Program Schedule

Changes will be made at the discretion of the Program Chairs.
## Monday, July 10

### Tutorials

13:30 – 16:30  
Chair: Donnie Keithley, Massachusetts Institute of Technology

<table>
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<tr>
<th>Time</th>
<th>Tutorial I: TUTORIAL INTRODUCTION TO FIELD ELECTRON EMISSION SYSTEMS</th>
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</table>
| 13:00 | Richard G. Forbes  
*Surrey University, UK* |

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<tr>
<th>Time</th>
<th>Tutorial II: STRONGFIELD PHYSICS AT NEEDLES AND NANOSTRUCTURES</th>
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</table>
| 13:45 | Peter Hommelhoff  
*Friedrich-Alexander-Universität, GERMANY* |

### Refreshment Break

14:30 – 15:00

### Tutorial III: QUANTUM 2.0 WITH FREE ELECTRONS

15:00  
Ido Kaminer  
*Israel Institute of Technology, ISRAEL*

### Tutorial IV: QUANTUM SENSORS AND CLOCKS BASED ON ATOMIC VAPORS

15:45  
John Kitching  
*National Institute of Standards and Technology (NIST), USA*

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### Registration and Wine & Cheese Welcome Reception

17:00 - 19:00
Tuesday, July 11

Welcome Address
08:00 - 08:15

Conference Chair:
Luis F. Velásquez-García, Massachusetts Institute of Technology, USA

Keynote Presentation
08:15 – 09:00

08:15 THE LONG AND SHORT OF VACUUM ELECTRONICS AT DARPA
William D. Palmer and David K. Abe
Defense Advanced Research Projects Agency (DARPA), USA

Session 1 - Electron Sources I
09:00 – 10:15
Chair:

09:00 ELECTRON EMISSION FROM HFC(100) TIP AT VARIOUS TEMPERATURES
Toshiaki Kusunoki¹ and Noriaki Arai²
¹Hitachi Ltd., JAPAN and ²Hitachi High-Tech, JAPAN

09:15 AN INTEGRATED SILICON NANOWIRE FIELD EMISSION ELECTRON SOURCE ON A CHIP WITH HIGH ELECTRON TRANSMISSION
Philipp Buchner¹, Matthias Hausladen¹, Andreas Schels², Florian Herdl²,
Simon Edler³, Michael Bachmann³, and Rupert Schreiner¹
¹Ostbayerische Technische Hochschule Regensburg, GERMANY and ²Ketek GmbH, GERMANY

09:30 ELECTRON-PHOTON INTERACTIONS IN A SCANNING ELECTRON MICROSCOPE
John W. Simonaitis¹, Maurice A.R. Krielaart¹, Stewart A. Koppell¹, Benjamin J. Slayton²,
Joseph Alongi¹, William P. Putnam², Karl K. Berggren¹, and Phillip D. Keathley¹
¹Massachusetts Institute of Technology, USA and ²University of California, Davis, USA

09:45 DEVELOPMENT OF A SELF FOCUSED SPINDT CATHODE FOR MILLIMETER-WAVE TRAVELING WAVE TUBES
Christopher E. Holland¹, David R. Whaley², Paul Schwoebel³, Colby Bellew¹, and Charles A. Spindt¹
¹SRI International, USA, ²L-3Technologies (now Stellant Systems), USA, and ³University of New Mexico, USA

10:00 CHARACTERIZATION AND OPERATION OF GRAPHENE-OXIDE-SEMICONDUCTOR EMITTERS AT ATMOSPHERIC PRESSURE LEVELS
Florian Herdl¹, Maximilian J. Kueddelsmann², Andreas Schels¹, Michael Bachmann³, Simon Edler³,
Dominik Wohlfartsstätter¹, Felix Düsberg³, Alexander Prugger³, Michael Dillig³, Florian Dams³, Rupert Schreiner³,
Cormac Ó Coileáin¹, Stefan Zimmermann², Andreas Pahlke³, and Georg S. Duesberg¹
¹University of the Bundeswehr Munich, GERMANY and ²Leibniz University Hannover, GERMANY,
³KETEK GmbH, GERMANY, and ⁴Ostbayerische Technische Hochschule Regensburg, GERMANY
10:15 - 10:45 Refreshment Break

Session 2 - Fundamentals I
10:45 – 12:00

10:45 COULOMB-CORRELATED FEW-ELECTRON STATES IN A TRANSMISSION ELECTRON MICROSCOPE BEAM
Rudolf Haindl¹,², Armin Feist¹,², Till Domröse¹,², Marcel Möller¹,², John H. Gaida¹,², Sergey V. Yalunin¹,², and Claus Ropers¹,²
¹Max Planck Institute for Multidisciplinary Sciences, GERMANY and ²University of Göttingen, GERMANY

11:00 BROADBAND INFRARED HYPER SPECTROSCOPY WITH HIGH SPATIAL RESOLUTION FOR THE STUDY OF NANOSCALE THERMAL EMITTERS IN VACUUM
Mokter M. Chowdhury, Jeff F. Young, George A. Sawatzky, and Alireza Nojeh
University of British Columbia, CANADA

11:15 CIRCUIT MODEL FOR NANOSCALE OPTICAL FREQUENCY ELECTRONICS
Adina R. Bechhofer¹, Shruti Nirantar¹,², Luca Daniel¹, Karl K. Berggren¹, and Phillip D. Keathley¹
¹Massachusetts Institute of Technology, USA and ²RMIT University, AUSTRALIA

11:30 EVIDENCE FOR A FIELD-INDEPENDENT ENHANCEMENT FACTOR IN THE REAL TUNNELING POTENTIAL BARRIER OF NANOTUBE EMITTERS
Caio P. de Castro¹, Thiago A. de Assis¹,², Roberto Rivelino¹, Fernando B. Mota¹, Caio M. C. de Castilho¹, and Richard G. Forbes³
¹Federal University of Bahia, BRAZIL, ²Fluminense Federal University, BRAZIL, and ³University of Surrey, UK

11:45 NUMERICAL MODEL DEVELOPMENT FOR CARBON-BASED FIELD EMISSION ELECTRON SOURCES
Nikolay Egorov, Konstantin Nikiforov, and Marina Bedrina
Saint Petersburg State University, RUSSIA

12:00 - 13:30 Lunch on Own

Plenary Presentation I
13:30 – 14:15

13:30 COMPACT VACUUM QUANTUM DEVICES
John Kitching
National Institute of Standards and Technology (NIST), USA

Session 3 - Other Applications I
14:15 – 15:30

14:15 IMAGING USING MEMS ELECTRON MICROSCOPE
Michał Krysztof, Marcin Białaś, and Tomasz Grzebyk
Wrocław University of Science and Technology, POLAND
14:30 DEVELOPMENT OF A MICRO MERCURY TRAPPED ION CLOCK PROTOTYPE EMPLOYING A SPINDT CATHODE IONIZATION SOURCE
Christopher E. Holland¹, John D. Prestage², Thai M. Hoang², Sang K. Chung², Thanh M. Le², Sung-Jin Park¹, and Nan Yu²
¹SRI International, USA, ²Jet Propulsion Laboratory, USA, and ³Eden Park Illumination, USA

14:45 MAGNETIC FOCUSING OF AN ELECTRON BEAM FROM A POINT FIELD EMITTER
Paweł Urbański, Piotr Szyszka, and Tomasz Grzebyk
Wrocław University of Science and Technology, POLAND

15:00 MINIATURIZED SURFACE DIELECTRIC BARRIER DISCHARGE PLASMA ACTUATORS FOR APPLICATION IN CHEMICAL ANALYSIS SYSTEMS
Julian Eiler¹, Christina Högl¹, Matthias Lindner¹, Michael Bachmann², and Rupert Schreiner¹
¹Ostbayerische Technische Hochschule Regensburg, GERMANY and ²Ketek GmbH, GERMANY

15:15 A COMPACT FLAT VACUUM LIGHT SOURCE USING A WIRE CATHODE AND CATHODOLUMINESCENT PHOSPHORS
Jordan T. Ricci, Sergei Mistyuk, and Charles E. Hunt
University of California, Davis, USA

Poster Session Preview
15:30 – 16:00

Poster Session, coffee break
16:00 - 18:00

Electron Sources

P.01 A VACUUM INSULATOR NEGATIVE ELECTRON AFFINITY ELECTRON EMITTER WITH HIGH QUANTUM EFFICIENCY
Juan A. Sanchez Vazquez, Anika T. Priyoti, Ragib Alhsan, Hyun Uk Chae, and Rehan Kapadia
University of Southern California, USA

P.02 LINEAR FEMTOSECOND TUNABLE-WAVELENGTH PHOTOASSISTED COLD FIELD EMISSION
Rudolf Haindl¹, Kerim Köster¹, John H. Gaida¹, Maximilian Franz¹, Armin Feist¹, and Claus Ropers¹,²
¹Max Planck Institute for Multidisciplinary Sciences, GERMANY and ²University of Göttingen, GERMANY

P.03 MODULATED ELECTRON BEAM EMISSION UNDER RF AND LASER FIELDS
Lan Jin, Yang Zhou, and Peng Zhang
Michigan State University, USA

P.04 STUDY OF DIELECTRIC NANOLAYERS AND MULTILAYER COATED EMITTERS
Daniel Burda¹,², Mohammad M. Allaham¹,³, Miroslav Horáček¹, and Alexandr Knápek²
¹Czech Academy of Sciences, CZECH REPUBLIC, ²Brno University of Technology, CZECH REPUBLIC, and ³Central European Institute of Technology, CZECH REPUBLIC
EFFECT OF DIELECTRIC SUBSTRATE ON GOLD NANOSCALE LATERAL VACUUM EMISSION DEVICES
Jonathan O'Mara\textsuperscript{1,3}, Jonathan Ludwick\textsuperscript{2,4}, Nathaniel Hernandez\textsuperscript{5}, Dennis Walker Jr.\textsuperscript{3}, Tyson Back\textsuperscript{4}, Marc Cahay\textsuperscript{3}, and Harris Hall\textsuperscript{3}
\textsuperscript{1}KBR, USA, \textsuperscript{2}UES Inc., USA, \textsuperscript{3}AFRL Sensors Directorate, USA, \textsuperscript{4}AFRL Materials and Manufacturing Directorate, USA, and \textsuperscript{5}University of Cincinnati, USA

FLAT PANEL X-RAY SOURCE USING TUNGSTEN OXIDE NANOWIRES COLD CATHODE PREPARED BY THERMAL OXIDATION
Qi Liu, Song Kang, Zufang Lin, Guofu Zhang, Shaozhi Deng, and Jun Chen
Sun Yat-sen University, CHINA

A MONOCHROMATIC ELECTRON EMISSION FROM TWO-DIMENSIONAL LAYER-STACKED HETEROSTRUCTURE
Yiting Wu, Yu Zhang, and Shaozhi Deng
Sun Yat-sen University, CHINA

ADVANTAGES OF K-POWER PLOT FOR EXPERIMENTAL IVC PROCESSING
Sergey V. Filippov, Anatoly G. Kolosko, and Eugeni O. Popov
Ioffe Institute, RUSSIA

MINIMAL PARAMETERS TO PREDICT THE THEORETICAL EMISSION CURRENT VS. FIELD CURVES
Fernando F. Dall'Agnol\textsuperscript{1}, Thiago A. de Assis\textsuperscript{2,3}, and Sergey V. Filippov\textsuperscript{4}
\textsuperscript{1}Federal University of Santa Catarina, BRAZIL, \textsuperscript{2}Universidade Federal da Bahia, BRAZIL, \textsuperscript{3}Universidade Federal Fluminense, BRAZIL, and \textsuperscript{4}Ioffe Institute, RUSSIA

SPACE CHARGE AND RESISTANCE EFFECTS ON SATURATION OF FIELD EMISSION
Guo-Ning Wang\textsuperscript{1}, Kaviya Aranganadin\textsuperscript{1}, Yung-Chiang Lan\textsuperscript{2}, Hua-Yi Hsu\textsuperscript{3}, John P. Verboncoeur\textsuperscript{4}, and Ming-Chieh Lin\textsuperscript{1}
\textsuperscript{1}Hanyang University, KOREA, \textsuperscript{2}National Cheng Kung University, TAIWAN, \textsuperscript{3}National Taipei University of Technology, TAIWAN, and \textsuperscript{4}Michigan State University, USA

UNDERSTANDING THE FAILURE MECHANISMS OF SILICON GATED FIELD EMITTERS
Rushmita Bhattacharjee\textsuperscript{1}, Ranajoy Bhattacharya\textsuperscript{1}, Stephen A. Guerrera\textsuperscript{2}, Nedeljko Karaulac\textsuperscript{2}, Girish Rughoobur\textsuperscript{2}, Winston Chen\textsuperscript{2}, Akintunde I. Akinwande\textsuperscript{2}, and Jim Browning\textsuperscript{1}
\textsuperscript{1}Boise State University, USA and \textsuperscript{2}Massachusetts Institute of Technology, USA

UNIFORM DISTRIBUTION OF INDIVIDUAL CURRENT IN CLUSTER OF EMITTERS
Sergey V. Filippov\textsuperscript{1}, Fernando F. Dall'Agnol\textsuperscript{2}, Thiago A. de Assis\textsuperscript{3,4}, Anatoly G. Kolosko\textsuperscript{1}, and Eugene O. Popov\textsuperscript{1}
\textsuperscript{1}Ioffe Institute, RUSSIA, \textsuperscript{2}Federal University of Santa Catarina, BRAZIL, \textsuperscript{3}Universidade Federal da Bahia, BRAZIL, and \textsuperscript{4}Universidade Federal Fluminense, BRAZIL
Other Applications

P.15  ADVANCED RADIATION SOURCE BASED ON FIELD EMISSION ELECTRON GUN WITH CARBON NANOTUBES
Hanna Lee¹, Jinho Choi¹, Amar Prasad Gupta², Jaekyu Jang³, Kyung-Sik Yoon¹, and Jehwang Ryu¹
¹Kyung Hee University, KOREA and ²CAT Beam Tech Co., Ltd., KOREA

P.16  AN AIR STABLE, ELECTRONICALLY TUNABLE NEGATIVE ELECTRON AFFINITY SILICON PHOTOCATHODE
Anika Tabassum Priyoti, Ragib Ahsan, Hyun Uk Chae, Juan Sanchez Vazquez, and Subrata Das
University of Southern California, Los Angeles, USA

P.17  FABRICATION OF DOUBLE-GATE ZNO NANOWIRE FIELD EMITTER ARRAYS
Zhuoran Ou, Chengyun Wang, Guofu Zhang, Xinran Li, Hai Ou, Juncong She, Shaozhi Deng, and Jun Chen
Sun Yat-sen University, CHINA

P.18  PHOTO ASSISTED PLANAR FIELD EMISSION FROM MONOLAYER TUNGSTEN DISULFIDE
Yan Tian, Xiangjun Zeng, Juncong She, Jun Chen, Shaozhi Deng, and Fei Liu
Sun Yat-sen University, CHINA

P.19  QUALITATIVE MODELING OF AN ELECTRON OR FINITE-CHORD SLENDER BODY TRANSITING A VACUUM WITH DRAG
Jonathan M. Protz
Independent Consultant, USA

P.20  STUDY OF ANODE TEMPERATURE OF COLD CATHODE FLAT PANEL X-RAY SOURCE
Ruowen Fan, Yicong Chen, Song Kang, Guofu Zhang, Juncong She, Shaozhi Deng, and Jun Chen
Sun Yat-sen University, CHINA

P.21  X-RAY RADIATION EFFICIENCY OF COLD CATHODE FLAT-PANEL X-RAY SOURCE
Song Kang¹, Mengke Qi², Guofu Zhang¹, Yuan Xu³, Shaozhi Deng¹, and Jun Chen¹
¹Sun Yat-sen University, CHINA and ²Southern Medical University, CHINA

18:00  End of Day
# Wednesday, July 12

## Announcements

08:00 - 08:10

Conference Chair:
Luis F. Velásquez-García, *Massachusetts Institute of Technology, USA*

## Plenary Speaker II

08:10 – 08:50

**LOW-TEMPERATURE PLASMAS FOR PERSONALIZED HEALTHCARE AND EFFICIENT SPACE PROPULSION**

Michael Keidar
*George Washington University, USA*

## Session 4 - Other Applications II

08:50 – 10:05

08:50 **DEVELOPMENT OF CNT CATHODES FOR SPACE APPLICATIONS**

Georg Hentsch and Martin Tajmar
*Technische Universität Dresden, GERMANY*

09:05 **FULLY 3D-PRINTED, MINIATURE LANGMIUR MULTI-PROBE SENSOR FOR CUBESAT IONOSPHERIC PLASMA DIAGNOSTICS**

Zoey Bigelow and Luis Fernando Velásquez-García
*Massachusetts Institute of Technology, USA*

09:20 **MINIATURE, 3-D PRINTED RF QUADRUPOLE MASS FILTERS FOR CUBESATS**

Alejandro Diaz and Luis Fernando Velásquez-García
*Massachusetts Institute of Technology, USA*

09:35 **3-D PRINTED, COMPACT, TIME-OF-FLIGHT REFLECTRON MASS FILTERS**

Nicholas Lubinsky and Luis Velásquez-García
*Massachusetts Institute of Technology, USA*

09:50 **THE VIABILITY OF NANOCLUSTER CARBON-BASED FIELD EMITTER ARRAYS FOR THE FIELD EMISSION ELECTRICAL PROPULSION SYSTEM**

Nirupama Malavalli Prasad¹, Omvir Singh Panwar¹, and Bukinakere S Satyanarayana²

¹BML Munjal University, INDIA and ²GD Goenka University, INDIA

10:05 - 10:25 Refreshment Break

## Session 5 - Fabrication Technologies I

10:25 – 11:40

10:25 **AN INTEGRATED FIELD EMISSION ELECTRON SOURCE ON A CHIP FABRICATED BY LASER-MICROMACHINING AND MEMS TECHNOLOGY**

Matthias Hausladen¹, Philipp Buchner¹, Andreas Schels², Simon Edler¹, Michael Bachmann³, and Rupert Schreiner¹

¹Ostbayerische Technische Hochschule Regensburg, GERMANY, ²University of the Bundeswehr, Munich, GERMANY, and ³KETEK GmbH, GERMANY
### Session 6 - Electron Sources II

**10:40**
**EXPLORING THE FIELD EMISSION CAPABILITIES OF ALGAN/GAN NANOSCALE VACUUM DIODES**
Nathaniel Hernandez¹, Marc Cahay¹, Jonathan O’Mara²,³, Jonathan Ludwick²,⁴
Dennis E. Walker Jr.², Tyson Back², and Harris Hall²

¹University of Cincinnati, USA, ²Air Force Research Laboratory, USA, ³KBR, USA, and ⁴UES, USA

**10:55**
**IN-SITU DIRECT OBSERVATION OF CARBON NANOTUBE SYNTHESIS UNDER ELECTRIC FIELD AND THEIR FIELD EMISSION PERFORMANCE**
Pascal Vincent¹, Federico Panciera², Ileana Florea³, Costel Cojocaru³, Sorin Perisanu¹, Anthony Ayari¹, Julien Chaste², Pierre Legagneux⁴, and Stephen T. Purcell¹

¹Université Claude Bernard Lyon ¹, CNRS, FRANCE, ²University of Paris-Saclay, CNRS, FRANCE, ³Ecole Polytechnique, FRANCE, and ⁴Thales Research and Technology, FRANCE

**11:10**
**ENHANCEMENT OF FIELD EMISSION PROPERTIES OF CARBON NANOTUBE FORESTS BY DIRECT GROWTH ON TITANIUM NITRIDE-COATED SUBSTRATES**
Stefanie Haugg, Carina Hedrich, Luis-Felipe Mochalski, Isabel González Díaz-Palacio, Robert Zierold, and Robert H. Blick

Universität Hamburg, GERMANY

**11:25**
**FIELD EMISSION PROPERTIES OF HIGHLY CONDUCTIVE DIAMOND-LIKE CARBON LAYERS**
Georg Hentsch¹, Martin Tajmar¹, and Volker Weihnacht²

¹Technische Universität Dresden, GERMANY and ²Fraunhofer Institute for Material and Beam Technology (IWS), GERMANY

**11:40 - 13:00**
Lunch on Own

### Session 6 - Electron Sources II

**13:00**
**3D-PRINTED, NON-PLANAR ELECTRON SOURCES FOR NEXT-GENERATION ELECTRON PROJECTION LITHOGRAPHY**
Alex Kachkine, Crystal E. Owens, A. John Hart, and Luis F. Velásquez-García

Massachusetts Institute of Technology, USA

**13:15**
**APPLICATIONS IN MICROSCOPY AND LITHOGRAPHY FOR A HERALDED ELECTRON SOURCE**
Stewart A. Koppell¹, John W. Simonaitis¹, Maurice A.R. Krielaart¹, Omer E. Ates², William P. Putnam², Karl K. Berggren¹, and Phillip D. Keathley¹

¹Massachusetts Institute of Technology, USA and ²University of California, Davis, USA

**13:30**
**EFFECT OF O₂ EXPOSURE ON SILICON FIELD EMITTER ARRAYS**
Reza Farsad Asadi¹, Tao Zheng¹, Girish Rughoobur², Ranajoy Bhattacharya³, Jim Browning³, Akintunde I. Akinwande², and Bruce Gnade⁴

¹Southern Methodist University, USA, ²Massachusetts Institute of Technology, USA, ³Boise State University, USA, and ⁴University of Texas at Dallas, USA

**13:45**
**FOCUSING ELECTRODE ON FOCAL SPOT SIZE AND DOSE BY CARBON NANOTUBE BASED COLD CATHODE ELECTRON BEAM (C-BEAM)**
Yi Yin Yu and Kyu Chang Park

Kyung Hee University, KOREA

**14:00**
**ELECTRON EMISSION-DRIVEN GAS-LIQUID PLASMA: SEED STERILIZATION AND SURFACE MODIFICATION**
Siwapon Srisophonph, Naowarat Tephiruk, and Khomsan Ruangwong

Kasetsart University, THAILAND
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<td>Refreshment Break</td>
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<td>14:45</td>
<td>Plenary Speaker III</td>
<td>14:45 – 15:30</td>
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<td>14:45</td>
<td>QUANTUM NATURE OF ELECTRON-LIGHT AND ELECTRON-MATTER</td>
<td>Ron Ruimy and Ido Kaminer</td>
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<td>INTERACTIONS</td>
<td><em>Technion - Israel Institute of Technology, ISRAEL</em></td>
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<td>15:30</td>
<td>Session 7 - Fundamentals II</td>
<td>15:30 – 16:45</td>
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<td>15:30</td>
<td>A DELTA BARRIER IN A WELL AND ITS GENERALIZATION FOR</td>
<td>Kevin Jensen¹, Jeane Riga², Andrew Shabaev³, Michael Osofsky⁴,</td>
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<td>EMISSION STUDIES</td>
<td>Joseph Prestigiaacomo³, and John J. Petillo¹</td>
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<td>*¹Leidos, USA and ²Air Force Research Laboratory, USA, ³Naval Research</td>
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<td><em>Laboratory, USA, and ⁴Towson University, USA</em></td>
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<td>15:45</td>
<td>EFFECTS OF DC BIAS ON QUANTUM PATHWAYS INTERFERENCE</td>
<td>Yang Zhou and Peng Zhang</td>
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<td>IN TWO-COLOR LASER INDUCED PHOTOEMISSION</td>
<td><em>Michigan State University, USA</em></td>
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<td>16:00</td>
<td>OXIDE ELECTRON EMITTERS: THERMIonic EMISSION FROM</td>
<td>Mike Chang, George A. Sawatzky, and Alireza Nojeh</td>
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<td>YTTRIUM OXIDE</td>
<td><em>University of British Columbia, CANADA</em></td>
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<td>16:15</td>
<td>PROGRESS ON THE JOURNEY TO PUT FIELD ELECTRON</td>
<td>Richard G. Forbes¹, Sergey V. Filippov², Anatoly G. Kolosko², and</td>
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<td>EMISSION ONTO A BETTER SCIENTIFIC BASIS</td>
<td>Eugeni O. Popov²</td>
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<td><em>¹University of Surrey, UK and ²Ioffe Institute, RUSSIA</em></td>
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<td>16:30</td>
<td>OVERVIEW OF ELECTRON EMISSION LAWS FROM 2D MATERIALS</td>
<td>Lay Kee Ang, Yee Sin Ang, Yi Luo, and Bee Hong Tiang</td>
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<td><em>Singapore University of Technology and Design, SINGAPORE</em></td>
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<td>16:45</td>
<td>End of Day</td>
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<td>17:30</td>
<td>Excursion – Duck Tour</td>
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Thursday, July 13

Announcements
08:00 - 08:05

Conference Chair:
Luis F. Velásquez-García, Massachusetts Institute of Technology, USA

Plenary Speaker IV
08:05 – 08:50

08:05
MINIATURE MASS SPECTROMETERS FOR ON-SITE CHEMICAL ANALYSIS
Zheng Ouyang
Tsinghua University, CHINA

Session 8 - Electron Sources III
08:50 – 10:05

08:50
ELECTRON BEAM INDUCED GROWTH OF CARBON NANOTIPS ON TUNGSTEN AND SILICON FIELDEMITTERS
Fabian Hecht, Florian Bauereiß, Josef Sellmair, Philipp Buchner, Matthias Hausladen, and Rupert Schreiner
Ostbayerische Technische Hochschule Regensburg, GERMANY

09:05
A LAB6 NANONEEDLE FIELD-EMISSION ELECTRON SOURCE FOR STABLE IMAGING WITH ATOMIC RESOLUTION IN A TRANSMISSION ELECTRON MICROSCOPE
Shuai Tang1,2, Jie Tang2, Eiji Okunishi3, Jun Uzuhashi3, Tadakatsu Oikubo3, Masaki Takeguchi2, and Lu-Chang Qin4
1Sun Yat-sen University, CHINA, 2National Institute for Materials Science, JAPAN, 3JEOL Ltd., JAPAN, and 4University of North Carolina, Chapel Hill, USA

09:20
IMPROVEMENT OF ELECTRON EMISSION PROPERTIES OF VOLCANO-STRUCTURED SILICON EMITTERS BY TITANIUM NITRIDE COATING
Hiromasa Murata, Katsuhisa Murakami, and Masayoshi Nagao
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

09:35
STUDY ON OPTIMAZATION OF CARBON NANOTUBE NANO-COLD CATHODE ARRAY FOR AN ELECTRON BEAM PUMPING ULTRAVIOLET LIGHT EMITTING DEVICE
Lei Luo, Yan Shen, Dong Han, Xiaoyu Qin, Junzhong Liang, Baohong Li, Yu Zhang, and Shaozhi Deng
Sun Yat-sen University, CHINA

09:50
ELECTRON EMISSION CHARACTERISTICS OF FIELD EMITTER ARRAYS COATED WITH OVER-STOICHIOMETRIC HAFNIUM NITRIDE
Tomoaki Osumi1,2, Ryosuke Horii1, Masayoshi Nagao1, Hiromasa Murata2, and Yasuhito Gotoh1
1Kyoto University, JAPAN and
2National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

10:05 - 10:25
Refreshment Break
Session 9 - Fundamentals III
10:25 – 11:40

10:25  ADJOINT OPTIMIZATION OF NANOSCALE VACUUM-CHANNEL TRANSISTOR (NVCT) GEOMETRY
Luke C. Adams¹, Gregory R. Werner¹, and John R. Cary¹,²
¹University of Colorado, Boulder, USA and ²Tech-X Corp, USA

10:40  FURTHER STUDIES ON USING THE AHFP EXPONENT TO CHOOSE BETWEEN ALTERNATIVE FIELD EMISSION THEORIES
Sergey V. Filippov¹, Richard G. Forbes², Eugeni O. Popov¹, Anatoly G. Kolosko¹, and Fernando F. Dall’Agnol³
¹Ioffe Institute, RUSSIA, ²University of Surrey, UK, and ³Federal University of Santa Catarina, BRAZIL

10:55  STUDY OF SILICON FIELD EMITTERS USING MONTE CARLO METHOD
Ze Niu, Mike Zhu, and Enrico Bellotti
Boston University, USA

11:10  AN ONLINE TOOL FOR THERMAL-FIELD EMISSION CALCULATIONS FROM METAL AND SEMICONDUCTING EMITTERS
Mikael Rinne¹, Salvador Barranco Cárceles², Veronika Zadin¹, Aquila Mavalankar³, Ian Underwood², and Andreas Kyritsakis¹
¹University of Tartu, ESTONIA, ²University of Edinburgh, SCOTLAND, and ³Adaptix Imaging Ltd., UK

11:25  MICRON-SCALE ELECTROSTATIC CHARGED-PARTICLE GUIDES: ANALYSIS AND SIMULATION
Benjamin J. Slayton, Ryan S. Kim, and William P. Putnam
University of California, Davis, USA

11:40 - 12:40  Lunch on Own

Plenary Presentation V
12:40 – 13:25

12:40  A MODULAR, PORTABLE AND STATIC COMPUTED TOMOGRAPHY SYSTEM FOR RESOURCE-CONSTRAINED ENVIRONMENT
Jake Hecla¹, Dufan Wu²,³, Avilash Cramer³, Tim Moulton¹, Amar Prasad Gupta⁴, Kai Yang³, Wolfgang Krull³, and Rajiv Gupta²,³
¹University of California, Berkeley, USA, ²Harvard Medical School, USA, ³Massachusetts General Hospital, USA, and ⁴Kyung Hee University, KOREA

Session 10 - Other Applications III
13:25 – 14:40

13:25  APPLICATION OF A NOVEL ADDRESSABLE-ARRAY X-RAY SOURCE TO MEDICAL IMAGING OF EXTREMITIES
D. Keith Bowen, James D. Cameron, Conrad Dirckx, Paul Edwards, Manuel Fohler, Isabel A. Gomes, Aquila M. Mavalankar, Sian Phillips, Kate L. Renforth, Steven P. Richards, Vadim Y. Soloviev, Silvia Sottini, Alexis Tello Valero, Nivedita Yumnam, and Stephen G. Wells
Adaptix Ltd, UK
13:40    MEMS QUADRUPOLE MASS SPECTROMETER
Piotr Szyszka, Jakub Jendryka, Jan Sobków, Michał Zychla, Marcin Bialas, Pawel Knapkiewicz, Jan Dziuban, and Tomasz Grzebyk
Wrocław University of Science and Technology, POLAND

13:55    REVOLUTIONIZING X-RAY IMAGING: SPINDT FIELD EMITTER TUBE WITH CHROMATIC SCAN CAPABILITY ACROSS WIDE VOLTAGE RANGE (30-160KV)
Ukyo Jeong, Ghiyuun Kang, Seungho Lee, Sanghyun Yoon, Jaehyun Ahn, Jaeil Lee, and Ilung Kim
Nano-X imaging Ltd, KOREA

14:10    DESIGN AND CHARACTERIZATION OF A MEDICAL MULTI-BEAM SYSTEM WITH DIRECTLY GROWN CNT FIELD EMISSION EMITTERS
Jinho Choi¹, Hanna Lee¹, Junho Yu¹, Amar Prasad Gupta¹,², Mrinal Bhusal Sharma², Jaekyu Jang², Jaeik Jung², Won Jung Lee¹, Seung Jun Yeo², Seung Hoon Kim³, Moonkyoo Kong⁴, and Jehwang Ryu¹
¹Kyung Hee University, KOREA, ²CAT Beam Tech Co., Ltd., KOREA, ³University of Ulsan College of Medicine, KOREA, and ⁴Kyung Hee University Medical Center, KOREA

14:25    MINIATURE, MONOLITHIC, FULLY ADDITIVELY MANUFACTURED GLASS-CERAMIC QUADRUPOLE MASS FILTERS FOR POINT-OF-CARE MASS SPECTROMETRY
Colin C. Eckhoff¹, Nicholas K. Lubinsky¹, Randall E. Pedder², and Luis F. Velásquez-García¹
¹Massachusetts Institute of Technology, USA and ²Ardara Technologies LP, USA

14:40 - 15:00    Refreshment Break

Session 11 - Fabrication Technologies II
15:00 – 16:15

15:00    NOVEL GLASS-SILICON EMITTER CHIP FOR FIELD EMISSION APPLICATIONS
Aleksandra M. Buchta¹, Alexander Kassner¹, Julia Voß², Tobias Leopold², Julian Petring¹, Leonard Diekmann¹, Folke Dencker¹, and Marc C. Wurz¹
¹Leibniz University Hanover, GERMANY and ²LPKF Laser & Electronics SE, GERMANY

15:15    INTEGRATED SILICON ELECTRON SOURCE FOR HIGH VACUUM MEMS DEVICES
Michał Krysztof, Paweł Miera, Paweł Urbański, and Tomasz Grzebyk
Wrocław University of Science and Technology, POLAND

15:30    A NOVEL BACK-FRONT DOUBLE-GATED FIELD EMISSION ELECTRON GUN USING 3D CNT EMITTERS FOR X-RAY SOURCE
Amar Prasad Gupta¹, Jinho Choi¹, Jongmin Lim¹, Mrinal Sharma Bhusal², Jaeik Jung², Seung Jun Yeo², Ahn Jeung Sun¹, and Jehwang Ryu¹
¹Kyung Hee University, KOREA and ²CAT Beam Tech Co., Ltd, KOREA

15:45    EFFICIENT SYNTHESIS OF HIGH-QUALITY CARBON NANOTUBES USING INDUCTION HEATING TECHNOLOGY
Jinho Choi¹, Hanna Lee¹, Junho Yu¹, Amar Prasad Gupta¹,², Mrinal Bhusal Sharma², Jaekyu Jang², Jaeik Jung², Won Jung Lee¹, Seung Jun Yeo², Moonkyoo Kong³, and Jehwang Ryu¹
¹Kyung Hee University, KOREA, ²CAT Beam Tech Co., Ltd., KOREA, and ³Kyung Hee University Medical Center, KOREA

16:00    TEMPERATURE EFFECTS ON GALLIUM NITRIDE FIELD EMITTER ARRAYS
Ranajoy Bhattacharya¹, Pao-Chuan Shih², Tomás Palacios², and Jim Browning¹
¹Boise State University, USA and ²Massachusetts Institute of Technology, USA
16:15 SIMULATING NANOSCALE VACUUM CHANNEL TRANSISTOR ARRAYS IN LTSPICE UTILIZING AN EMPIRICAL WARM-BEAM CHILD-LANGMUIR MODEL
Jesse M. Snelling¹, Gregory R. Werner¹, and John R. Cary¹,²
¹University of Colorado, Boulder, USA and ²Tech-X Corporation, USA

16:30 BETA FACTOR MAPPING OF INDIVIDUAL EMITTING TIPS DURING INTEGRAL OPERATION OF FIELD EMISSION ARRAYS
Andreas Schels¹, Florian Herdl¹, Matthias Hausladen³, Dominik Wohlfartsstätter², Michael Bachmann², Simon Edler², Felix Düsberg², Andreas Pahlke², Philipp Buchner³, Rupert Schreiner³, and Walter Hansch¹
¹University of the Bundeswehr Munich, GERMANY, ²KETEK GmbH, GERMANY, and ³Ostbayerische Technische Hochschule Regensburg, GERMANY

16:45 HOW ACCURATE IS A FIELD EMISSION EXPERIMENT?
Anthony Ayari, Pascal Vincent, Sorin Perisanu, Philippe Poncharal, and Stephen T. Purcell
University Claude Bernard Lyon, CNRS, FRANCE

17:00 SIMULATION OF SEMICONDUCTING FIELD EMITTERS AND ITS THERMAL EFFECTS
Salvador Barranco Cárceles¹, Andreas Kyritsakis², Veronika Zadin², Aquila Mavalankar³, and Ian Underwood¹
¹University of Edinburgh, SCOTLAND, ²University of Tartu, ESTONIA, and ³Adaptix Imaging Ltd., UK

17:15 EFFECT OF ELECTRICAL AGING OF COLD CATHODE C-BEAM ON FOCAL SPOT SIZE AND X-RAY DOSE
Ketan Bhotkar, Yi Yin Yu, Bishwa Chandra Adhikari, and Kyu Chang Park
Kyung Hee University, KOREA

17:30 End of Day

Banquet—Odyssey Dinner Cruise
IVNC 2024 Announcement
Winner SGS Award
19:00 - 22:00
One bus will be picking up dinner cruise attendants from the Hyatt at @ 6 PM sharp;
another bus will be picking up dinner cruise attendants from Tang Center @ 6 PM sharp