2016 29th International Vacuum Nanoelectronics Conference (IVNC 2016)

Vancouver, British Columbia, Canada
11-15 July 2016
08:00-10:00 Registration

10:00-10:30 Breakfast and welcome address

10:30-12:00 Tutorial 1: theory and modeling of field-electron emitters
- 10:30 Tutorial T1.1 (35+10 min): Field electron emission theory for metals and semiconductors  N/A
  R. G. Forbes
  University of Surrey, UK
- 11:15 Tutorial T1.2 (35+10 min): Atomic-level modeling of cold field electron emission, using carbon as an example  N/A
  Z. Li
  Sun Yat-sen University, China

12:00-14:00 Lunch and networking

14:00-15:30 Tutorial 2: theory and modeling of photo-electron emitters
- 14:00 Tutorial T2.1 (35+10 min): An introduction to photoemission: theory and modeling  N/A
  K. L. Jensen
  Naval Research Laboratory, USA
- 14:45 Tutorial T2.2 (35+10 min): Photoemission of electrons from sharp needle tips driven by femtosecond laser pulses: a tutorial  N/A
  P. Hommelhoff
  Friedrich-Alexander University Erlangen-Nuremberg, Germany

15:30-16:00 Coffee break

16:00-17:30 Tutorial 3: theory and modeling of thermal electron emitters
- 16:00 Tutorial T3.1 (35+10 min): Thermionic emission theory: a tutorial  N/A
  T. R. Groves
  University at Albany, State University of New York, USA
- 16:45 Tutorial T3.2 (35+10 min): Thermionic emission for novel materials and its thermal relevance on other emission mechanisms  N/A
  L. K. Ang
  Singapore University of Technology and Design, Singapore

17:30-18:00 Free time

18:00-19:30 Welcome reception
08:00-08:30 Breakfast and registration

08:30-10:15 Photo-emission 1: ultra-fast emitters
- 08:30 Plenary PE1.P1 (35+10 min): Harnessing photoionization or photo-recombination to create attosecond science and technology N/A
  P. B. Corkum
  University of Ottawa and National Research Council, Canada
- 09:15 PE1.C1 (15+5 min): An exact formulation for ultrafast electron emission due to a DC bias and a laser field 1
  P. Zhang, Y. Y Lau
  University of Michigan, USA
- 09:35 PE1.C2 (15+5 min): Electron emission from nanostructures triggered by optical and terahertz ultrafast pulses 3
  M. Monshipouri, Y. Abdi, Y. Oh, S. Bagiante, V. Guzenko, S. Tsujino, F. Brunner, T. Feurer
  University of Tehran, Iran; Paul Scherrer Institute, Switzerland; University of Bern, Switzerland
- 09:55 PE1.C3 (15+5 min): Field emission from gated silicon field emitter array induced by sub-nanosecond laser pulses 5
  H. Shimawaki, Y. Neo, H. Mimura, M. Nagao, F. Wakaya, M. Takai
  Hachinohe Institute of Technology, Japan; Shizuoka University, Japan; National Institute of Advanced Industrial Science and Technology, Japan; Osaka University, Japan

10:15-10:30 Coffee break

10:30-11:50 Photo-emission 2: properties and applications
- 10:30 PE2.C1 (15+5 min): Photo-enhanced field emission properties of p-doped black Si arrays 7
  S. Mingels, V. Porshyn, P. Serban, D. Lützenkirchen-Hecht, G. Müller, C. Prommesberger, C. Langer, R. Schreiner
  University of Wuppertal, Germany; OTH Regensburg, Germany
- 10:50 PE2.C2 (15+5 min): Delayed photo-emission model for PIC codes N/A
  Naval Research Laboratory, USA; Leidos Corp., USA; Gnosys, Inc., USA; Los Alamos National Laboratory, USA
- 11:10 PE2.C3 (15+5 min): A bright and durable field-emission source derived from frozen refractory-metal Taylor cones 9
  G. Hirsch
  Hirsch Scientific, USA
- 11:30 PE2.C4 (15+5 min): Radiation tolerance of compact image sensor with field emitter array and cadmium telluride-based photoconductor 11
  Kyoto University, Japan; National Institute of Advanced Industrial Science and Technology, Japan; Shizuoka University, Japan; National Institute of Technology, Japan; Osaka Prefecture University, Japan

11:50-16:30 Lunch and tour 1

16:30-18:00 Rapid fire posters overview and poster session 1
08:00-08:30 Breakfast and registration

08:30-10:15 Field-emission 1: vacuum nanoelectronic devices
- 08:30 Plenary FE1.P1 (35+10 min): Nanoscale vacuum electronic devices   N/A
  M. Meyyappan, NASA Ames Research Center, USA
- 09:15 FE1.C1 (15+5 min): The enhancement of the electron field emission behavior of diamond/CNTs materials via the plasma post-treatment process for the applications in triode-type vacuum field emission transistor  13
- 09:35 FE1.C2 (15+5 min): Graphene-based micro-emitters and vacuum transistors  15
  G. Wu, X. Wei, Peking University, China
- 09:55 FE1.C3 (15+5 min): Planar graphene vacuum transistor performance potential  17
  J. L. Shaw, J. G. Champlain, B.-D. Kong, K. L. Jensen, J. B. Boos, Naval Research Laboratory, USA

10:15-10:30 Coffee break

10:30-12:00 Field-emission 2: novel nanoscale emitters
- 10:30 Invited FE2.I1 (20+10 min): Application of ultra-high-brightness nano-emitter for electron microscopes   N/A
  H. Zhang, J. Tang, Y. Yamauchi, L.-C. Qin, National Institute for Materials Science, Japan; University of North Carolina Chapel Hill, USA
- 11:00 FE2.C1 (15+5 min): Fabrication of transparent gated ZnO nanowire field emitter arrays  19
  G. Zhang, Z. Zhang, L. Zhao, J. She, S. Deng, N. Xu, J. Chen, Sun Yat-sen University, China
- 11:20 FE2.C2 (15+5 min): Field electron emission of boron nitride nanotube emitters  21
  K. N. Yun, G. Leti, J. S. Han, C. J. Lee, Y.-H. Song, Korea University, Korea; ETRI, Korea
- 11:40 FE2.C3 (15+5 min): Single SnO2 nanowire: field emission investigations  23
  P. D. Joshi, D. S. Joag, I. S. Mulla, D. J. Late, Savitribai Phule Pune University, India; Centre for Materials for Electronics Technology, India; CSIR-National Chemical Laboratory, India

12:00-14:00 Rapid fire posters overview, lunch and poster session 2

14:00-15:30 Field-emission 3: nano-carbon emitters
- 14:00 Invited FE3.I1 (20+10 min): Circular gated carbon nanotube field emitters with ballasted resistance   N/A
  J. T. W. Yeow, University of Waterloo, Canada
- 14:30 FE3.C1 (15+5 min): A platform to optimize the field emission properties of carbon-nanotube-based fibers  25
  M. Cahay, W. Zhu, K. L. Jensen, R. G. Forbes, S. B. Fairchild, T. C. Back, G. Graeu, T. Murray, J. R. Harris, D. A. Shiffler, University of Cincinnati, USA; Naval Research Laboratory, USA; University of Surrey, UK; Air Force Research Laboratory, USA; University of Dayton, USA
- 14:50 FE3.C2 (15+5 min): Unprecedented current modulation with in-plane gated field emitters  27
  L. Sabaut, P. Ponard, J.-P. Mazellier, P. Legagneux, Thales Electron Devices, France; Thales Research and Technology, France
- 15:10 FE3.C3 (15+5 min): In situ field emission measurement and field emission enhancement of few-layer graphene decorated with Au nanoparticles  29
  J. Xu, Q. Wang, Z. Qi, Y. Zhai, X. Zhang, Southeast University, China

15:30-16:00 Coffee break

16:00-17:30 Field-emission 4: non-vacuum devices and vacuum generation
- 16:00 Invited FE4.I1 (20+10 min): On the role of field emission in atmospheric-pressure microscale plasmas   N/A
  D. B. Go, University of Notre Dame, USA
- 16:30 FE4.C1 (15+5 min): Ultra-low turn-on field emission devices characterized at atmospheric pressures and high temperatures  31
  W. M. Jones, D. Lukin, A. Scherer, California Institute of Technology, USA
- 16:50 FE4.C2 (15+5 min): He channel nanotransistors – Towards “vacuum-less” empty state electronics  33
  S. A. Guerrera, A. I. Akinwande, Creative Microsystems, Inc., USA; Massachusetts Institute of Technology, USA
- 17:10 FE4.C3 (15+5 min): Improved ionization efficiency in MEMS-type ion-sorption micropump  35
  T. Grzebyk, A. Górecka-Drzazga, J. A. Dziuban, Wroclaw University of Science and Technology, Poland
08:00-08:30 Breakfast and registration

08:30-10:25 Thermal emission and energy conversion
- 08:30 Plenary TEC.P1 (35+10 min): Thermoelectronic energy conversion - A large-scale nano-application? N/A
  J. Mannhart, R. Wanke, I. Rastegar, W. Voesch, W. Braun
  Max Planck Institute for Solid State Research, Germany
- 09:15 Invited TEC.I1 (20+10 min): Wafer-scale thermionic energy converters N/A
  R. T. Howe
  Stanford University, USA
- 09:45 TEC.C1 (15+5 min): The state and potential of diamond in efficient direct energy conversion 37
  F. A. Koeck, R. J. Nemanich
  Arizona State University, USA
- 10:05 TEC.C2 (15+5 min): Towards compact solar thermionic converters based on carbon nanotubes forests 39
  K. Dridi, A. H. Khoshaman, A. Nojeh, G. A. Sawatzky
  University of British Columbia, Canada

10:25-10:30 Coffee break

10:30-12:00 Materials and devices 1: fabrication and characterization
- 10:30 Invited MD1.I1 (20+10 min): The applications of super-aligned carbon nanotubes in vacuum electronics N/A
  P. Liu, Y. Wei, L. Liu, S. Fan, K. Jiang
  Tsinghua University, China
- 11:00 MD1.C1 (15+5 min): Vertically aligned carbon nanotubes (VACNTs) size shrinking through catalyst size reduction: use of innovative nanodiamonds hard mask technique 41
  J.-P. Mazellier, J. Delchevalerie, L. Sabaut, H. Girard, S. Saada
  Thales Research and Technology, France; Thales Electron Devices, France; CEA-LIST LCD, France
- 11:20 MD1.C2 (15+5 min): Self-aligned double patterning for vacuum electronic device fabrication 43
  A. T. Koch, A. R. Lingley, M. N. Mankin, T. S. Pan
  Modern Electron, USA
- 11:40 MD1.C3 (15+5 min): Electron emission properties of graphene-oxide-semiconductor planar-type electron emission devices 45
  AIST, Japan; University of Tsukuba, Japan; NIMS, Japan

12:00-16:30 Lunch and tour 2

16:30-17:30 Free time

17:30-18:00 Group photo

18:00-21:00 Banquet
08:00-08:30 Breakfast and registration

08:30-10:25 Materials and devices 2: microscopy
- 08:30 Plenary MD2.P1 (35+10 min): With new electron optical concepts towards the most advanced electron microscopes  N/A
  M. Haider
  CEOS GmbH, Germany; Karlsruhe Institute of Technology, Germany
- 09:15 Invited MD2.I1 (20+10 min): Using ultra-bright electron sources to analyze matter atom-by-atom  N/A
  O. L. Krivanek, N. J. Bacon, N. Delfby, T. C. Lovejoy
  Nion Co., USA; Arizona State University, USA
- 09:45 MD2.C1 (15+5 min): Development of small sized FE-SEM equipped with a carbon nanotube field emitter  47
  Y. Saito, S. Oishi, S. Yamazaki, H. Nakahara, H. Murata, T. Ohno
  Nagoya University, Japan; Meijo University, Japan; Technex Lab Co., Japan
- 10:05 MD2.C2 (15+5 min): Field emission microscopy study of freestanding carbon nanotube array  49
  Y. Sun, Y. Li, J. T.W. Yeow
  University of Waterloo, Canada

10:25-10:40 Coffee break

10:40-12:20 Materials and devices 3: microscopy
- 10:40 Invited MD3.I1 (20+10 min): The current state-of-the-art in electron imaging and spectroscopy of materials  N/A
  Cornell University, USA
- 11:10 Invited MD3.I2 (20+10 min): Quantum electron microscopy  N/A
  K. K. Berggren, N. Abedzadeh, A. Agarwal, C.-S. Kim, R. Hobbs, P. Kruit, Y. Yang
  Massachusetts Institute of Technology, USA; Delft University of Technology, Netherlands
- 11:40 MD3.C1 (15+5 min): Electron emission microscopy of scandate cathode emission sites  51
  I. Brodie, B. Vancil
  E beam, Inc., USA
- 12:00 MD3.C2 (15+5 min): Low energy electron microscopy study of directionally solidified LaB$_6$–(Zr, V)B$_2$ eutectics  53
  University of Dayton, USA; Air Force Research Laboratory, USA; Commissariat à l’Energie Atomique, France; Université de ParisSud/Orsay, France; Ecole des Mines de Paris, France; Ohio University, USA; Lawrence Berkeley National Laboratory, USA; NASA Glenn Research Center, USA

12:20-14:00 Rapid fire posters overview, lunch and poster session 3

14:00-15:20 Field-emission 5: properties and applications
- 14:00 FE5.C1 (15+5 min): Developing field emission electron sources based on ultrananocrystalline diamond for accelerators  55
  S. V. Baryshev, C. Jing, J. Qiu, S. Antipov, V. Jabotinski, J. Shao, W. Gai, A. V. Sumant
  Euclid TechLabs LLC, USA; Argonne National Laboratory, USA
- 14:20 FE5.C2 (15+5 min): Intrinsic emittance and coherence of double-gate field emitter arrays  57
  S. Tsujino, P. Das Kanungo, C. Lee, T. Yamada, G. Kassier, R. J. D. Miller
  Paul Scherrer Institute, Switzerland; National Institute of Advanced Industrial Science and Technology, Japan; Max Planck Institute for the structure and Dynamics of Matter, Germany
- 14:40 FE5.C3 (15+5 min): A high-performance carbon nanotube-based field emission x-ray tube for commercial dental imaging  59
  ETRI, Korea; UST, Korea
- 15:00 FE5.C4 (15+5 min): Extraction of the characteristics of limiting elements from field emission measurement data  61
  M. Bachmann, F. Danus, F. Därsberg, M. Hofmann, A. Pabke, C. Langer, R. Lawrovski, C. Prommesberger, R. Schreiner
  Ketek GmbH, Germany; OTH Regensburg, Germany

15:20-15:40 Coffee break

15:40-17:00 Field-emission 6: novel nanoscale emitters
- 15:40 FE6.C1 (15+5 min): Spin polarization of electrons field-emitted from Cr thin film deposited on W<001> tips  63
  S. Nagai, N. Sakai, K. Miyazaki, H. Toyama, T. Iwata, K. Kajiwara, K. Hata
  Mie University, Japan
- 16:00 FE6.C2 (15+5 min): An electron source possessing spatial and temporal coherence: A niobium nanoemitter  65
  Academia Sinica, Taiwan
- 16:20 FE6.C3 (15+5 min): Field emission from three-dimensional epitaxial grown GaN-microrods  67
  R. Lawrovski, C. Langer, C. Prommesberger, R. Schreiner
  OTH Regensburg, Germany
- 16:40 FE6.C4 (15+5 min): In-situ study of surface work function, electrical characteristic and field emission property of individual ZnO nanowire  69
  Y. Chen, X. Song, Z. Li, J. She, S. Deng, N. Xu, J. Chen
  Sun Yat-sen University, China
POSTER SESSION 1

P1.1. High current density MEMS deuterium ionizers  
M. Araghchini, S. A. Guerrera, A. I. Akinwande  
Massachusetts Institute of Technology, USA

P1.2. Secondary electron emission from novel gate in x-ray tube  
L. Yuan, Z. Zhuoya, L. Wei, Z. Xiaobing, C. Shengcheng, Y. Hua  
Southeast University, China

P1.3. X-ray phase contrast imaging using a micro-focused electron source  
C. Shengcheng, Z. Zhuoya, L. Wei, Z. Xiaobing, L. Yuan, Y. Hua  
Southeast University, China

P1.4. Field emission characteristics of carbon nanotube cold cathode by driving millisecond width pulse voltage  
Y. Tan, W. Zhu, Y. Zhang, J. Chen, N. Xu, S. Deng  
Sun Yat-sen University, China

P1.5. Carrier concentration-dependence of cooling of field emission from n-type semiconductor cathodes  
M. S. Chung, J. Y. Choi, N. M. Miskovsky, P. H. Cutler  
University of Ulsan, Korea; Pennsylvania State University, USA

P1.6. Tip-geometry enhanced cooling of field emission from semiconductor cathodes  
J. Y. Choi, B.-G. Yoon, M. S. Chung  
University of Ulsan, Korea

P1.7. Carbon nanotube fiber array field emission cathodes  
S. B. Fairchild, D. Marincel, T. C. Back  
Air Force Research Laboratory, USA; Rice University, USA; University of Dayton, USA

R. G. Forbes  
University of Surrey, UK

P1.9. Comparisons between apex-radius values extracted from Fowler-Nordheim plots and from SEM measurements, for carbon-based field emitters  
R. G. Forbes, A. A. Al-Qudah, S. Alnawasreh, M. A. Madanat, M. S. Mousa  
University of Surrey, UK; Mu'tah University, Jordan

P1.10. Notes on the format of Fowler-Nordheim-type equations  
R. G. Forbes  
University of Surrey, UK

P1.11. On the physical electrostatics of finite field emitter arrays  
R. G. Forbes  
University of Surrey, UK

P1.12. Testing Fowler-Nordheim-type equations  
R. G. Forbes, J. H.B Deane  
University of Surrey, UK

P1.13. Electrical properties of CsSb photocathode emitters in panel device applications  
H.-S. Jeong, K. Keller, B. Culkin  
University of Suwon, Korea; Photegra Corporation, USA

P1.14. Fabrication of flat-panel lighting devices utilizing cesium antimonide photocathodes as flat electron emitters  
H.-S. Jeong, K. Keller, B. Culkin  
University of Suwon, Korea; Photegra Corporation, USA

P1.15. Fabrication of microplasma devices utilizing various diamond films and CNT/diamond heterostructured films as cathodes  
D. Manoharan, I-N. Lin, Loganathan  
Tamkang University, Taiwan; National Tsing Hua University, Taiwan
P1.16. Development of CdTe based photoconductive target for radiation tolerant compact image sensors  
T. Masuzawa, Y. Neo, H. Mimura, T. Okamoto, M. Nagao, Y. Gotoh, M. Akiyoshi, N. Sato, I. Takagi  
Shizuoka University, Japan; National Institute of Technology, Japan; National Institute of Advanced Industrial Science and Technology, Japan; Kyoto University, Japan; Osaka Prefecture University, Japan

P1.17. Permeation of electron beam through graphene  
T. Masuzawa, Y. Neo, H. Mimura, T. Yamada  
Shizuoka University, Japan; National Institute of Advanced Industrial Science and Technology, Japan

P1.18. Cascade luminescence as a way to increase the energy efficiency of cathodoluminophores  
D. I. Ozol  
Moscow Institute of Physics and Technology, Russia

P1.19. Preliminary study of cathode ray tube phosphores on the basis of nanocrystal quantum dots  
D. I. Ozol  
Moscow Institute of Physics and Technology, Russia

P1.20. Cold field emission from a low-dimensional paraboloidal tip  
A. A. Patterson, A. I. Akinwande  
Massachusetts Institute of Technology, USA

P1.21. New phenomenological model of the so-called “low voltage” field emission  
V. E. Ptitsin  
Russian Academy of Sciences, Russia

P1.22. Physical and numerical modeling of the stand-alone nanoscale electrical energy generator operating on the bases of abnormal thermal field emission phenomenon at room temperature  
V. E. Ptitsin  
Russian Academy of Sciences, Russia

P1.23. Resonant tunneling behavior in ion-enhanced field and thermo-field emission  
X. Tan, N. Griggs, P. Rumbach, D. B. Go, K. L. Jensen  
University of Notre Dame, USA; Naval Research Laboratory, USA

P1.24. The role of carbon nanotube forest density in thermionic emission  
K. Voon, K. Dridi, M. Chowdhury, M. Chang, A. Nojeh  
University of British Columbia, Canada

P1.25. Theoretical and experimental study of characteristics of the planar tetrode with field emission of diamond-like carbon film  
N.P. Aban’shin, A.P. Loginov, D.S. Mosiyash, A.N. Yakunin  
Volg-Svet Co. Ltd., Russia; Russian Academy of Sciences, Russia

P1.26. Theoretical research on an 8mm traveling wave tube based on carbon nanotube cold cathode  
Z. Yuan, X. Yuan, S. Guo, Y. Yan, Y. Zhang, S. Deng  
University of Electronic Science and Technology of China, China; Sun Yat-Sen University, China

P1.27. Enhancement of interfacial adhesion between carbon nanotube thin film and substrate using a gold-nickel buffer layer  
Q. Liang, Y. Zhang, Y. Ke, J. Chen, N. Xu, S. Deng  
Sun Yat-Sen University, China

P1.28. Field emission from graphene sheets grown by RF-PECVD method  
N. Zhao, J. Chen, K. Qu, Z. Zhao, W. Lei, X. Zhang  
Southeast University, China; Nanjing University of Posts and Telecommunications, China

xvii
POSTER SESSION 2

P2.1. Fabrication of single-atom electron sources by use of surface diffusion method 107
H. Asai, S. Kumagai, H. Murata, E. Rokuta, C. Oshima
Meijo University, Japan; Waseda University, Japan

P2.2. Emission from in-situ Ba-coated nanocrystalline graphite/CNT emitters 109
R. Gorski, B. Rozansky, H. Busta
Prairie Prototypes, USA

P2.3. Progress in the development of a multiscale model of the field emission properties of carbon nanotube fibers 111
University of Cincinnati, USA; University of Surrey, UK; Air Force Research Laboratory, USA; University of Dayton, USA

P2.4. Carbon nanotube thermionic emitter for a compact SEM gun N/A
M. Chang, K. Dridi, A. Nojeh, R. F. Pease
University of British Columbia, Canada; Stanford University, USA

P2.5. Gated p-Si field emission cathode applied in an ionization vacuum gauge 113
C. Langer, C. Prommesberger, R. Lawrowski, R. Schreiner, Y. Huang, J. She
OTH Regensburg, Germany; Sun Yat-sen University, China

P2.6. A 2D/3D image charge for modeling field emission N/A
K. L. Jensen, D. A. Shiffler, J. R. Harris, I. M. Rittersdorf, J. J. Petillo
Naval Research Laboratory, USA; Air Force Research Laboratory, USA; Leidos, USA

P2.7. Development of a complete computational method to calculate electron emission currents from sharp dynamically evolving metal tips N/A
A. Kyritsakis, K. Eimre, V. Zadin, V. Jansson, F. Djurabekova
University of Helsinki, Finland; University of Tartu, Estonia

P2.8. Atomistic modeling of metal surfaces under high electric fields: direct coupling of electric fields to the atomistic simulations 115
M. Veske, A. Kyritsakis, F. Djurabekova, R. Aare, K. Eimre, V. Zadin
University of Helsinki, Finland; University of Tartu, Estonia

P2.9. Co-doped ZnO thin films prepared by nanocluster-beam deposition: synthesis at various flow rate of helium gas and annealing at different temperature N/A
X. Li, Z. Zhao
Southeast University, China

P2.10. The physical principle of spin-polarized field emission 117
S.-D. Liang
Sun Yat-sen University, China

P2.11. Fabrication of single-crystalline SmB$_6$ nanocone arrays and investigation of their field emission properties 119
X. Yang, H. Gan, L. Peng, Y. Tian, J. Chen, S. Deng, N. Xu, F. Liu
Sun Yat-sen University, China

P2.12. Field emission behaviors of B/LaB$_6$ hierarchical heterojunction nanostructures 121
Sun Yat-sen University, China

P2.13. High density current electron emission from graphene 123
H. Zhai, J. Liu, C. Le, B. Zeng
University of Electronic Science and Technology of China, China

P2.14. Thermionic emission from carbon nanotubes N/A
P. Liu, Y. Wei, L. Liu, K. Jiang, S. Fan
Tsinghua University, China

P2.15. Coulomb blockade modulated current-voltage characteristic of a diamond field emitter 125
S. Mingels, V. Porshyn, D. Lützenkirchen-Hecht, G. Müller, V. I. Kleshch, A. N. Obraztsov
University of Wuppertal, Germany; Moscow State University, Russia; University of Eastern Finland, Finland
POSTER SESSION 2 (continued)

P2.16. Atomistic study of field emission current from graphene nano-ribbon and effect of strain on field emission current  
M. Behrooz, M. Monshipouri, Y. Abdi  
University of Tehran, Iran

P2.17. First principle method for studying field emission current of carbon nanotubes  
M. Monshipouri, M. Behrooz, Y. Abdi  
University of Tehran, Iran

P2.18. Influence of light on field emission from carbon nanotube forests in presence of silver nanoparticles  
M. Monshipouri, Y. Abdi, S. Darbari  
University of Tehran, Iran; University of Tarbiat Modares, Iran

P2.19. Work function measurement of Hf-oxide/W(100) surface by using of photoemission electron microscope  
H. Nakane, T. Kawakubo  
Muroran Institute of Technology, Japan; Kagawa National College of Technology, Japan

P2.20. A field emission nano-focus x-ray source with effective electron beam focusing module  
ETRI, Korea; UST, Korea

P2.21. CNT paste emitters with minimal damage during high temperature vacuum brazing fabricated using fillers having low catalytic activities  
S. Park, O. Floweri, N. Lee  
Sejong University, Korea

P2.22. Current-voltage characteristic hysteresis dependence on power supply regime for large area field emitters  
A.F. Ioffe Physico-Technical Institute, Russia; St.-Petersburg State Polytechnical University, Russia; The Bonch-Bruevich SPb State University of Telecommunications, Russia; OCSiAl Company, Russia; Kutateladze Institute of Thermophysics, Russia

P2.23. Extracting formal emission area by on-line processing of current-voltage data, using FN-type equations for the Schottky-Nordheim barrier  
A.F. Ioffe Physico-Technical Institute, Russia; Peter the Great St.-Petersburg Polytechnical University, Russia; The Bonch-Bruevich SPb State University of Telecommunications, Russia; University of Surrey, UK

P2.24. The technique of online analysis of the current-voltage characteristics of nanocomposite field emitters using the SK-charts  
A. G. Kolosko, E. O. Popov, S. V. Filippov, I. U. Smirnov, Y. Gotoh  
A.F. Ioffe Physico-Technical Institute, Russia; The Bonch-Bruevich SPb State University of Telecommunications, Russia; Peter the Great St.-Petersburg Polytechnical University, Russia; Kyoto University, Japan

P2.25. Field emission behavior of Au-tip-coated p-type Si pillar structures  
University of Wuppertal, Germany; KETEK GmbH, Germany; OTH Regensburg, Germany

P2.26. Effect of crystallinity of graphene on its field emission character  
S. Tang, Y. Zhang, S. Deng, J. Chen, N. Xu  
Sun Yat-Sen University, China
P3.1. Modeling electron emission from polycrystalline diamonds N/A
   O. Chubenko, S. S. Baturin, S. V. Baryshev
   George Washington University, USA; Euclid TechLabs, USA

P3.2. Improving the extraction of characteristic field enhancement factors from nonlinear Fowler–Nordheim plots in orthodox cold field electron emission N/A
   T. A. de Assis
   Federal University of Bahia, Brazil

P3.3. The consequences of dependence between the formal area efficiency and the macroscopic electric field on linearity behavior in Fowler-Nordheim plots N/A
   T. A. de Assis, F. F. Dall’Agnol, R. F. S. Andrade
   Federal University of Bahia, Brazil; Federal University of Santa Catarina, Brazil

P3.4. Surface morphology and field emitter cathode quality 149
   D. Enderich, J. Booske, N. Behdad
   University of Wisconsin-Madison, USA

P3.5. Improving oxidation resistance of carbon nanotubes at high temperature using boron and phosphorus compounds 151
   O. Floweri, S. Park, N. Lee
   Sejong University, Korea

P3.6. Non-resonant emission diode on silicon cathode with diamond like coating 153
   N. M. Goncharuk, N. F. Karasukhin
   Research Institute "Orion", Ukraine

P3.7. Evaluation of current density distribution of field emitted electrons by numerical simulation in conjunction with analytical approach 155
   Y. Gotoh, H. Tsuji, M. Nagao
   Kyoto University, Japan; National Institute of Advanced Industrial Science and Technology, Japan

P3.8. Effect of microscale gas discharges on thermo-field emission current 157
   J. R. Haase, D. B. Go
   University of Notre Dame, USA

P3.9. Field emission investigation of composites of polypyrrole with graphene oxide, reduced graphene oxide and graphene nanoribbons 159
   K. Harpale, S. Bansode, M. More, D. J. Late
   University of Pune, India; CSIR-National Chemical Laboratory, India

P3.10. Spatial mapping of photoemission from plasmonic nanoparticles using electron-beam resists N/A
   Massachusetts Institute of Technology, USA; DESY, Germany; University of Hamburg, Germany

P3.11. High mobility thin-film transistors formed by metal-induced crystallization of amorphous zinc tin oxide semiconductors N/A
   S. T. Kim, N. Oh, K. J. Lee, H. J. Seul, J. K. Jeong
   Hanyang University, Korea

P3.12. Field emission properties of GNP emitters dependent on gap between anode and cathode 161
   S. H. Lee, Y. Sun, C. J. Lee, Y.-H. Song
   Korea University, Korea; ETRI, Korea

P3.13. Fabrication of ZnO nanowire field emitter arrays with self-aligned focus electrode structure 163
   Y. Liu, L. Zhao, Z. Zhang, D. Chen, G. Zhang, J. She, S. Deng, N. Xu, J. Chen
   Sun Yat-Sen University, China

P3.14. Fabrication and characterization of gated ZnO nanowire field electron emitters 165
   L. Luo, J. She, S. Deng, J. Chen, N. Xu
   Sun Yat-Sen University, China
POSTER SESSION 3 (continued)

P3.15. Determination of geometrical form factor of emitter from Schottky plot 167
Meijo University, Japan; PARAM Corporation, Japan

P3.16. Aerospace environmental stability of nanostructured transfer mold amorphous carbon field emitter arrays 169
M. Nakamoto, J. Moon
Shizuoka University, Japan

P3.17. Oxygen ratio dependent of positive bias stability and negative bias illumination stability in amorphous IGZO thin-film transistors N/A
N. On, S. T. Kim, K. J. Lee, H. Soel, J. K. Jeong
Hanyang University, Korea

P3.18. Fabrication of miniature carbon nanotube electron beam module for x-ray tube application 171
J. H. Hong, J. S. Kang, K. C. Park
Kyung Hee University, Korea

P3.19. High performance carbon nanotube electron beams with gate electrode optimization 173
J. S. Kang, K. C. Park
Kyung Hee University, Korea

P3.20. Pseudo crystalline silicon (pc-Si) thin films with carbon nanotube electron beam exposure 175
H. R. Lee, J. S. Kang, M. T. Chung, K. C. Park
Kyung Hee University, Korea

P3.21. Field emission from black silicon structures with integrated gate electrode 177
C. Prommesberger, C. Langer, R. Lawrowski, R. Schreiner
OTH Regensburg, Germany

P3.22. Soluble-processed SiO2 gate insulator fabrication via deep UV curing for amorphous oxide transistors N/A
Hanyang University, Korea; Inha University, Korea

P3.23. Single crystalline metallic molybdenum nano-pyramids: preparation and high current field emission properties 179
Y. Shen, N. Xu, Y. Zhang, J. Chen, J. She, S. Deng
Sun Yat-Sen University, China

P3.24. High emission performance of carbon nanotube paste field emitters fabricated by graphite filler 181
Y. Sun, K. N. Yun, S. H. Lee, C. J. Lee
Korea University, Korea

P3.25. Efficient fabrication of field emitters from super-aligned carbon nanotube arrays N/A
Y. Wei, P. Liu, L. Liu, K. Jiang, Q. Li, S. Fan
Tsinghua University, China

P3.26. Fabrication of amorphous IGZO thin film transistor for active-driving of ZnO nanowire field emitters 183
X. Li, X. Chen, Z. Zhang, H. Ou, J. She, S. Deng, N. Xu, J. Chen
Sun Yat-Sen University, China

P3.27. Tuning field emission properties of tungsten trioxide nanowires for flat panel x-ray source application 185
P. Xie, D. Chen, G. Zhang, Z. Zhang, F. Liu, J. She, S. Deng, N. Xu, J. Chen
Sun Yat-Sen University, China

P3.28. Modulation of the work function of graphene by Na and Cl co-adsorbed on opposite sides on graphene 187
G. Yuan, X. Song, H. Mimura
Ocean University of China, China; Shizuoka University, Japan