Derbenev's flat-to-round and round-to-flat optical transformations, designed to match electron beams from a high energy storage ring

into a and out of a solenoidal cooling channel. We plan to do this initially with negligible space charge followed by cases with significant space charge.
My Tasks for this project: I am a Co-Principal Investigator on this project. I mentor the students on setting up how to measure magnetic fields using automated XYZ stages and Hall effect Gaussmeters. I'm also mentoring both students and fellow retired scientists on setting up a control system that will interface and remotely operate multiple banks of power supplies that will energize electromagnets on the experiment. I'm assisting with the design and fabrication of the high-voltage interlock system that protects users from the high-voltage of the electron gun.
Project dates: 01/06/2021-31/05/2024
Total Funding: UMD-IREAP ($750k)

- **Engineering Materials for Spacecraft (Lockheed Martin):**
  My Tasks for this project: I am a key scientist on this project.
  Project dates: 04/01/2023-03/31/2026
  Total Funding: UMD-MSE ($6.2M)

Research programs that have ended

- **Collaborative Research on Novel High Power Sources for the Physics of Ionospheric Modification (Funded by Air Force Office of Scientific Research):** The objective of this Multidisciplinary University Research Initiative was to develop prototype EM sources for mobile ionospheric heaters based on: (i) Comprehensive understanding of the current status of IM research and applications; (ii) Combination of theoretical/modeling with laboratory experiments scaled to simulate ionospheric plasma parameters; (iii) Understanding of modern high power RF source technology and antenna engineering including meta-materials.
  My Tasks for this project: I was a key scientist on this project. I mentored the students and taught them how to use the vector network analyzer and high bandwidth oscilloscopes. Together we designed and fabricated pi-matching network circuits, that impedance matched the electron beams impedance to that of a 50-ohm load and/or an antenna. I also taught the students how to setup a pulsed power high-voltage system to drive an electron gun, as part of the other experimental aspect of the project.
  Project dates: 15/12/2013-14/06/2019
  Total Funding: UMD-IREAP ($7.8M)

- **Collaborative Project with Fermilab National Accelerator Laboratory (FNAL) on 4 ½ Cell Microwave Superconducting Accelerating Structure (Funded by University Research Association/Department of Energy):** The objective of this program was to design a superconducting electron beam irradiation facility capable of being used for environmental applications, such as wastewater treatment. The University of Maryland was tasked with studying the electron loss during transport through the 4 ½ cell superconducting microwave accelerating structure as it would impact cooling requirements.
  My Tasks for this project: I was the Principal Investigator on this project. I assisted fellow scientists at FNAL with the design and simulation of the niobium cavities as well as the electron

emitter for the superconducting accelerator. This task used special software that simulates electron transport in electron guns that UMD had access too. This project required a lot of design iterations, going back and forth between FNAL scientists and I until all parties were happy with the final design.
Project dates: 01/06/2017-31/05/2018
Total Funding: UMD-IREAP ($16k)

- **University of Maryland Electron Ring (Funded by Department of Energy and the National Science Foundation):** The objective of this program was to study scaled low-energy electron beams, cleverly accessing the intense regime of beam operation in accelerators at a much lower cost than larger and more energetic machines. These low-energy systems make an ideal testbed for experimenting in pushing up the brightness of existing and future accelerators.
  My Tasks for this project: I was a Co-Principal Investigator on this project. I mentored students and assisted fellow scientists and taught them how to use the oscilloscopes and control system for this circular particle accelerator. By educating everyone on running the particle accelerator, they were able to perform beam-based measurements that was compared with simulations and theoretical calculations.
  Project dates: **01/07/2013-30/06/2022**
  Total Funding: UMD-IREAP ($1.9M)

TEACHING

'As an Associate Research Professor, I created a new capstone course in 2023 called ENEE408J, "Audio Electronics Engineering." This course taught 4th-year undergraduates (2024, 2023) the theory and experimental implementation of musician and audio electronics that covers implementing filters with multi-channel audio amplifiers, digital signal processing, electromagnetics, and physics of the various transducers, room acoustics, etc. I mentor three groups of 5 students per group and direct their projects as they progress through the semester with weekly class meetings and have the students present short presentations to the class of approximately 5-10 min each.

I have also co-created a capstone course and taught it every spring semester (from 2016-2022) called ENEE408T, "Building the 5 MeV Cyclotron." This course also teaches 4th-year undergraduates in the theory and operation of a particle accelerator called the cyclotron. The students learn the fundamentals of the machine, and how to simulate various aspects of the machine: from the magnetic fields to the RF fields to the proton beam physics. I mentor all student groups and direct their projects as they progress through the semester with weekly meetings and presentations to the class.

I have also continued co-teaching as an instructor for the United States Particle Accelerator School (USPAS) as part of my extracurricular activities. This 1-2 week traveling school ventures around the country educating anyone interested in particle accelerators.

In addition to this extracurricular activity, I continue to assist the Department of Energy as a proposal referee for Phase I and II SBIR/STTR proposals (unpaid activity) as well as assist various Journals (Physical Review Letters, Physical Review Accel Beams, Physics of Plasmas and Nuclear Instruments and Methods) with being a paper referee (unpaid activity).

MENTORING

RESEARCH PROGRAMS-MENTOR

I have mentored numerous graduate, undergraduate, and high school students in numerous research areas.

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)-MENTOR FUNDED by NSF

TREND 2012 – Carlos Blanco, Purdue University, Non-Linear Wave Dynamics in Charged Particle Beam Systems

TREND 2014 – Jared Ginsberg, Cornell University, Modeling and Characterization of Soliton Trains in an Electron Beam

TREND 2017 – Joseph Betz, Widener University, X-band Microwave Accelerating Cavity

TREND 2018 – Kathleen Hamilton, University of Maryland, Longitudinal RF Confinement in UMER

TREND 2020 – Ambar C. Rodriguez Alicea, University of Puerto Rico, Predicting Cross-section Images of Particle Beams for UMER Using Neural Networks

TREND 2021 – William Matava, University of Texas at Austin, Design and Simulations of a Small-Scale Electron LINAC

TREND 2022 – Ariana Bussio, University of Maryland, Compact Ion Generation, Focusing & Filtering for Nuclear Decay Studies

TREND 2024 – Cheyenne Valles, University of Maryland, 2D PIC Simulations of Laser Beat Wave Plasma Acceleration Near Critical Density

GEMSTONE HONORS PROGRAM-TEAM CHARGEX-MENTOR

I also mentor a small, selected group of students enrolled into the University of Maryland College Park program, known as the Gemstone Honors Program. The group I mentor is called "ChargeX" and they are interested in developing novel devices that could be used to charge electric vehicles and electric boats. I mentor them weekly to ensure their project stays on track with Gemstone deadlines. This mentoring occurs over a period of three years where I start working with the students in their 2^{nd} year and by the time they graduate in their 4^{th} year, they present an undergraduate thesis and a full report that includes all the work they have done. I assist the students with this report, both in editing and guiding them with the content.

PUBLICATIONS

1. K.M. Sturge, N. Hoppis, A.M. Bussio, J. Barney, **B.L. Beaudoin**, C. Brown, B. Carlsten, C. Chun, B.C. Clifford, J. Cumings, N. Dallmann, J. Fitzgibbon, E.H. Frashure, A.E. Hammell, J. Hannan, S.L. Henderson, M.E. Hiebert, J. Krutzler, J. Lichhardt, M. Marr-Lyon, T. Montano, N. Moody, A. Mueller, P. O'Shea, R. Schneider, K. Smith, B. Tappan, C. Tiemann, D. Walter and T.W. Koeth, *"Dynamics of high-speed electrical tree growth in electron-irradiated polymethyl methacrylate,"* Science, 18 Jul 2024, Vol. 385 Issue 6706, pp. 300-304.

2. L. Dovlatyan, **B.L. Beaudoin**, S. Bernal, I. Haber, D. Sutter, and T.M. Antonsen Jr., *"Optimization of flat to round transformers with self-fields,"* Phys. Rev. Accel. Beams 25, 044002 (2022).

3. **B.L. Beaudoin**, I. Haber, R.A. Kishek, T.W. Koeth, T.M. Antonsen Jr., *"Multi-stream instability of a single long electron bunch in a storage ring,"* Physics of Plasmas, 052106 (2019).

4. **B.L. Beaudoin**, A. Ting, S. Gold, A.H. Narayan, R. Fischer, J.A. Karakkad, G.S. Nusinovich, D.B. Matthew, T.M. Antonsen Jr., *"Experimental Studies on Radio Frequency Sources for Ionospheric Heaters,"* Physics of Plasmas, 103116 (2018).

5. **B.L. Beaudoin**, G.S. Nusinovich, G. Milikh, A. Ting, S. Gold, J.A. Karakkad, A.H. Narayan, D.B. Matthew, D.K. Papadopoulos and T.M. Antonsen Jr., *"Highly Efficient, Megawatt-Class, Radio Frequency Source for Mobile Ionospheric Heaters,"* Journal of Electromagnetic Wave and Applications, Special Issue Article: Microwave Tubes and Applications **37**, pp. 1786-1801, (2017).

6. **B.L. Beaudoin**, J.C.T. Thangaraj, D. Edstrom Jr., J. Ruan, A.H. Lumpkin, D. Broemmelsiek, K.A. Carlson, D.J. Crawford, A. Romanov, J.K. Santucci, G. Stancari, R. Thurman-Keup, A. Warner, *"Longitudinal Bunch Shaping of Picosecond High-Charge MeV Electron Beams,"* Physics of Plasmas **23**, 103107 (2016).

7. **Invited: B.L. Beaudoin**, I. Haber, R.A. Kishek, S. Bernal and T. Koeth, "Long path-length experimental studies of longitudinal phenomena in intense beams," Physics of Plasmas **23**,056701 (2016).

8. **B. Beaudoin** and R.A. Kishek, *"Measurement of Tune in the Beam Ends as a Diagnostic Tool for Profiling the Momentum,"* Physical Review Special Topics – Accelerators & Beams **16**, 114201 (2013).

9. **Invited: B. Beaudoin**, S. Bernal, C. Blanco, I. Haber, R.A. Kishek, T. Koeth, and Y. Mo, *"Modeling HIF Relevant Longitudinal Dynamics in UMER,"* Nuclear Instruments and Methods A **733**, 178-181 (2014).

10. **B. Beaudoin**, I. Haber, R.A. Kishek, S. Bernal, T. Koeth, D. Sutter, P.G. O.Shea, and M. Reiser, *"Longitudinal Confinement and Matching of an Intense Electron Beam,"* Physics of Plasmas **18**, 013104 (2011).

11. J.A. Karakkad, D. Matthew, R. Ray, **B.L. Beaudoin**, A. Narayan, G.S. Nusinovich, A. Ting andT.M. Antonsen Jr., "High efficiency inductive output tubes with intense annular electron beams", Physics of Plasmas **24**, 103116, (2017).

12. G.S. Nusinovich, **B.L. Beaudoin**, C. Thompson, J.A. Karakkad, and T.M. Antonsen Jr., "Limiting current of intense electron beams in a decelerating gap", Physics of Plasmas **23**, 023114, (2016).

13. Y.C. Mo, R.A. Kishek, D. Feldman, I. Haber, **B. Beaudoin**, P.G. O'Shea, and J.C.T. Thangaraj, *"Experimental Observations of Soliton Wave Trains in Electron Beams,"* PhysicalReview Letters **110**, 084802 (2013).

14. K. Poorrezaei, R.B. Fiorito, R.A. Kishek, **B.L. Beaudoin**, *"New technique to measure emittance for beams with space charge,"* Physical Review Special Topics – Accelerators & Beams **16**, 082801 (2013).

15. **Invited:** R.A. Kishek, **B. Beaudoin**, S. Bernal, M. Cornacchia, D. Feldman, R. Fiorito, I. Haber, T.W. Koeth, Y. Mo, P.G. O'Shea, K. Poor Rezaei, D. Sutter, and H. Zhang, "The University of Maryland Electron Ring Program," Nuclear Instruments and Methods A **733**, 233-237 (2014).

16. S. Bernal, **B.L. Beaudoin**, T. Koeth, and P.G. O'Shea, *"Smooth Approximation of Dispersion with Strong Space Charge,"* Physical Review Special Topics - Accelerators & Beams **14**, 104202 (2011).

17. K. Fiuza, **B. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, P.G. O'Shea, C. Papadopoulos, D. Sutter, and C. Wu, *"Design of a scaled recirculator for Heavy Ion Inertial Fusion,"* Journal of Physics - Conference Series **244**, 032029 (2010).

18. I. Haber, S. Bernal, **B. Beaudoin**, M. Cornacchia, D. Feldman, R.B. Feldman, R. Fiorito, K. Fiuza, T.F. Godlove, R.A. Kishek, P.G. O'Shea, B. Quinn, C. Papadopoulos, M. Reiser, D. Stratakis, D. Sutter, J.C.T. Thangaraj, K. Tian, M. Walter, and C. Wu, *"Scaled electron studies at the University of Maryland,"* Nuclear Instruments and Methods A **606**, 64-68 (2009).

19. 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, *"Scaled electron experiments at the University of Maryland,"* Nuclear Instruments and Methods A **577**, 150-156 (2007).

20. **B. Beaudoin**, T.M. Antonsen Jr., I. Haber, T.W. Koeth, A.H. Narayan, G. Nusinovich, K. Ruisard, *"Novel High Power Sources for the Physics of Ionospheric Modification"*, Proceedings of the 2015 International Particle Accelerator Conference, Richmond, VA, Paper ID WEPTY056 (2015).

21. **B. Beaudoin**, I. Haber, R.A. Kishek, "*Barrier Shock Compression with Longitudinal Space Charge*", Proceedings of the 2015 International Particle Accelerator Conference, Richmond, VA, Paper ID MOPMA044 (2015).

22. **B. Beaudoin**, D. Edstrom Jr., A.H. Lumpkin, J. Ruan, J. Thangaraj, "*Longitudinal Bunch Shaping at Picosecond Scales using Alpha-BBO Crystals at the Advanced Superconducting Test Accelerator*", Proceedings of the 2015 International Particle Accelerator Conference, Richmond, VA, Paper ID MOPMA043 (2015).

23. **B.L. Beaudoin**, I. Haber, R.A. Kishek, and T. Koeth, *"Experimental Observations of a Multi-stream Instability in a Long Intense Beam,"* Proceedings of the 2013 International Particle Accelerator Conference, Shanghai, China, May 2013, 2044 (2013).

24. **B.L. Beaudoin**, S. Bernal, K. Fiuza, I. Haber, R.A. Kishek, T. Koeth, M. Reiser, D. Sutter, and P.G. O'Shea, *"Space-Charge Effects in Bunched and Debunched Beams,"* Proceedings of the2011 IEEE Particle Accelerator Conference, New York, NY, Paper ID MOOD51 (2011).

25. **B.L. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, T. Koeth, D. Sutter, and P.G. O'Shea, *"Longitudinal Confinement of an Intense Beam Using Induction Focusing,"* Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, (New York: AIP Press **1299**, 2010), p. 603.

26. **B.L. Beaudoin**, S. Bernal, M. Cornacchia, K. Fiuza, I. Haber, R.A. Kishek, T.W. Koeth, M. Reiser, D.F. Sutter, H. Zhang, and P.G. O'Shea, *"High Intensity Beam Physics at UMER,"* Proceedings of the 46th ICFA Advanced Beam Dynamics Workshop on High-Intensity, High-Brightness Hadron Beams, Morschach, Switzerland, Sep 2010, 629 (2010).

27. **B. Beaudoin**, S. Bernal, K. Fiuza, I. Haber, R.A. Kishek, P.G. O'Shea, M. Reiser, D. Sutter, and J.C.T. Thangaraj,*"Longitudinal Beam Bucket Studies for a Space-Charge Dominated Beam,"* Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC, Paper ID, FR5PFP058 (2009).

28. **B.L. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, P.G. O'Shea, M. Reiser, J.C.T. Thangaraj, K. Tian, M. Walter, and C. Wu, *"Application of Induction Module for Energy Perturbations in the University of Maryland Electron Ring,"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. 07CH37866, 2322 (2007).

29. S. Bernal, **B. Beaudoin**, H. Baumgartner, S. Ehrenstein, I. Haber, T. Koeth, E. Montgomery, K. Ruisard, D. Sutter, D. Yun, and R.A. Kishek, *"Ultra-low Current Beams in UMER to Model Space-Charge Effects in High-energy Proton and Ion Machines,"* Proceedings of the 17th Workshop on Advanced Accelerator Concepts (AAC), Washington, DC, August 2016.

30. K. Ruisard, I. Haber, T. Koeth, **B.L. Beaudoin**, D. Matthew, and H. Baumgartner, *"The University of Maryland Electron Ring distributed octupole lattice: marrying quasi-integrable optics with the FODO lattice,"* Proceedings of the 17th Workshop on Advanced Accelerator Concepts (AAC), Washington, DC, August 2016.

31. K. Ruisard, H. Baumgartner, **B. Beaudoin**, I. Haber, T.W. Koeth, and D.B Matthew, *"Early Tests and Simulation of Quasi-Integrable Octupole Lattices at the University of Maryland Electron*

Ring," Proceedings of the 57th ICFA Advanced Beam Dynamics Workshop on High- Intensity, High-Brightness and High-Power Hadron Beams, Malmo, Sweden, July 2016.

32. H. Baumgartner K. Ruisard, I. Haber, T. Koeth, D. Matthew, M. Teperman, **B.L. Beaudoin**, *"Quantification of Octupole Magnets at the University of Maryland Electron Ring,"* Proceedings of the 2016 North America Particle Accelerator Conference, Chicago, IL, October 2016, (2016).

33. K. Ruisard, H. Baumgartner, **B. Beaudoin**, I. Haber, M. Teperman, T. Koeth, *"Experimental Plans for Single-Channel Strong Octupole Fields at the University of Maryland Electron Ring,"* Proceedings of the 2016 North America Particle Accelerator Conference, Chicago, IL, October (2016).

34. K.J. Ruisard, **B. Beaudoin**, I. Haber, and T. Koeth, "*Simulations and Experiments in Support of Octupole Lattice Studies at the University of Maryland Electron Ring,"* Proceedings of the 2015 International Particle Accelerator Conference, Richmond, VA, 653 (2015).

35. S. Bernal, **B.L. Beaudoin**, I. Haber, T. Koeth, Y. Mo, E. Montgomery, K.P. Rezaei, K. Ruisard, W. Stem, D. Sutter, H. Zhang, and R.A. Kishek *"Stability of Emittance vs. Space-Charge Dominated Beams in an Electron Recirculator,"* Proceedings of the 16th Workshop on Advanced Accelerator Concepts (AAC), San Jose, CA, July 2014, p. 100003.

36. J.L. Gonski, **B.L. Beaudoin**, S. Burcher, J.E. Krutzler, T.W. Koeth, "A Novel Optical Method for Measuring Beam Phase and Width in the Rutgers 12-Inch Cyclotron," Proc. 20th International Conference on Cyclotrons and their Applications, Vancouver, Canada, Paper ID WE1PB04, September 2013.

37. Y.C. Mo, **B.L. Beaudoin**, D. Feldman, I. Haber, R.A. Kishek, and P.G. O'Shea, *"Experimental Study of Soliton Wave Trains in Electron Beams,"* Proceedings of the 2013 International Particle Accelerator Conference, Shanghai, China, May 2013, 1835 (2013).

38. S. Bernal, **B.L. Beaudoin**, M. Cornacchia, and D. Sutter, *"Stability of Emittance vs. Space-Charge Dominated Beams in an Electron Recirculator,"* Proceedings of the 2013 North American Particle Accelerator Conference, Pasadena, CA, Sep/Oct 2013, TUPAC31 (2013).

39. R.A. Kishek, **B.L. Beaudoin**, S. Bernal, M. Cornacchia, D. Feldman, R. Fiorito, I. Haber, T. Koeth, Y.C. Mo, K. Poor Rezaei, K.J. Ruisard, W. Stem, D. Sutter, and H.D. Zhang, *"The University of Maryland Electron Ring (UMER) Program – Recent Developments,"* Proceedings of the 2013 North American Particle Accelerator Conference, Pasadena, CA, Sep/Oct 2013, FROAA1 (2013).

40. W. Stem, **B.L. Beaudoin**, I. Haber, and T. Koeth, *"Experimental Detection of Envelope Resonance in a Space-Charge-Dominated Electron Ring,"* Proceedings of the 2013 North American Particle Accelerator Conference, Pasadena, CA, Sep/Oct 2013, TUPAC32 (2013).

41. D.F. Sutter and **B.L. Beaudoin**, *"Measurement of Plasma Wave Speed from Electron Beam End Erosion,"* Proceedings of the 2013 North American Particle Accelerator Conference, Pasadena, CA, Sep/Oct 2013, TUPAC33 (2013).

42. H.D. Zhang, **B.L. Beaudoin**, and R.A. Kishek, *"Experimental Study of Halo Formation in Space Charge Dominated Beam,"*Proceedings of the 2013 North American Particle Accelerator Conference, Pasadena, CA, Sep/Oct 2013, FROAA6 (2013).

43. **Invited:** R.A. Kishek, **B. Beaudoin**, I. Haber, D. Feldman, T. Koeth, and Y. Mo, *"Longitudinal Space Charge Phenomena in an Intense Beam in a Ring,"* Proceedings of the 52nd ICFA Advanced Beam Dynamics Workshop on High-Intensity and High-Brightness Hadron Beams, Beijing, China, Sep 2012, Paper ID, WEO1C05 (2012).

44. H. Zhang, **B. Beaudoin**, S. Bernal, R. Fiorito, R. Kishek, K. Poor Rezaei, and A. Shkvarunets, *"Beam Halo Measurements using Adaptive Masking Methods and Proposed Halo Experiment,"* Proceedings of the 52nd ICFA Advanced Beam Dynamics Workshop on High-Intensity and High-Brightness Hadron Beams, Beijing, China, Sep 2012, Paper ID, MOP260 (2012).

45. S. Bernal, **B.L. Beaudoin**, M. Cornacchia, D. Sutter, and R.A. Kishek, *"Orbit Corrections for Alternative Lattices at the University of Maryland Electron Ring (UMER),"* Proceedings of the 2012 International Particle Accelerator Conference, New Orleans, LA, USA, May 2012, 3993 (2012).

46. Yichao Mo, **B.L. Beaudoin**, D. Feldman, I. Haber, R.A. Kishek, P.G. O'Shea, and J.C.T. Thangaraj, *"Experimental Observations of Large-amplitude Solitary Waves in Electron Beams,"* Proceedings of the 2012 International Particle Accelerator Conference, New Orleans, LA, USA, May 2012, 1377 (2012).

47. K.J. Ruisard, **B.L. Beaudoin**, I. Haber, R.A. Kishek, and T. Koeth, *"Design of an Electrostatic Extraction Section for the University of Maryland Electron Ring,"* Proceedings of the 2012 International Particle Accelerator Conference, New Orleans, LA, USA, May 2012, 2964 (2012).

48. William Stem, **B.L. Beaudoin**, I. Haber, and T. Koeth, *"Recovering Measured Dynamics from a DC Circulating Space-charge-dominated Storage Ring,"* Proceedings of the 2012 International Particle Accelerator Conference, New Orleans, LA, USA, May 2012, 2967 (2012).

49. Haber, **B.L. Beaudoin**, S. Bernal, R.A. Kishek, T. Koeth, and Y.C. Mo, *"Experimental and Simulation Study of the Long-path-length Dynamics of a Space-charge-dominated Bunch,"* Proceedings of the 2012 Linear Accelerator Conference, Tel Aviv, Israel, Sep 2012, Paper ID, THPB061 (2012).

50. T. Koeth, **B. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, and P.G. O'Shea, *"Longitudinal Relaxation of a Space-Charge Dominated Bunch,"* Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, NY, Paper ID, MOOB53 (2011).

51. S. Bernal, **B.L. Beaudoin**, T. Koeth, and P.G. O'Shea, *"Smooth Approximation of Dispersion with Strong Space Charge,"* Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, NY, Paper ID, WEP101 (2011).

52. R.A. Kishek, **B.L. Beaudoin**, S. Bernal, M. Cornacchia, K. Fiuza, I. Haber, T. Koeth, P.G. O'Shea, D.F. Sutter, and H. Zhang, *"Advances in Modeling the University of Maryland Electron Ring,"*Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, NY, Paper ID, WEP050 (2011).

53. D. Sutter, **B.L. Beaudoin**, S. Bernal, M. Cornacchia, R.A. Kishek, T. Koeth, P.G. O'Shea, and M. Reiser, *"Current Dependent Tune Shifts in the University of Maryland Electron Ring,"*Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, NY, Paper ID, WEP102 (2011).

54. S. Bernal, D. Sutter, **B. Beaudoin**, M. Cornacchia, K. Fiuza, I. Haber, R.A. Kishek, T. Koeth, M. Reiser, and P.G. O'Shea, *"Transverse Beam Physics in UMER - Update,"* Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, (New York: AIP Press **1299**, 2010), p. 580.

55. Timothy W. Koeth, **B. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, M. Reiser, and P.G. O'Shea,*"Measurement & Simulation of Interpenetration and DC Accumulation in the University of Maryland Electron Ring,"* Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, (New York: AIP Press **1299**, 2010), p. 608.

56. S. Bernal, D. Sutter, M. Cornacchia, **B. Beaudoin**, I. Haber, R.A. Kishek, M. Reiser, C. Wu, and P.G. O'Shea, *"Operational Studies of the 10 keV Electron Storage Ring UMER,"* Proceedings of 13th Workshop on Advanced Accelerator Concepts (AAC), Santa Cruz, CA, July/Aug, 2008, (New York: AIP Press **1086**, 2009), p. 738.

57. Jayakar C.T. Thangaraj, **Brian Beaudoin**, Donald Feldman, Rami Kishek, Santiago Bernal, David Sutter, Martin Reiser, and Patrick O'Shea, *"Generation and transport of space charge waves in the University of Maryland Electron Ring (UMER),"* Proceedings of 13th Workshop on Advanced Accelerator Concepts (AAC), Santa Cruz, CA, July/Aug, 2008, (New York: AIP Press **1086**, 2009), p. 732.

58. S. Bernal, **B. Beaudoin**, T. Koeth, M. Cornacchia, D. Sutter, K. Fiuza, I. Haber, R.A. Kishek, C. Wu, C. Papadopoulos, M. Reiser, and P.G. O'Shea, *"Resonance Phenomena Over a Broad Range of Beam Intensities in an Electron Storage Ring,"* Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC, Paper ID, FR5PFP059 (2009).

59. K. Fiuza, **B. Beaudoin**, S. Bernal, I. Haber, R.A. Kishek, M. Reiser, P.G. O'Shea, and D.F. Sutter,*"Modeling Acceleration of High-Intensity Space-Charge-Dominated Beams,"* Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC,Paper ID, FR5PFP060 (2009).

60. R.A. Kishek, D. Stratakis, **B. Beaudoin**, S. Bernal, M. Cornacchia, I. Haber, P.G. O'Shea, M. Reiser, D. Sutter, J.C.T. Thangaraj, and C. Wu, *"Matching and Injection of Beams with Space*

Charge into the University of Maryland Electron Ring (UMER)," Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC, Paper ID, FR5PFP061 (2009).

61. D. Sutter, S. Bernal, C. Wu, M. Cornacchia, **B. Beaudoin**, K. Fiuza, I. Haber, R.A. Kishek, M. Reiser, and P.G. O'Shea, *"Coherent Phenomenon Over a Range of Beam Intensities in the Storage Ring UMER,"* Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC, Paper ID, FR5PFP063 (2009).

62. C. Wu, E.H. Abed, **B. Beaudoin**, S. Bernal, K. Fiuza, I. Haber, R.A. Kishek, P.G. O'Shea, M. Reiser, and D. Sutter, *"A Novel Beam Steering Algorithm Using Orbit Response Matrix,"* Proceedings of the 2009 IEEE Particle Accelerator Conference, Vancouver, BC, Paper ID, FR5REP029 (2009).

63. J.C.T. Thangaraj, **B.L. Beaudoin**, S. Bernal, D. Feldman, R. Feldman, R.A. Kishek, P.G. O'Shea, C. Papadopoulos, M. Reiser, D. Stratakis, and D. Sutter, *"Space charge waves as a diagnostic to measure transverse beam size of space charge dominated beams,"* Proceedings of the 2008 Beam Instrumentation Workshop, May 2008, Lake Tahoe, CA, (New York: AIP Press,2008), p. 149.

64. C. Wu, E. Abed, **B.L. Beaudoin**, S. Bernal, R.A. Kishek, P.G. O'Shea, M. Reiser, and D.F. Sutter,*"Linear Resonance Analysis of Beams with Intense Space Charge in the University of Maryland Electron Ring (UMER),"* Proceedings of the 42nd ICFA Advanced Beam Dynamics Workshop on High-Intensity, High-Brightness Hadron Beams, Nashville, TN, Aug 2008, 165 (2008).

65. R.A. Kishek, G. Bai, **B. Beaudoin**, S. Bernal, D. Feldman, R. Feldman, R. Fiorito, T.F. Godlove, I. Haber, T. Langford, P.G. O'Shea, B. Quinn, C. Papadopoulos, M. Reiser, D. Stratakis, D. Sutter, K. Tian, J.C.T. Thangaraj, M. Walter, and C. Wu, *"The University of Maryland Electron ring (UMER) Enters a New Regime of High-Tune-Shift Rings,"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**,820(2007).

66. S. Bernal, **B. Beaudoin**, R.A. Kishek, M. Reiser, D. Sutter, and P.G. O'Shea, *"Low-current, Space-Charge Dominated Beam Transport at the University of Maryland Electron Ring (UMER),"*Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 3561 (2007).

67. R.B. Fiorito, **B.L. Beaudoin**, S. Casey, D. Feldman, P.G. O'Shea, and B. Quinn, *"OTR Measurements of the 10 keV Electron Beam at the University of Maryland Electron Ring (UMER),"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 4006 (2007).

68. C. Papadopoulos, G. Bai, R.A. Kishek, I. Haber, M. Walter, **B. Beaudoin**, P.G. O'Shea, and M. Reiser, *"Modeling Skew Quadrupole Effects on the UMER Beam,"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No.**07CH37866**, 3567 (2007).

69. J.C.T. Thangaraj, G. Bai, **B.L. Beaudoin**, S. Bernal, D. Feldman, R. Fiorito, I. Haber, R.A. Kishek, P.G. O'Shea, M. Reiser, D. Stratakis, K. Tian, and M. Walter, *"Evolution of Laser Induced Perturbation and Experimental Observation of Space Charge Waves in the University of Maryland Electron Ring (UMER),"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 3570 (2007).

70. K. Tian, G. Bai, **B.L. Beaudoin**, D. Feldman, R.B. Fiorito, I. Haber, R.A. Kishek, P.G. O'Shea, M. Reiser, D. Stratakis, D. Sutter, J.C.T. Thangaraj, M. Walter, and C. Wu, *"Fast Imaging of Time-dependent Distributions of Intense Beams,"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 3573 (2007).

71. M. Walter, G. Bai, **B.L. Beaudoin**, S. Bernal, D. Feldman, T. Godlove, I. Haber, R.A. Kishek, P.G. O'Shea, C. Papadopoulos, B. Quinn, M. Reiser, D. Stratakis, J.C.T. Thangaraj, and C. Wu, *"Beam Extraction Concepts and Design for the University of Maryland Electron Ring (UMER),"*Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 1754 (2007).

72. M. Walter, G. Bai, **B.L. Beaudoin**, S. Bernal, D. Feldman, T. Godlove, I. Haber, R.A. Kishek, P.G. O'Shea, C. Papadopoulos, B. Quinn, M. Reiser, D. Stratakis, D. Sutter, J.C.T. Thangaraj, and C. Wu,*"Multi-turn Operation of the University of Maryland Electron Ring (UMER),"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 1751 (2007).

73. C. Wu, E. Abed, G. Bai, **B. Beaudoin**, S. Bernal, I. Haber, R. Kishek, P. O'Shea, M. Reiser, D. Stratakis, D. Sutter, K. Tian, and M. Walter, *"A Robust Orbit-Steering and Control Algorithm Using Quadrupole-scans as a Diagnostic,"* Proceedings of the 2007 IEEE Particle Accelerator Conference, Albuquerque, NM, ed. C. Petit-Jean-Genaz, IEEE Cat. No. **07CH37866**, 509 (2007).

74. S. Bernal, G. Bai, **B. Beaudoin**, D. Feldman, R. Feldman, R. Fiorito, T.F. Godlove, I. Haber, R.A. Kishek, C. Papadopoulos, B. Quinn, M. Reiser, D. Stratakis, D. Sutter, K. Tian, J.C.T. Thangaraj, M. Walter, C. Wu, and P.G. O'Shea, *"New Developments In Space-Charge Beam Physics Research at the University Of Maryland Electron Ring (UMER),"* Proceedings of 12th Workshop on Advanced Accelerator Concepts (AAC), Lake Geneva, WI, 10-15 July, 2006, ed., Manoel Conde and Catherine Eyberger, (New York: AIP Press **877**, 2006), p. 94.

75. G. Bai, R.A. Kishek, **B. Beaudoin**, S. Bernal, D. Feldman, T. Godlove, I. Haber, B. Quinn, M. Reiser, D. Sutter, M. Walter, and P.G. O'Shea, *"Modeling and Experiments on Injection into University of Maryland Electron Ring,"* Proceedings of 12th Workshop on Advanced Accelerator Concepts (AAC), Lake Geneva, WI, 10-15 July, 2006, ed., Manoel Conde and Catherine Eyberger, (New York: AIP Press **877**, 2006), p. 582.

76. R.A. Kishek, G. Bai, **B. Beaudoin**, S. Bernal, D. Feldman, R. Fiorito, T.F. Godlove, I. Haber, P.G. O'Shea, B. Quinn, C. Papadopoulos, M. Reiser, D. Stratakis, D. Sutter, K. Tian, J.C.T. Thangaraj, M. Walter, and C. Wu, *"Benchmarking Space Charge Codes Against UMER*

*Experiments,"*Proceedings of the 2006 International Computational Accelerator Physics Conference (ICAP), Chamonix, France, Oct 2006 **WEA3MP03**, 263 (2006).

77. Bernal, G. Bai, **B. Beaudoin**, D. Feldman, R. Feldman, R. Fiorito, T.F. Godlove, I. Haber, R.A. Kishek, C. Papadopoulos, B. Quinn, M. Reiser, D. Stratakis, D. Sutter, K. Tian, T.C.J. Tobin, M. Walter, C. Wu, and P.G. O'Shea, *"Space-charge Beam Physics Research at the University Of Maryland Electron Ring (UMER),"* 22nd ICFA Advanced Beam Dynamics Workshop on High Intensity & High Brightness Hadron Beams, Tsukuba, Japan, May 2006 **WEAX05**, 218 (2006).