



PPPS-2007

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January 12, 2008

FINAL REPORT ON PPPS-2007

The Pulsed Power and Plasma Science Conference (PPPS-2007), a combination of the 16th Biennial IEEE International Pulsed Power Conference and the 34th Annual IEEE International Conference on Plasma Science, took place in Albuquerque, New Mexico June 17-22, 2007. The 2007 Symposium on Fusion Engineering co-located with the PPPS-2007 Conference. A registrant to either conference (the registration fees were identical) had access to all technical sessions in both conferences. The poster sessions were held jointly as well.

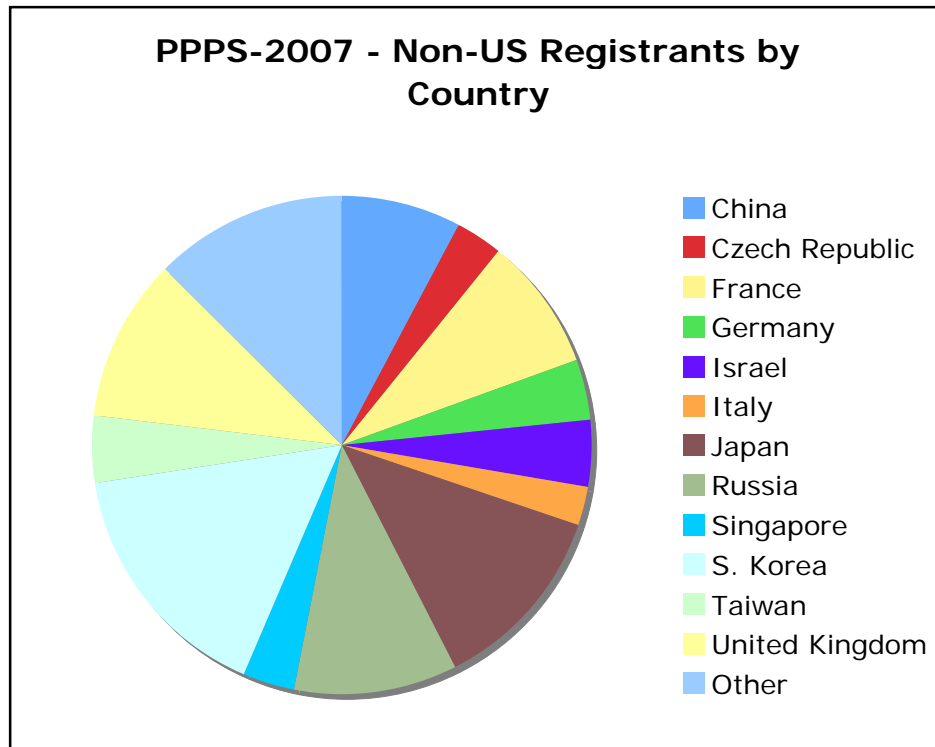
The General Chair of PPPS-2007 was Professor Edl Schamiloglu from the University of New Mexico and the Technical Program Chair was Dr. Frank Peterkin from the Naval Surface Warfare Center, Dahlgren Division. Professor John Gaudet of the University of New Mexico was the Treasurer and Mr. Charles Reuben of the University of New Mexico was the Conference Secretary.

There were almost 1200 registrants at the PPPS-2007 Conference, of which 455 were from outside the US. The distribution of foreign registrants is shown in the pie chart that follows. After the US, the greatest number of registrants were from South Korea (73), followed by Japan (56), the Russian Federation (48), the United Kingdom (48), France (40), and China (36). The European registrants (including the Russian Federation) totaled 207, while the Asia/Pacific registrants totaled 209 (including Australia).

Over 900 abstracts were presented across 7 plenary sessions, 54 oral sessions (6 parallel oral sessions over 4 ½ days), and 5 poster sessions. There were no competing oral sessions during the poster sessions.

The PPPS-2007 organizers set aside \$20,000 to support student travel to the conference. The organizers express their gratitude to Dr. John Luginsland (NumerEx) for organizing the selection of the student travel grant awardees.

Since the PPPS-2007 conference is a combination of two IEEE NPSS conferences, four *Best Student Presentation* awards were presented (described in the Awards section of this Newsletter). The PPPS-2007 organizers thank Dr. Dave Abe of NRL for organizing the process and selecting the travel grant awardees.



The PPPS-2007 Exhibitors' Program was directed by Darryl Droemer (NSTech/Sandia National Laboratories). There were 49 booths occupied by 46 vendors in the NE Exhibit Hall of the Albuquerque Convention Center (shared space with the poster session and cyber café). Several of the vendors came from Europe to exhibit at this conference.

The PPPS-2007 Companion Program was organized by Mrs. Judy Gilman and was open to companions of the SOFE conference registrants. On Monday the companions took a tour of the Utility Shack and learned about Native American jewelry. They were then given a walking tour of Old Town in Albuquerque. On Tuesday the companions were given a tour of Acoma Pueblo. On Wednesday they visited Santa Fe and the Georgia O'Keefe Museum. On Thursday the companions toured the art collection of the beautiful Hyatt Regency Tamaya Spa and Resort and spent a leisurely afternoon. The Conference Organizers thank Judy for the wonderful job she did in organizing the Companion Program. Each of the four days was well attended.

The conference registration opened on Sunday afternoon June 17, followed by a *Welcome Reception* on Sunday evening (joint reception with SOFE). The New Mexico Woodwind Quintet performed during the reception.

The Conference technical program opened on Monday morning with a *SuperPlenary Session*. Three plenary addresses were presented on Monday morning to a combined audience of PPS-2007 and SOFE-2007 registrants. The first speaker was Dr. Keith Matzen, Director of the Pulsed Power Sciences Center at Sandia National Laboratories, whose address focused on Pulsed Power activities at Sandia, focusing on the refurbishment of the Z-accelerator. The second speaker, representing the ICOPS community, was Dr. Andrew Ng of Lawrence Livermore National Laboratory, whose address described recent advances in warm, dense matter. The final speaker, representing the SOFE community, was Mr. Brad Nelson of Oak Ridge National Laboratory. His address described the engineering challenges of the ITER Joint International Tokamak project.

On Monday evening Kelly Hahn of Sandia National Laboratories organized a *Women in Pulsed Power and Plasma Science Reception*. (This is reported on in greater detail in the Appendix.) All women registrants were given a ticket and the remaining tickets were distributed to conference registrants on a first-come-first-served basis. Kelly invited Dr. Joan Woodard, Executive Vice President of Sandia National Laboratories, to give a brief presentation at the reception. (Kelly describes this event in a brief article following this report).

There was a Special Evening Forum on Monday entitled: *National Academies Plasma 2010 Open Forum*. This forum was organized by Professor Steven Cowley of UCLA, co-chair of the National Academies Panel whose report was just released in June. Professor Mark Kushner (Iowa State) discussed the low-temperature plasma portion of the report.

Tuesday morning opened with a *Joint Plenary Session* with SOFE. Dr. Ed Moses of Lawrence Livermore National Laboratory presented an address describing progress on completion of the National Ignition Facility (NIF), as well as the National Ignition Campaign. Following the Plenary Albuquerque Mayor Martin Chavez paid an impromptu visit and welcomed the conference attendees to his city. Mayor Chavez spoke of Albuquerque's past, with the city having celebrated its Tricentennial in 2006. He also spoke of Albuquerque's future, with national laboratories, high tech industry and a growing film industry joining forces to lead the economic engine of the future.

Tuesday evening was the *Night Out at the Rio Grande Zoo*, joint with SOFE. The weather was perfect and the conference registrants were entertained by the Salsa Band Café Mocha. Registrants also had an opportunity to tour the Zoo exhibits, which were open only to the PPS-2007 and SOFE Conference registrants.

Wednesday morning opened with the PSAC Award Lecture by the 2007 recipient of the award, Prof. Yitzhak Maron of the Weizmann Institute of Science. His lecture was entitled "Interaction of Plasmas with Pulsed Magnetic Fields: What Can We Learn from the Field Measurements?"

On Wednesday evening the PPS-2007 Conference hosted a *Members-Only Reception*. All IEEE members were provided a ticket to this event. The purpose of this reception was to allow IEEE members an opportunity to meet with other members, and encourage

Senior Membership and Fellow Nominations. There were over 350 members attending this reception.

Drs. Jim Benford and John Swegle organized a Special Wednesday Evening Forum entitled: *High Power Microwaves: Where do we go from here?* The organizers invited Dr. Kirk Hackett (Chief Scientist, Air Force Research Laboratory, Directed Energy Microwaves Directorate), Dr. Tom Hussey (Chief Scientist, Air Force Office of Scientific Research), Professor Andreas Neuber (Texas Tech University), and Academician Michael Yalandin (Institute of Electrophysics, Ekaterinburg, Russia) to present their views of the future in this field. The room was overflowing with over 80 interested audience members. The panelists fielded questions following their presentations.

The Thursday morning plenary was the Erwin Marx Award Lecture by the 2007 recipient, Dr. David L. Johnson (L-3 Communications, retired from Sandia National Laboratories). His lecture was entitled "From Hermes I to ZR: Forty One Years of Pulsed Power."

The PPPS-2007 Awards Banquet took place Thursday evening. The New Mexico Woodwind Quintet entertained the attendees during the reception. Following the banquet the Conference Awards were formally presented to all of the recipients (see the photos and bios for all the award recipients in the Awards portion of this Final Report). The evening closed with a spirited presentation of future ICOPS, Power Modulator, and Pulsed Power Conferences.

The Friday morning plenary was the Peter Haas Award Lecture by the 2007 recipient, Professor Karl H. Schoenbach (Old Dominion University). His lecture was entitled "Bioelectrics – Using Nanosecond Pulsed Power Technology to Control Biological Cell Functions."

It was a pleasure to find all 6 oral sessions on Friday 5 PM to be filled with conference participants.

All conference registrants will have an opportunity to submit papers that will be published in the *Proceedings of the PPPS-2007 Conference*. In addition, two Special Issues of the IEEE Transactions on Plasma Science will be derived from papers presented at this conference. The first is the Special Issue on Plenary and Invited talks from PPPS-2007, edited by Mounir Laroussi (Old Dominion University), Frank Hegeler (Naval Research Laboratory) and XinPei Lu (College of Electrical & Electronic Engineering HuaZhong University of Sci. & Tech., WuHan, Hubei Province, China), which will be published April 2008. The second is the Special Issue on Pulsed Power Science and Technology, edited by Bryan Oliver (Sandia National Laboratories), Frank Peterkin (Naval Surface Warfare Center, Dahlgren Division), Randy Curry (University of Missouri-Columbia), and Raymond Allen (Naval Research Laboratory) which will be published October 2008.

The Minicourse associated with the PPPS-2007 Conference was organized by Professor Mark Gilmore (University of New Mexico) and Mr. Dan Jobe (Ktech Corporation). The

Minicourse, entitled “Diagnostics for High Density Plasmas and Pulsed Power Systems,” was attended by 60 participants and took place Friday and Saturday. The Minicourse dinner was hosted by the High Finance Restaurant atop Sandia Peak. Registrants took the Sandia Peak Tram for their 20 minute flight to dinner.

A special workshop was organized by Professor Martin Gundersen of USC that was entitled “Writing for and Working with the Film Industry: An Introduction for Scientists and Engineers.” This workshop was open to registrants of PPS-2007, SOFE, and the IEEE Particle Accelerator Conference (which took place the week following PPS-2007). Two prominent Hollywood insiders ran the workshop, Syd Field, known for writing the “Bible” of screenwriting, and Alex Singer, a prominent Director known for several movies and numerous Star Trek: The Next Generation episodes. Over 70 registrants participated in this Saturday workshop, part of IEEE NPSS’s *Weekend of Science* outreach to K-12 in Albuquerque and the greater New Mexico community (see Sal Portillo’s article describing this event).

The PPS-2007 Organizers thank the scientific community for their participation in the conference and look forward to seeing their friends and colleagues at the next ICOPS (Karlsruhe, Germany June 15-19 2008, organized by Professor Manfred Thumm, KFK) and at the next Pulsed Power Conference (Washington, DC June 29-July 2, 2009, organized by Dr. Frank Peterkin, NSWC Dahlgren Division).



This report was prepared by Edl Schamiloglu, General Chair, IEEE PPS-2007. He can be reached at the Department of Electrical & Computer Engineering, University of New Mexico, MSC01 1100, 1 University of New Mexico, Albuquerque, NM 87131, USA; Phone: +1505-277-4423; Fax: +1505-277-1439; e-mail: edl@ece.unm.edu.



Frank Peterkin
*Technical Program
Chair*



John Gaudet
Finance Chair



Charles Reuben
*Conference
Coordinator*

APPENDIX

Women in Pulsed Power and Plasma Science Reception

In conjunction with the 2007 IEEE Pulsed Power and Plasma Science (PPPS) Conference, the IEEE Women in Engineering (WIE) and the PPPS conference organizers jointly sponsored the “Women in Pulsed Power and Plasma Science” evening reception held on June 18 at the Convention Center in Albuquerque, NM. Approximately 80 people, half of which were female, attended the social event, hosted by Dr. Kelly Hahn of Sandia National Laboratories (SNL). The invited speaker Dr. Joan Woodard, Executive Vice President and Deputy Director of SNL, delivered a lively speech drawing from her own experiences throughout her career. Woodard concluded her talk with some interesting statistics regarding how women from around the world perceive themselves in the workplace in relation to their roles at home.

The intent of the reception was simply to give an opportunity for the female conference participants to convene in a social gathering. Events like this give the chance for women in the community to get to know each other, because there are so few women in the workplace in these particular fields. Of the approximately 1200 conference attendees, about 100 were women. Of these, about half were students and a third were from outside the United States.

The PPPS Conference, chaired by Prof. Edl Schamiloglu of the University of New Mexico, was a combination of two conferences, the 16th IEEE Pulsed Power Conference and 34th International Conference on Plasma Science. Technical topics included pulsed power accelerators, z-pinch plasmas, and high power microwaves, just to name a few.

The mission of WIE is to “inspire, engage, encourage, and empower IEEE women worldwide.” Interestingly, 2.5 % of members of the IEEE are WIE members. Of those, about a third are male.



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PAC-PPPS Science Weekend



Science Weekend was a collaborative effort between the 2007 Particle Accelerator Conference (PAC'07) and PPPS-2007 conference. Sal Portillo was the liaison for the PPPS-2007 Conference and Hillary Smith and Tsuyoshi Yajima were the liaisons for PAC 07. The idea behind the weekend was to give middle school through high school students and their families an opportunity to observe some basic experiments that would capture their imagination and kindle their interest in science. Exhibits included holding a bowling ball with a vacuum, building an electric motor, a demonstration on non linear dynamic driven system as well as experiments with liquid nitrogen, to name a few.

The ScreenWriting Workshop organizers also reached out to the local New Mexico community, inviting Science and English high school teachers to the Workshop. About half of the Workshop attendees were from the New Mexico community.

Members from several institutions contributed to the science experiments and displays, which were set-up in the West Wing of the Albuquerque Convention Center. Volunteers included representatives from Los Alamos National Laboratory, Sandia National Laboratories, the Coalition on Plasma Science, and Princeton Plasma Physics Laboratory. Several undergraduate volunteer interns from various universities helped out as well. Ice cream and punch were served and every student and parent received a Science Weekend T-shirt. The students and their families enjoyed their experience, especially the adults and the grade school and pre school kids - who seemed to delight in the pleasure (and the noise!) of watching a balloon rocket towards the ceiling of the convention center. Perhaps the full import and meaning of Newton's laws of motion was not totally assimilated by the budding experimenters but perhaps a seed was planted. It was indeed a very rewarding experience.



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Awards

Nuclear and Plasma Sciences Society Award – Early Achievement Award – John Luginsland

John W. Luginsland received a B.S.E., M.S.E., and Ph.D. in nuclear engineering (plasma physics option) from The University of Michigan, Ann Arbor in 1992, 1994, and 1996, respectively.

He joined the Advanced Weapons and Survivability Directorate of the Air Force Phillips Laboratory, Kirtland AFB, NM as a National Research Council Resident Research Associate in 1996, and was a staff member of the Plasma Physics Branch, Directed Energy Directorate, Air Force Research Laboratory from 1998 to 2001. From 2001 to 2003, he worked with Science Applications International Corporation on advanced pulsed power applications. He currently works out of Ithaca, NY for NumerEx, an Albuquerque-based small business. His research interests primarily focus on theoretical and computational plasma physics, electromagnetism, and fluid dynamics with applications to advanced survivability concepts, accelerator schemes, and various types of radiation production. He is especially interested in the application of high performance computing and advanced optimization techniques to create virtual prototyping capabilities in various areas of electromagnetic design. He enjoys collaboration with experimentalists.

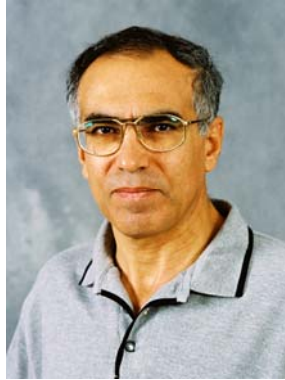
John Luginsland's citation reads: *For contributions to the development and application of theoretical and computational methods leading to enhanced understanding and improved experimental performance of high current diodes and high power microwave sources.*



John Luginsland (right) receiving the NPSS Early Achievement Award from Plasma Science TC Chair, Ron Gilgenbach

ICOPS Award

PSAC Award



Yitzhak Maron

Yitzhak Maron was born in 1948 in Iraq. With his family, he emigrated to Israel in 1951. In 1968, he graduated with a B.Sc. in Physics/Mathematics from the Hebrew University in Jerusalem and went on to complete his M.Sc. studies there in 1970. From 1971-1977, he conducted his Ph.D. research at the Weizmann Institute of Science, where he spent an additional three years as a postdoctoral fellow. In 1980, he joined the Laboratory of Plasma Studies at Cornell University (Ithaca, New York) where he worked as a Research Associate. He returned to the Weizmann Institute in 1985 to become a Professor of Physics and is currently the Head of the Plasma Laboratory at the Faculty of Physics.

Professor Maron is a world leader in the development of spectroscopic methods to determine the charge and current density distributions as well as electric and magnetic fields in non-equilibrium short-duration plasmas. His pioneering experimental techniques have made it possible to measure, understand, and control the extreme plasma environments of high power ion diodes, plasma opening switches (POS), and Z-pinches. His many “firsts” include the use Stark shift measurements to determine the dynamic electric field distribution in the high-voltage gaps in ion diodes, making it possible to measure the electron density distribution in magnetically insulated diode gaps; use of Doppler line shapes to determine the ion beam divergence in acceleration gaps, determination of the electron temperature and particle flow in dynamic ionizing plasmas, the use of Zeeman-splitting measurements in pulsed-plasmas to determine the evolution of the spatial distribution of magnetic fields in diodes, Z-pinches, and POS; and the determination of the properties of turbulent fields in diodes and POS plasmas. Professor Maron’s body of work has greatly advanced the understanding of pulsed-plasmas and atomic physics under extreme conditions.

In addition to his outstanding scientific achievements, he has also helped to train new generations of researchers through his teaching activities and his collaborations with universities and institutions throughout the world. In recognition of his many talents and accomplishments, Professor Maron was made a Fellow of the American Physical Society in 1996 and a Fellow of the IEEE in 2005.

Pulsed Power Awards

Erwin Marx Award



David L Johnson

David Johnson was born and raised in Minneapolis, Minnesota. He graduated from the University of Minnesota in 1966 with a Bachelors of Electrical Engineering. He joined Sandia National Laboratories on a work/study program. In 1968 he received a Masters of Science in Electrical Engineering from the University of New Mexico. His arrival at Sandia was only about 6 months after the formation a small pulsed power group headed by Tom Martin who was tasked with developing flash x-ray sources for Sandia's weapons program. The limited staff and the newness of the field offered an excellent environment to participate in all areas in the research and development of Sandia's pulsed power facilities. Dave retired in 2000, after 34 years at Sandia, and joined Maxwell Laboratories/Titan Pulsed Sciences/L-3 Communications but continued at Sandia under contract. He considers himself lucky to have been in a field that was new, exciting, and had a tremendous growth during his career. "I haven't fully retired, yet, because pulsed power is still fun for me."

Peter Haas Award



Karl H. Schoenbach

Karl H. Schoenbach received his Dr.rer.nat. degree in physics in 1970 from the Technische Hochschule Darmstadt (THD), Germany. From 1970 to 1978, he worked at the THD in the area of high pressure gas discharge physics and on the dense plasma focus. From 1979 to 1985, Karl Schoenbach held a faculty position at Texas Tech University, where he was involved in research on fast opening switches. In 1985, he joined the faculty at Old Dominion University (ODU) in Norfolk, VA, where he now holds the Batten Endowed Chair in Bioelectric Engineering. Until 1993, Karl Schoenbach was active in research on photoconductive, solid state switches, and since then he has concentrated his research efforts on high pressure microdischarges, electrical discharges in liquids, and on environmental and medical applications of pulse power and plasma technology. He was elected Fellow of the IEEE in 1994 for “contributions to the research and development of very-high-power electronic devices.” Karl Schoenbach has chaired a number of workshops and conferences, among them, the 1991 IEEE International Conference on Plasma Science, and the first International Symposium on “Nonthermal Medical/Biological Treatments Using Electromagnetic Fields and Ionized Gases” (ElectroMed) in 1999. For the past 12 years, he has added a touch of cell-biology – pulsed electric field effects on biological cells and tissue - to his favorite research topics of pulsed power and plasma science. Karl Schoenbach is the director of the Frank Reidy Research Center for Bioelectrics at ODU, an interdisciplinary research center established in 2002. At the center, he works with pulsed power and plasma scientists, as well as with biologists and biophysicists, to connect plasma science, pulsed power science and technology and cell-biology in a new field of research: “bioelectrics.” The goal of this work is to gain a better understanding of the effects of nanosecond electrical pulses on cells and tissue, and to explore their potential for medical applications.



David A. Wetz
*2006 Outstanding
Pulsed Power Student*



Gregory F. Edmiston
*2007 Outstanding
Pulsed Power Student*



Craig Donaldson
*Best Student
Presentation*



Siqi Luo
*Best Student
Presentation*

2007 OUTSTANDING PULSED POWER STUDENT AWARDS

In recognition of outstanding contributions as a student in pulsed power engineering, science or technology.

2006 - DAVID A. WETZ, JR

David A. Wetz Jr. (S'1998, M'2006) was born in El Paso, TX on August 3, 1982. He received the B.S. degree in electrical engineering, the B.S. degree in computer science, the M.S. degree in electrical engineering, and the Ph.D. degree in electrical engineering from Texas Tech University,

Lubbock, Texas in 2003, 2004, and 2006 respectively. He is currently employed as a Research Associate at the Institute for Advanced Technology (IAT) at the University of Texas at Austin where he performs research in the pulsed power field with the main focus being on electromagnetic launch technology.

2007 - GREGORY F. EDMISTON

Also the Recipient of a Best Student Presentation Award

Gregory F. Edmiston (S'00) was born in Oklahoma City, OK. He received the B.S.E.E. and M.S.E.E. degrees from Texas Tech University in Lubbock, TX in 2004 and 2005, respectively. He is currently pursuing his Ph.D. in electrical engineering at Texas Tech. His research inter-

ests include surface flashover physics, high-power microwaves, explosively driven pulsed power, and compact pulsed power systems. He has worked as a Research Assistant at the Center for Pulsed Power and Power Electronics at Texas Tech University since 2004.

BEST STUDENT PRESENTATION AWARDS CRAIG DONALDSON

Craig Donaldson was born in Aberdeen, UK, in 1982. He received the B.Sc.degree (Honours) in Physics in 2004 and the M.Sc. in High Power Radio

Frequency Science and Engineering in 2005 from the University of Strathclyde, Glasgow, UK. He is now currently undertaking a Ph.D in the Department of Physics, University of Strathclyde.

SIQI LUO

Siqi Luo (M'2005) received the M.S. degree in Advanced Materials in the Singapore-MIT Alliance (SMA) program at the National University of Singapore, 2003. He was awarded the Singapore government scholarship and Institute of Materials Research & Engineering (IMRE) Award for Best Student for his M.S. work. He received the B.S. degree in materials science at Shanghai Jiao Tong University in 2001.

His industrial experience includes a graduate research internship at the Institute of Microelectronics (IME) of Singapore in 2003 and an engineer position at Semiconductor Manufacturing International Corporation (SMIC) in Shanghai, China in 2001.

He is currently a Ph.D. student in the Department of Electrical and Computer Engineering at the University of Wisconsin-Madison. His research work focuses on experimental and computational study of the RF, microwave and laser plasma technologies.

OLIVER PRINZ

Oliver Prinz was born in Karlsruhe, Germany, in 1978. He received the Dipl.-Ing. degree in electrical engineering in 2004 from the University of Karlsruhe (TH), Germany. Currently he is working towards his Ph.D.

Since 2002 he has been with the gyrotron group at the Research Center Karlsruhe, Forschungszentrum Karlsruhe

(FZK). First he was working on diagnostic systems for high-power gyrotrons. From 2004 onwards his research interests have been quasi-optical mode converters and multi-frequency gyrotrons.

Oliver Prinz won the IEEE Region 8 student paper contest in 2005 and is currently chairman of the IEEE student branch Karlsruhe, Germany.



Oliver Prinz
*Best Student
Presentation*

A complete listing of the technical committees, exhibitors, in memoria, and contributed, invited and plenary papers can be found in the 2007 IEEE Pulsed Power Conference Proceedings on DVD:

Proceedings on DVD
2007 IEEE Pulsed Power Conference

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IEEE Catalog Number: 07CH37864C
ISBN: 1-4244-0914-4
Library of Congress: 2006940969

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