34th International Vacuum Nanoelectronics Conference

Schedule

Monday, 5th July 2021

Time (Lyon)	
12:40-13:00	Opening comments from the two Chairmen

M1 - Tutorials

Chair - tbd

Time(Lyon)	Title and Authors (speaker underlined) Local Time	Page
13:00-13:45 Tutorial M1.1 19:00	**Micro-Nano Fabrication of Integrated Tip-Based Field Electron Emission Devices** **Juncong She**, Sun Yat-Sen University	31
13:45-14:30 Tutorial M1.2	**Ion sources and optical charged particles dedicated to FIB technology today. Current trends and challenges in semiconductors, failure analysis and HR SIMS** **Arnaud HouëL**, Anne DELOBBE, Justine RENAUD, Matthieu VITTEAU Orsay Physics	33

14:30-15:00	Pause

M2 - Tutorials

Chair – Richard Forbes

Time(Lyon)	Title and Authors (speaker underlined)	Page
15:00-15:45	**Electron emission calculations beyond the classical equations: finite size, space charge and thermal effects in sharp emitters** **Andreas Kyritsakis** University of Tartu, Estonia	35
15:45-16:30 Tutorial M2.2 10:45	**A Tutorial on the Physics And Modeling Of Electron Sources** **Kevin L. Jensen**, Naval Research Laboratory	36

16:30-16:45	Pause

M3 - Tutorials

Chair – Christopher Edgcombe

Time(Lyon)	Title and Authors (speaker underlined)	Page

16:45-17:30 Tutorial M3.1	**On the brightness, transverse emittance, and transverse coherence of a field emission beam** **Soichiro Tsujino** Paul Scherrer Institut, Switzerland	37

17:30-17:45	Pause

M4 - Poster Flashs Time Zone A

Chair S. Purcell and J.-P. Mazellier

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
	Industriel Sponsors	
	We wish to thank our industriel sponsors Orsay Physics, Kashiyama Europe GMBH, Hamamatsu France and Slide Pack who all will be available in the poster sessions. Three will present flashes.	
17:50	**Orsay Physics**	
17:52	**Hamamatsu France**	
17:54	**Slide Pack**	
	Microscopy + Spectroscopy	
17:58	**Electron energy analysis in Scanning Field Emission Microscopy using a Bessel box energy analyzer** **M. Bodik**, M. Demydenko, C.G.H. Walker, T. Bähler, T. Michlmayr, A.-K. Thamm, U. Ramsperger, A. Pratt, S.P. Tear, M.M. El Gomati, D. Pescia ETH Zürich, Switzerland	127
18:00	**Fowler-Nordheim Slope Dependence on Pressure in Controlled Poor Vacuum** **Girish Rughoobur**, Olusoji O. Ilori and Akintunde I. Akinwande Massachusetts Institute of Technology, USA	129
18:02	**Collector dependence of field emission in the Scanning Field Emission Microscopy** **H.J. Gotsis**, N.C. Bacalis, and J.P. Xanthakis	131
	Modeling	
18:04	**Study of Self-Heating Effects in Looped Carbon Nanotube Fibers** **Geet Tripathi**, Kartik Sharma, Marc Cahay, Jonathan Ludwick, F. F. Dall' Agnol, T. A. de Assis University of Cincinnati, USA	133
18:06	**Influence of Contact Resistance on the Field Emission Characteristics of a Carbon Nanotube** **Geet Tripathi**, Marc Cahay, Jonathan Ludwick, and Kevin L. Jensen University of Cincinnati, USA	135
18:08	**User-friendly method for testing field electron emission data: Technical report** **Mohammad M. Allaham**, Alexandr Knápek, Marwan S. Mousa, and Richard G. Forbes Institute of Scientific Instruments of CAS, Czech Republic	137

18:10	**Testing the performance of Murphy-Good plots when applied to current-voltage characteristics of Si field electron emission tips** **Mohammad M. Allaham**, Philipp Buchner, Rupert Schreiner and Alexandr Knápek Institute of Scientific Instruments of CAS, Czech Republic	139
18:12	**Estimating the uniformity of nanoscale vacuum channel transistor arrays using space-charge effects** **Jesse M. Snelling**, Gregory R. Werner, John R. Cary University of Colorado, USA	141
	RF and Xrays from electron beams	
18:14	**Confined Electron Laser** **Arya Fallahi**, Niels Kuster, Lukas Novotny ETH Zurich, Switzerland	142
18:16	**Single - Cycle THz Accelerating Structure with Wave Beam Focusing Lens** **Sergey Antipov**, Sergey Kuzikov, and Alexander Vikharev Euclid Techlabs, Russia	144
18:18	**Magnetron Sputtering Formation of Molybdenum-Copper Alloys for Fabrication of Millimeter-Band Planar Slow Wave Structures** **A.V. Starodubov**, D.A. Nozhkin, A.A. Serdobintsev, I.O. Kozhevnikov, A.M. Pavlov, V.V. Galushka, N.M. Ryskin, G. Ulisse, V. Krozer Saratov Branch, Kotelnikov Institute of Radio Engineering and Electronics, Russia	146
18:20	**A Facile Approach for Surface Quality Improvement of Mm-Band Planar Electromagnetic Structures Fabricated by Laser Ablation** **A.V. Starodubov**, A.A. Serdobintsev, I.O. Kozhevnikov, A.M. Pavlov, V.V. Galushka, N.M. Ryskin Saratov Branch, Kotelnikov Institute of Radio Engineering and Electronics, Russia	148
	Theory of Emission : Classic Quantum Tunneling	
18:22	**Analyses of field electron emission Molybdenum current-voltage data using Fowler-Nordheim and Murphy-Good plots** **Mohammad M. Allaham**, Marwan S. Mousa, Daniel Burda, Mohammad H. AlSa'eed, Sabreen Y. AlJrawen and Alexandr Knápek Institute of Scientific Instruments of CAS, Czech Republic	150
18:24	**Universality of Characteristic Field Enhancement Factor from Arched Carbon Nanofibers** **Thiago A. de Assis**, Fernando F. Dall'Agnol, Marc Cahay Federal University of Bahia, Brazil	152
18:26	**Using the parameter "formal area efficiency" (α_f^{SN}) to analyze current-voltage measurements on large-area field electron emitters** Richard G. Forbes, University of Surrey, UK	154
18:28	**A Tutorial Commentary on the Schottky Constant**	156

	Richard G. Forbes, University of Surrey, UK	
18:30	**Correction of Conceptual Error in Feynman's Textbook Treatment of Pointed-Conductor Electrostatics** **Richard G. Forbes,** University of Surrey, UK	158
18.32	**Features of the field enhancement factor on blade-type emitters** **S.V. Filippov**, E.O. Popov, A.G. Kolosko, F.F. Dall'Agnol Ioffe Institute, Russia	160
18:34	**Comparison of the effective parameters of single-tip tungsten emitter using FN and MG-plots** **Eugeni O. Popov,** Sergey V. Filippov, Anatoly G. Kolosko, Alexandr Knápek, Ioffe Institute, Russia	162
	Vacuum Nano Electronics	
18:36	**High Current Field Emission Arrays for Crossed Field Device Experiments** **Ranajoy Bhattacharya**, Mason Cannon, Rushmita Bhattacharjee, Winston Chern, Nedeljko Karaulac, Girish Rughoobur, Akintunde I. Akinwande and Jim Browning, Boise State University, USA	164
18:38	**Lifetime and Breakdown Mechanisms in Double-Gated Si FEAs** **Girish Rughoobur** and Akintunde I. Akinwande Massachusetts Institute of Technology, USA	166
18:40	**Influence of Geometrical Arrangements of Si Tip Arrays Fabricated by Laser Micromachining on their Emission Behaviour** **Matthias Hausladen1**, Vitali Bomke, Philipp Buchner, Michael Bachmann, Alexandr Knápek, and Rupert Schreiner OTH Regensburg, Germany	168
18:42	**Silicon Field Emitter Arrays Fabricated Using a Layout-Independent Process** **Nedeljko Karaulac**, Winston Chern, Girish Rughoobur, and Akintunde I. Akinwande, Massachusetts Institute of Technology, USA	170
18:44	**Current dependent performance test used on different types of silicon field emitter arrays** **Andreas Schels**, Simon Edler, Walter Hansch, Michael Bachmann, Florian Herdl, Felix Düsberg, Magdalena Eder, Manuel Meyer, Markus Dudek, Rupert Schreiner Universität der Bundeswehr München, Germany	172
18:46	**Optimizing current uniformity in nanoscale vacuum channel transistors with space charge feedback** **Gregory R. Werner,** Luke Adams, Jesse M. Snelling, John R. Cary University of Colorado, USA	174
	Nano Emitters	
18:48	**Carbon Nanotube Fiber Cathodes and Saturation of their Field Emission Current** **Evgenii P. Sheshin**, Ilya N. Kosarev, Bulat I. Masnaviev and D. I. Ozol	175

	Moscow Institute of Physics and Technology, Russian Federation	
18:50	**Field emission properties of sharp tungsten cathodes coated with a thin resilient oxide barrier** **Daniel Burda**, Mohammad M. Allaham, Alexandr Knápek, Dinara Sobola, Marwan Suleiman Mousa Institute of Scientific Instruments of the CAS, Czech Republic	177
18:52	**Field emission properties of sharp tungsten cathodes coated with a thin resilient oxide barrier** **Daniel Burda**, Mohammad M. Allaham, Alexandr Knápek, Dinara Sobola, Marwan Suleiman Mousa Institute of Scientific Instruments of the CAS, Czech Republic	179
18:54	**Using High Aspect Ratio AFM Probe for Digital Twin Development of SiC FEA** **Konstantin Nikiforov**, Nikolay Egorov, Ivan Sokolov, Valery Strebko, Vladimir Mikhailovskiy, Denis Danilov, Vladimir Golubkov, Vladimir Ilyin, and Alexey Ivanov Saint Petersburg State University, Russia	181
18:56	**High Brightness Carbon Nanotube Fiber Field Emission Cathode** **Taha Y. Posos**, Jack Cook, Oksana Chubenko, Steven B. Fairchild, Nathaniel P. Lockwood and Sergey V. Baryshev Michigan State University, Michigan, USA	183

Tuesday, 6th July 2021

Time (Lyon)	
12:40-13:00	Opening comments from the two Chairmen

Tu1 - Ultrafast, Ultra-intense Laser Excitation of Free and Bound Electrons

Chairs - Xu Ninsheng and Anthony Ayari

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
13:00-13:45 Plenary Tu1.1	**Ultrafast electron control with various means: from multiphoton physics at needle tips to nanophotonic particle acceleration** Roy Shiloh, Tomáš Chlouba, Ang Li, Philip Dienstbier, Alexander Tafel, Johannes Illmer, Norbert Schönenberger, Peyman Yousefi, Stefanie Kraus, Leon Brückner, Julian Litzel, Bastian Löhrl, **Peter Hommelhoff** Friedrich-Alexander-Universität, Germany	39
13:45-14:15 Invited Tu1.2 8:45	**Ultrafast Electron Scattering: Femtosecond Electron Pulses in Materials Research** Laurent P. René de Cotret, Martin R. Otto, Jan-Hendrik Pöhls, Tristan Britt, Mark J. Stern, Mark Sutton, **Bradley J. Siwick** McGill University, Canada	41

14:15-14:30	Pause

14:30-14:45 Oral Tu1.3	**Emission of electrons from a metal tip irradiated by femtosecond IR lasers at wavelengths of 800 and 1240 nm** A.V. Ovchinnikov, O.V. Chefonov, M.B. Agranat, N.A. Abramovskii, S.B. Bodrov, A.M. Kiselev, A.A. Murzanev, A.V. Romashkin, **A.N. Stepanov** Russian Academy of Sciences (IAP RAS), Russia	43
14:45-15:00 Oral Tu1.4	**Tunable Wavelength One-photon Photoassisted Cold Field Emission from W(310)-nanotips** **Rudolf Haindl**, Kerim Köster, Armin Feist and Claus Ropers University of Göttingen, Germany	45
15:00-15:15 Oral Tu1.5	**Photoemission from an ultrabright and ultrafast LaB6 nanowire electron emitter studied at atomic scale** **Ang Li**, Han Zhang, Stefan Meier, Alexander Tafel, Peter Hommelhoff Friedrich-Alexander-Universität, Germany	47

15:15-15:45	Pause

Tu2 – Advances in Electron Microscopy and Spectroscopy

Chair tbd

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
15:45-16:15 Invited Tu2.1	**Nano-optics with Fast Electrons** **M. Kociak** Université Paris Sud, France	NA
16:15-16:45 Invited Tu2.2	**Longitudinal and transverse modulation of electron wave function with light, and its application to electron microscopy** **Ivan Madan,** Giovanni Vanacore, Gabriele Berruto, Enrico Pomarico, Javier García de Abajo, Ido Kaminer, Fabrizio Carbone École Polytechnique Fédérale de Lausanne, Switzerland	49
16:45-17:00 Oral Tu2.3	**Voltage-controlled three-electron-beam interference by a three-element Boersch phase shifter with top and bottom shielding electrodes** **P. Thakkar**, V.A. Guzenko, P-H. Lu, R.E. Dunin-Borkowski, J.P. Abrahams and S. Tsujino Paul Scherrer Insitut, Switzerland	51
17:00-17:30 Invited Tu2.4	**A standing molecule as a coherent single-electron field emitter** Taner Esat, Marvin Knol, Philipp Leinen, Matthew F. B. Green, Malte Esders, Niklas Friedrich, Michael Maiworm, Nicola Ferri, Pawel Chmielniak, Sidra Sarwar, Torsten Deilmann, Peter Krüger, Hadi H. Arefi, Daniel Corken, James Gardner, Kristof T. Schütt, Jeff Rawson, Paul Kögerler, Michael Rohlfing, Rolf Findeisen, Alexandre Tkatchenko, Klaus-Robert Müller, Reinhard J. Maurer, Christian Wagner, Ruslan Temirov & **F. Stefan Tautz** Peter Grünberg Institut, Germany	53
17:30-17:45 Oral Tu2.5	**Scanning Field Emission Microscopy with Spin and Energy Analysis** **A-K Thamm**, J. Wei, M. Demydenko, C.G.H. Walker, D. Pescia and U. Ramsperger, A. Pratt, S.P. Tear, M.M. El Gomati Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland	55

17:45-18:00	Pause

Tu3 – Poster Session Time Zone A

Chair tbd

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
18:00 20:00	Following the M4 - Poster Flashes Time Zone A.	

Wednesday, 7th July 2021

W1- Poster Flashes Time ZoneB

Chair S. Purcell, J.-P. Mazellier

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
	Industriel Sponsors	
	We wish to thank our industriel sponsors Orsay Physics, Kashiyama Europe GMBH, Hamamatsu France and Slide Pack who all will be available in the poster sessions. Three will present flashes.	
10:50	**Orsay Physics**	
10:52	**Hamamatsu France**	
10:54	**Slide Pack**	
	Applications	
11:00	**Fabrication of ZnO nanowires cold cathode X-ray source with micro patterned transmission anode** **Song Kang**, Yangyang Zhao, Guofu Zhang, Shaozhi Deng, Ningsheng Xu, Jun Chen Sun Yat-sen University, China	184
11:02	**Cold Cathode X-Ray Flat Panel Detector Based on Ga2O3 Thin Film Photoconductor** **Haojian Huang**, Manni Chen, Zhipeng Zhang, Juncong She, Shaozhi Deng, Ningsheng Xu, Jun Chen Sun Yat-sen University, China	186
11:04	**Development of gated carbon nanotube cold cathode for miniature X-ray source** **Junfan Wang**, Yajie Guo, Haifeng Zhu, Baohong Li, Yu Zhang, Shaozhi Deng, Ningsheng Xu and Jun Chen Sun Yat-sen University, China	188
11:06	**Optimization of Focusing Structure for a Micro-Focus X-ray Source** **Junfan Wang**, Yajie Guo, Haifeng Zhu, Baohong Li, Yu Zhang, Shaozhi Deng, Ningsheng Xu and Jun Chen Sun Yat-sen University, China	190
11:08	**Focal Spot Size Enhancement by Offset control of Triode e-beam Module for High Resolution X-ray Imaging** **Yi Yin Yu** and Kyu Chang Park Kyung Hee University, Korea	192
11:10	**Outgassing during LAFE operation in the diode system** **S.V. Filippov**, A.G. Kolosko, E.O. Popov Ioffe Institute, Russia	194
11:12	**Cathodoluminescent UV Sources for Photocatalytic Disinfection of Air** **Evgenii P. Sheshin**, Ilya N. Kosarev, Bulat I. Masnaviev, Alexander O. Getman, Ilya A. Savichev and Dmitry I. Ozol Moscow Institute of Physics and Technology, Russian Federation	196

11:14	**Concept of a Secondary Emission Converter of the Energy of Fast Electrons and γ-Quanta On the Basis of Carbon Materials (e.g. Graphene)** **Dmitry I. Ozol** Moscow Institute of Physics and Technology, Russian Federation	198
11:16	**Towards a MEMS transmission point X-ray source** **Tomasz Grzebyk**, Krzysztof Turczyk, Anna Górecka-Drzazga, Jan A. Dziuban Wroclaw University of Science and Technology, Poland	200
11:18	**Optimization of Gated ZnO Nanowire Field-Emitter Arrays by Tuning Pixel Density** **Songyou Zhang**, Xiuqing Cao, Guofu Zhang, Shaozhi Deng, Juncong She, Ningsheng Xu and Jun Chen Sun Yat-sen University, China	202
11:20	**Study of Nanoscale Cathodes for Gas Discharge Devices** **Sergey M. Karabanov** Ryazan State Radio Engineering University, Russia	204
11:22	**UV lighting with carbon nanotube based cold cathode electron beam (C-beam) and its characteristics** **Sung Tae Yoo**, and Kyu Chang Park Kyung Hee University, Korea	206
	Microscopy + Spectroscopy	
11:24	**Microscope equipped with graphene-oxide-semiconductor electron source** **Yukino Kameda**, Katsuhisa Murakami, Masayoshi Nagao, Hidenori Mimura and Yoichiro Neo Research Institute of Electronics Shizuoka University, Japan	208
	Nano Emitters	
11:26	**Nanosphere Lithography to Enhance the Field Emission Properties of a Self Aligned Nanocarbon Based Field Emitters** **Nirupama M.P**, Satyanarayana B.S., O.S. Panwar BML Munjal University, India	210
11:28	**Field Emission Characteristics of ZnO Nanowire Driven by Pulsed Voltage** **Deyi Huang**, Yangyang Zhao, Shuai Wang, Guofu Zhang, Juncong She, Shaozhi Deng, Ningsheng Xu and Jun Chen Sun Yat-sen University, China	212
11:30	**Efficient fabrication of vertical carbon nanotube array cold cathode using laser cutting** **Chuyang Liao**, Jiupeng Li, Xiaoyu Qin, Qi Bo, Baohong Li, Shaozhi Deng, Yu Zhang Sun Yat-sen University, China	214

11:32	**Functionalize of vertically aligned CNTs emitter (C-beam) for surface modification and patterning of self-assembled monolayers (SAM)** **Alfi Rodiansyah**, Kyu Chang Park Kyung Hee University, Korea	216
	Novel emitters	
11:34	**Field emission properties of line-shape CNT field emitters** **Jun Soo Han**, Sang Heon Lee, Han Bin Go, Si Eun Han and Cheol Jin Lee School of Electrical Engineering, Korea University, Korea	218
11:36	**Field emission behaviour of fresh and aged Sb2Te3 nanosheets** **Somnath R. Bhopale**, and Mahendra A. More Pune University, India.	220
11:38	**$PtSe_2$ Nanosheets as Efficient Field Emitter** **Mahendra S. Pawar**, Mahendra A. More, and Dattatray J. Late National Chemical Laboratory, Pune, India	222
11:40	**Electron emission from a solvothermally synthesized ZnS-RGO nanocomposite field emitter** **Sanjeewani R. Bansode**, Mahendra A. More, Rishi B. Sharma Savitribai Phule Pune University, India.	224
11:42	**Low-Macroscopic-Field Electron Emission from Metal Thin Films** **I.S. Bizyaev**, P.G. Gabdullin, M.A. Chumak, V.Ye. Babyuk, S.N. Davydov, A.V. Arkhipov, O.E.Kvashenkina Peter the Great St. Petersburg Polytechnic University, Russia	226
	RF and Xrays from electron beams	
11:44	**Cold cathode electron gun based on single wall carbon nanotubes field emitters for THz traveling wave tube** **Ruirui Jiang**, Baoqing Zeng, Jianlong Liu, Kaiqiang Yang, and Jing Zhao University of Electronic Science and Technology of China, China	228
	Theory of Emision : Ab Initio	
11:46	**First-Principle Model of the Electron Field Emission From Silicon Nano-Scale Tip** Gleb D. Demin, Nikolay A. Djuzhev, Nikolay N. Patyukov, and **Ilya D. Evsikov** National Research University of Electronic Technology (MIET), Russia	230
	Theory of Emission : Classic Quantum Tunneling	
11:48	The notional emission area for cylindrical posts and its variation with local electric field Rajasree Ramachandran1,2,*, Debabrata Biswas1,2 1Homi Bhabha National Institute, Mumbai 400 094, INDIA	232
	Vacuum Nano Electronics	
11:50	**Cascade Electron Source Based on Horizontal Tunneling Junction** **Zhiwei Li,** Xianlong Wei Peking University, China	234

11:52	**Degradation of an emitter based on VACNT made by DC-PECVD during field emission** **M.A. Chumak,** A.A. Rokacheva, L.A. Filatov, I.S. Bizyaev, E.O. Popov, S.V. Filippov, A.G. Kolosko Peter the Great St.-Petersburg Polytechnical University, Russia	236
11:54	**Analysis of The Field Emission Current From an Array of Silicon Field Nanoemitters For Portable X-Ray Systems** **Petr Yu. Glagolev**, Gleb D. Demin, Nikolay A. Djuzhev, Ilya D. Evsikov, and Nikolay A. Filippov, National Research University of Electronic Technology (MIET), Russia	238
11:56	**Experimental study of the multi-tip field emitter based on the array of silicon pyramidal microstructures** Ilya D. Evsikov, Gleb D. Demin, Tatiana A. Gryazneva, Maksim A. Makhiboroda, Nikolay A. Djuzhev, Oleg V. Pankratov, Eugeni O. Popov, Sergey V. Filippov, Anatoly G. Kolosko and **Maksim A. Chumak** Peter the Great St.-Petersburg Polytechnical University, Russia	240
11:58	**Technology of the fabrication of Mo-based diode and triode structures with nanoscale vacuum gap** **Tatiana A. Gryazneva**, Nikolay A. Djuzhev, Gleb D. Demin, Nikolay A. Filippov, Ilya D. Evsikov and Maksim A. Makhiboroda National Research University of Electronic Technology (MIET), Russia	242

12:00-13:00	Pause

W2 - Novel Emission Mechanisms 1

Chair- TBD

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
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13:45-14:00 Oral W2.2 20:45	**Enhancement of thermionic emission and conversion characteristics using polarization and band-engineered n-type AlGaN cathodes** **Shigeya Kimura**, Hisashi Yoshida, Hisao Miyazaki, Takuya Fujimoto, and Akihisa Ogino	59
14:00-14:30 Invited W2.3 21:00	**Planar type electron emission device using atomic layered materials and it applications** **Katsuhisa Murakami**, Naoyuki Matsumoto, Yukino Kameda, Yoshinori Takao, Yoichiro Neo, Yoichi Yamada, Kazutaka Mitsuishi, Masahiro Sasaki, Hidenori Mimura, and Masayoshi Nagao National Institute of Advanced Industrial Science and Technology, Japan	61
14:30-14:45 Oral W2.4 20:30	**Mechanism of electron emission from graphene/hexagonal boron nitride heterostructure: Implication on MIM planar cathode** **Yicong Chen**, Zhibing Li, Jun Chen	63

	Sun Yat-sen University, China	
14:45-15:00 Oral W2.5 21:45	**Oxygen Resistance Investigation of Graphene-Oxide-Semiconductor Planar-Type Electron Sources for Low Earth Orbit Applications** **Naoyuki Matsumoto**, Yoshinori Takao, Masayoshi Nagao, and Katsuhisa Murakami Yokohama National University, Japan	65

14:45-15:15	Pause

W3 - Novel Emission Mechanisms 2

Chair: Jun Chen 21:00

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
15:15-15:45 Invited W3.1 22:00	**Development of highly spin-polarized field emitter using Heusler alloy Co2MnGa** **Shigekazu Nagai** Mie University, Japan	67
15:45-16:00 Oral W3.2 22:45	**A HfC nanowire field emission point electron source** **Shuai Tang**, Jie Tang, Ta-Wei Chiu, Wataru Hayami, Lu-Chang Qin National Institute for Materials Science, Tsukuba, Japan	69
16:00-16:15 Oral W3.3	**Field Emission from Genuine Graphene: An Experimental Study** **Philippe Poncharal**, Anthony Ayari, Pascal Vincent, Sorin Perisanu, Stephen T. Purcell University Claude Bernard Lyon 1 / CNRS, France	71
16:15-16:30 Oral W3.4	**Combined effect of single-electron charging and quantum confinement on field electron emission from heterostructured nanotips** **Victor I. Kleshch** Moscow State University, Russia	73
16:30-16:45 Oral	**Negative Differential Resistance in Laser-Assisted Field Emission from Si Nanowires** M. Choueib, A. Derouet, P. Vincent, A. Ayari, P. Poncharal, C. S. Cojocaru, **R. Martel**, S.T. Purcell Université de Montréal, Canada	75

16:45-17:00	Pause

W4- Vacuum Nano/Micro Devices

Chair: Rupert Schreiner and Arya Fallahi

17:00-17:30 Invited W4.1	*To be announced - Vacuum Nano Electronics* **Akintunde I. Akinwande** Massachusetts Institute of Technology, USA	NA
17:30-17:45 Oral W4.2	**Ion-Atomic clocks with Spindt type Field Emitter Array** **John D. Prestage**, Christopher Holland, Thai Hoang , Sang Chung, Thanh Le, Nan Yu Jet Propulsion Laboratory, USA	NA
17:45-18:00 Oral W4.3	**Investigation on the Emission Behaviour of p-doped Silicon Field Emission Arrays with Individually Controllable Single Tips** **Philipp Buchner**, Vitali Bomke, Matthias Hausladen, Simon Edler, Michael Bachmann, Rupert Schreiner Ostbayerische Technische Hochschule (OTH) Regensburg, Germany	77
18:00-18:15 Oral	**Failure Mode of Si Field Emission Arrays based on Emission pattern analysis**	79

W4.4	**Reza Farsad Asadi**, Tao Zheng, Jaime da Silva, Girish Rughoobur, Akintunde I Akinwande, Bruce Gnade Massachusetts Institute of Technology, USA	
18:15-18:30 Oral W4.5	**Field Emission Arrays from Graphite Fabricated by Laser Micromachining** **Robert Ławrowski**, Michael Bachmann and Rupert Schreiner Ostbayerische Technische Hochschule (OTH) Regensburg, Germany	81
Oral 18:30-18:45 W4.6	**Effects of Ultra Violet Light Exposure on Gated Silicon Field Emitter Arrays** **Ranajoy Bhattacharya**, Mason Canon, Nedeljko Karaulac, Girish Rughoobur, Winston Chern, Akintunde I. Akinwande and Jim Browning Boise State University, USA	83
18:45-19:00 Oral W4.7	**Emission Behavior of Planar Nano-Vacuum Field Emitters** **Marco Turchetti**, Yujia Yang, Mina R. Bionta, Alberto Nardi, Luca Daniel, Karl K. Berggren, Philip D. Keathley Massachusetts Institute of Technology, USA	85

Thursday, 8th July 2021

Th1– Poster Session Time Zone B

Chair tbd

Time(Lyon)		
9:45 11:45	Following the W1 - Poster Flashes Time Zone B.	

Th2 – Shoulder Gray Spiçndt Award

Chairman: tbd

Time(Lyon)		
11:45 12:00	Heinz Busta announces SGS award winner.	

Th3 – Presentation IVNC 2022 South Korea

Chair tbd

Time(Lyon)		
12:00 12:30	Professor Park : South Korea attributes for the IVNC 2022	

12:30-13:00	Pause

Th4 - High frequency EM radiation from Electron Beams

Chair: Peter Hommelhoff

13:00-13:45 Plenary Th4.1	**Evolution of traveling wave tubes towards sub-THz frequency** **Claudio Paoloni** Lancaster University, UK	86
13:45-14:15 Invited Th4.2	**Terahertz Acceleration Technology Towards Compact Light Sources** **Arya Fallahi**, ETH Zurich, Switzerland	87

14:15-14:45	Pause

Th5 – Applications and their modelisation

Chair: tbd

Time(Lyon)	Title and Authors (speaker bold underlined, institute of speaker only)	Page
14:45-15:15 Invited Th5.1 20:30	**High performance cold cathode CNT x-ray tube** Sang Heon Lee, Jun Soo Han, Han Bin Go, Si Eun Han and **Cheol Jin Lee** Korea University, South Korea	90
15:15-15:30 Oral Th5.2 21:00	**Direct-Conversion X-Ray Detectors Based on ZnO Nanowire Field Emitters Grown on Ga2O3 Photoconductors** **Zhipeng Zhang**, Manni Chen, Xinpeng Bai, Huanjun Chen, Shaozhi Deng, Jun Chen Sun Yat-sen University, China	92

15:30-15:45 Oral Th5.3	**A novel current dependent field emission performance test** **Florian Herdl**, Michael Bachmann, Dominik Wohlfartsstätter, Felix Düsberg, Markus Dudeck, Magdalena Eder, Manuel Meyer, Andreas Pahlke, Simon Edler, Andreas Schels, Walter Hansch, Rupert Schreiner KETEK GmbH, Germany	94
15:45-16:00 Oral Th5.4	**Designing Micro-gap Thermionic Energy Harvesters** **Ehsanur Rahman** and Alireza Nojeh University of British Columbia, Canada	96
16:00-16:15 Oral Th5.5	**Proposal for a Negative Capacitance Vacuum Field Effect Transistors with sub-60mV/dec Subthreshold Swing** **N. Hernandez**, M. Cahay, J. Ludwick, and T. Back University of Cincinnati, Cincinnati, USA	98

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Th6 - Nano-Micro Emitters (Nanotubes, Nanowires, Spindt and micro cathodes, etc.)

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15:00-16:45 Oral Th6.1 NME2.1	**Direct in situ Electron Microscope Synthesis of CNTs with Applied Electric Field and Field Emission** **P. Vincent**, F. Panciera, I. Florea, M. Ezzedine, M.-R. Zamfir, S. Perisanu, C. Cojocaru, N. Blanchard, D. Pribat, S.T. Purcell, P. Legagneux	100
16:45-17:00 Oral Th6.2 NME 2.2	**Effect of Substrate Conductivity on Si Self-Assembled Field Emission Arrays** **Shabnam Ghotbi**, Saeed Mohammadi Purdue University, USA	102
17:00-17:15 Oral Th6.4 NME 2.4	**Strongly anisotropic field emission from highly aligned carbon nanotube films** **S. B. Fairchild**, T. A. de Assis, J. H. Park, M. Cahay, J. Bulmer, D.E. Tsentalovich, Y. S. Ang6, L. K. Ang6, J. Ludwick, P.T. Murray, Y. Zhou, P. Zhang Wright-Patterson Air Force Base, USA	104
17:15-17:30 Oral Th6.5	**A Universal Multiscale Method for Rapid Determination of Local Emission Current Density from Nanoscale Emitters** **J. Ludwick** and T. C. Back, M. Cahay, N. Hernandez, H. Hall, J. O'Mara, K. L. Jensen, J. H. B. Deane, R. G. Forbes Air Force Research Laboratory,USA	106

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F1 Theory of Emission : Ab Initio

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13:00-13:30 Invited F1.1	**Field emitters at atomic scale – insights from order-N density functional theory** **C. J. Edgcombe** University of Cambridge, United Kingdom	108
13:30-13:45 Oral F1.2	**Thermal-Field Electron Emission from Three-Dimensional Cd_3As_2** **Wei Jie Chan**, Yee Sin Ang, and L. K. Ang Singapore University of Design and Technology, Singapore	110
13:45-14:00 Oral F1.3	**Field emission from two dimensional materials:a quantum mechanical model and its application to graphene** **Bruno Lepetit** Université Toulouse III Paul Sabatier, CNRS, France	112
14:00-14:15 Oral F1.4	**Tunneling Delay and the Modeling of Electron Emission** **Kevin L. Jensen**, Joel L. Lebowitz, Jeanne M. Riga, Andrew Shabaev, Donald A. Shier, Rebecca Seviour	NA
14:15-14:30 Oral F1.5	**Theoretical analysis of efficiency of plasmonic photoemission from single silver nanospheres** **Shisong Luo**, Yicong Chen, Zhibing, Jun Chen Sun Yat-sen University, China	114

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Theory of Emission : Classic Quantum Tunneling

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15:00-15:15 Oral F2.1	**General scaling laws of space charge effects in field Emission** **A. Kyritsakis**, M. Veske, V. Zadin and F. Djurabekova University of Tartu, Estonia	116
15:15-15:30 Oral F2.2	**Absence of space-charge-limited current from field emission due to non-FN law** **Cherq Chua**, Chun Yun Kee, Yee Sin Ang, Lay Kee Ang Singapore University of Technology and Design, Singapore	118
15:30-15:45 Oral F2.3	**Behavior of notional cap-area efficiency (gn) for hemisphere-on-plane and related field emitters** **S.V. Filippov,** A.G. Kolosko, E.O. Popov, Richard G. Forbes Ioffe Institute, Russia	120
15:45-16:00 Oral F2.4	**Does a banal tungsten field emitter obey the field emission theory?** **Anthony Ayari**, Pascal Vincent, Sorin Perisanu, Philippe Poncharal, Stephen T. Purcell	122

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16:00-16:15 Oral F2.5	**A Generalized Formula for Barrier Strength (Gamow Factor), applicable to various field ion and electron emission contexts** **<u>Richard G. Forbes</u>** University of Surrey, UK	124

16:15-???	Closing statements