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MONDAY, 11 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*

TUESDAY, 12 JULY 2016

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. Serbun, 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

K. L. Jensen, J. J. Petillo, D. Panagos, S. Ovtchinnikov, N. A. Moody
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

Y. Gotoh, H. Tsuji, M. Nagao, T. Masuzawa, Y. Neo, H. Mimura, T. Okamoto, M. Akiyoshi, N. Sato, I. Takagi
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*

WEDNESDAY, 13 JULY 2016

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
  D. Manoharan, H.-T. Chang, I-N. Lin, T.-H. Chang, P.-Y. Hsieh, S. Kunuku, K.-C. Leou, C.-Y. Lee, N.-H. Tai,
  Tamkang University, Taiwan; NTHU, Taiwan
- 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. Gruen, 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

THURSDAY, 14 JULY 2016

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. Delchevalrie, 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
  K. Murakami, M. Nagao, S. Tanaka, T. Iijima, J. Fujita, Y. Nemoto, M. Takeguchi
  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*

FRIDAY, 15 JULY 2016

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. Dellby, T. C. Lovejoy
  Nion Co., USA; Arizona State University, USA
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  Nagoya University, Japan; Meijo University, Japan; Technex Lab Co., Japan
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  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
  D. J. Baek, R. Hovden, B. H. Savitzky, I. El Baggari, P. Liu, S. H. Sung, L. F. Kourkoutis
  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
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  I. Brodie, B. Vancil
  E beam, Inc., USA
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  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*

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  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, M. Monshipouri, 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
  S. Park, J.-W. Jeong, J.-W. Kim, J.-T. Kang, J.-H. Yeon, M.-S. Shin, S. Kim, E. Go, H. Jeon, Y. C. Choi, Y.-H. Song
  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. Dams, F. Düsberg, M. Hofmann, A. Pahlke, C. Langer, R. Ławrowski, 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*

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  Mie University, Japan
- 16:00 FE6.C2 (15+5 min): An electron source possessing spatial and temporal coherence: A niobium nanoemitter 65
  W.-T. Chang, J.-L. Hou, C.-C. Shih, Y.-F. Yu, T.-Y. Fu, I.-S. Hwang
  Academia Sinica, Taiwan
- 16:20 FE6.C3 (15+5 min): Field emission from three-dimensional epitaxial grown GaN-microrods 67
  R. Ławrowski, C. Langer, C. Prommesberger, R. Schreiner
  OTH Regensburg, Germany
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  Sun Yat-sen University, China

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POSTER SESSION 1 (continued)

POSTER SESSION 2

POSTER SESSION 2 (continued)

POSTER SESSION 3

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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
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Federal University of Bahia, Brazil; Federal University of Santa Catarina, Brazil

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University of Wisconsin-Madison, USA

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Sejong University, Korea

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Research Institute "Orion", Ukraine

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Kyoto University, Japan; National Institute of Advanced Industrial Science and Technology, Japan

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University of Notre Dame, USA

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University of Pune, India; CSIR-National Chemical Laboratory, India

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R. G. Hobbs, W. P. Putnam, A. Fallahi, Y. Yang, F. X. Kärtner, K. K. Berggren
Massachusetts Institute of Technology, USA; DESY, Germany; University of Hamburg, Germany

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S. T. Kim, N. On, K. J. Lee, H. J. Seul, J. K. Jeong
Hanyang University, Korea

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Korea University, Korea; ETRI, Korea

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Sun Yat-Sen University, China

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L. Luo, J. She, S. Deng, J. Chen, N. Xu
Sun Yat-Sen University, China

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