9th ITG International Vacuum Electronics Workshop 2024

August 28 – 30, 2024, Physikzentrum Bad Honnef (www.pbh.de), Germany

Workshop, Previous Day

Wednesday, August 28, 2024

15:00	**ITG (VDE)-Fachausschuss MN6 "Vakuumelektronik und Displays", 144th Meeting**, Physikzentrum Bad Honnef (PBH), Meeting Room: **Winter Garden**
18:30	Start of the ITG Workshop for all participants: **Come Together Dinner & Evening Discussion,** Physikzentrum Bad Honnef: Restaurant „**Lichtenberg"** (in the Cellar)

Workshop Program, 1st Day

Thursday, August 29, 2024

Location: **Lecture Hall „Wilhelm und Else Heraeus"**

08:30	**Welcome Address: Wolfram Knapp,** Workshop Chairman
	***Session 1.1*: Thermionic and Field Emission Cathodes (I)** Chairman: **Wolfram Knapp**
08:35 *L1.1-1*	**COMMON PRINCIPLES OF Ba AND Th DISPENSER CATHODES FOR HIGH EMISSION APPLICATIONS** **Georg Gaertner** Consultant, Aachen, Germany Corresponding author: georg.f.gaertner@t-online.de
09:00 *L1.1-2*	**MINIATURIZATION OF AN ELECTRON GUN WITH COLD FIELD EMITTER FOR A SCANNING ELECTRON MICROSCOPE** **Josef Sellmair[1], Sapannarat Chaichana[1], Matthias Hausladen[1], Philipp Buchner[1], Rupert Schreiner[1] Michal Krysztof[2]** [1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]Wroclaw University of Science and Technology, 50-370 Wroclaw, Poland Corresponding author: josef.sellmair@oth-regensburg.de
09:25 *L1.1-3*	**FIELD EMISSION PROPERTIES OF SHARP TUNGSTEN CATHODES COATED WITH A THIN OXIDE BARRIER CREATED BY ANODIZATION** **Zuzana Košelová[1,2], Mohammad M. Allaham[1,3], Daniel Burda[1,4], Alexandr Knápek[1,2], Zdenka Fohlerová[2]**

	[1]Institute of Scientific Instruments of the Czech Academy of Sciences, Královopolská 147, 612 00 Brno, Czech Republic [2]Department of Microelectronics, Brno University of Technology, Technická 10, 616 00 Brno, Czech Republic [3]Department of Physics, Brno University of Technology, Technická 8, 616 00 Brno, Czech Republic [4]Central European Institute of Technology Brno, Brno University of Technology, Purkyňova 123, 612 00 Brno, Czech Republic Corresponding author: Zuzana.Koselova@isibrno.cz
09:50 *L1.1-4*	**MEASUREMENT OF THE CURRENT DISTRIBUTION OF A FIELD EMISSION CATHODE ARRAY USING A CMOS CAMERA AND COMPARISON WITH THE ACTUAL DIRECTLY MEASURED CURRENT VALUES** **Matthias Hausladen[1], Andreas Schels[2], Philipp Buchner[1], Mathias Bartl[1], A. Asgharzade[1], S. Edler[2], D. Wohlfartsstätter[2], Michael Bachmann[2], Ruppert Schreiner[1]** [1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]Ketek GmbH, D-82737 Munich, Germany Corresponding author: matthias.hausladen@oth-regensburg.de
10:15	**Coffee Break**
	***Session 1.2*: Gyrotrons (I)** Chairman: **Andreas Lawall**
10:45 *L1.2-1*	**DEVELOPMENT AND QUALIFICATION OF THE THALES TH1509U EUROPEAN 170 GHz 1 MW CW INDUSTRIAL GYROTRON** **Alberto Leggieri[1], Ferran Albajar[2], Stefano Alberti[3], Konstantinos A. Avramidis[4], Ruggero Bertazzoni[2], Falk H. Braunmueller[3], Antonio Cammi[5], Ioannis Chelis[4], Davide Dall'Acqua[2], Rosa Difonzo[6], Lukas Feuerstein[7], Eleonora Gajetti[6] , Gerd Gantenbein[7], Jérémy Genoud[3], Jérémy Gontard[1], Timothy P. Goodman[3], Jean-Philippe Hogge[3], Stefan Illy[7], Carolina Introini[5], Zisis Ioannidis[4], John Jelonnek[7], Jianbo Jin[7], Sophie Kohler[1], François Legrand[1], Christophe Lievin[1] , Rodolphe Marchesin[1], Ijaze M. Oumar[1], Tomasz Rzesnicki[7], Francisco Sanchez[2], Laura Savoldi[6], Sebastian Stanculovic[7], Ioannis Tigelis[4], Etienne Vallée[1], Manfred Thumm[7]** [1]THALES, Vélizy-Villacoublay, France 78140 [2]Fusion For Energy, Barcelona, Spain 08019 [3]Ecole Polytechnique Fédérale de Lausanne, Swiss Plasma Center, Lausanne, Switzerland 1015 [4]National and Kapodistrian University, Athens, Greece 15771 [5]Politechnic of Milan, Milan Italy 20133 [6]Politechnic of Turin, Turin Italy 10129 [7]Karlsruhe Institute of Technology, Karlsruhe Germany 76131 Corresponding author: alberto.leggieri@thalesgroup.com
11:10 *L1.2-2*	**EXPERIMENTAL ANALYSIS OF ADVANCED COOLING SOLUTIONS FOR CAVITIES OF MULTI-MW CW GYROTRONS** **Sebastian Stančulović[1], Rosa Difonzo[2], Gerd Gantenbein[1], Stefan Illy[1], John Jelonnek[1], Tobias Ruess[1], Tomasz Rzesnicki[1], Laura Savoldi[2]**

	[1]Karlsruhe Institute of Technology, Kaiserstr. 12, 76131 Karlsruhe, Germany [2]MAHTEP Group, Dipartimento Energia "Galileo Ferraris", Politecnico di Torino (PoliTo), Torino, Italy Corresponding author: Sebastian.stanculovic@kit.edu
11:35 *L1.2-3*	**DESIGN AND OPTIMIZATION OF A DIODE-TYPE MAGNETRON INJECTION GUN FOR TRI-FREQUENCY GYROTRON** **Ravinder Beemagani[1], Debasish Mondal[1], S. Yuvaraj[2], A. K. Jha[1], M. V. Kartikeyan[3,4]** [1]Department of Electrical Engineering, IIT Tirupati, India [2]Department of Electronics and Communication Engineering, NIT Andhra Pradesh, India [3]Department of Electronics and Communication Engineering, IIT Roorkee, India [4]Indian Institute of Information Technology, Design a. Manufacturing, Kancheepuram, India Corresponding author: ee21d003@iittp.ac.in
12:00 *L1.2-4*	**DESIGN AND SIMULATION ANALYSIS OF OUTPUT SYSTEM FOR TRI-FREQUENCY GYROTRON** **Debasish Mondal[1], Ravinder Beemagani[1], S. Yuvaraj[2], A. K. Jha[1], M. V. Kartikeyan[3,4]** [1]Department of Electrical Engineering, IIT Tirupati, India [2]Department of Electronics and Communication Engineering, NIT Andhra Pradesh, India [3]Department of Electronics and Communication Engineering, IIT Roorkee, India [4]Indian Institute of Information Technology, Design a. Manufacturing, Kancheepuram, India Corresponding author: dmondal@iittp.ac.in
12:30	**Lunch**
	***Session 1.3*: Vacuum Interrupters (I)** Chairman: **Gösta Mattausch**
13:30 *L1.3-1*	**INFLUENCE OF CONTACT MATERIAL FOR ROTATING VACUUM ARCS USING INCREASED GAPS ABOVE 20 MM** **Timo Meyer[1], Dietmar Gentsch[2], Michael Kurrat[1]** [1]elenia – Institute for High Voltage Technology and Power Systems, 38106 Braunschweig, Germany [2]ABB AG, Electrification – Distribution Solutions (ELDS), 40472 Ratingen, Germany Corresponding author: timo.meyer@tu-braunschweig.de
13:55 *L1.3-2*	**TEST SETUP AND FIRST MAGNETIC MEASUREMENTS OF THE ARC IGNITION PROCESS IN A MODEL VACUUM SWITCH** **Manuel Philipp, Myriam Koch** High Voltage Laboratories, Technical University of Darmstadt, 64283 Darmstadt, Germany Corresponding author: manuel.philipp@tu-darmstadt.de
14:20 *L1.3-3*	**3D PARTICLE-IN-CELL SIMULATION OF SURFACE FLASHOVER IN VACUUM INTERRUPTERS** **Svetlana Gossmann[1], Thomas Hammer[1], Andreas Lawall[2], Frank Graskowski[2]** [1]Siemens AG, Technology, Erlangen, Germany

	[2]Siemens AG, Smart Infrastructure, Berlin, Germany Corresponding author: svetlana.gossmann@siemens.com
14:45 *L1.3-4*	**FACTORS INFLUENCING THE CHOPPING CURRENT IN VACUUM INTERRUPTERS** **Markus Fischer[1], Dietmar Gentsch[2], Michael Beltle[1], Stefan Tenbohlen[1], Werner Ebbinghaus[2]** [1]University of Stuttgart, Institute of Power Transmission and High Voltage Technology (IEH), Stuttgart, Germany [2]ABB AG, Electrification - Distribution Solution (ELDS), Ratingen, Germany Corresponding author: markus.fischer@ieh.uni-stuttgart.de
15:10	**Coffee Break** **with Workshop Photo Session in Front of the Physikzentrum**
	***Session 1.4*: Vacuum Electronic Applications and Measurements** Chairman: **Ernst Bosch**
15:40 *L1.4-1*	**HEMPT – INNOVATIVE ELECTRIC PROPULSION TECHNOLOGY FOR COMMERCIAL AND SCIENTIFIC SPACECRAFT** **Gabriel Suske, Angelo Genovese, Joachim Daeubler, Alexey Lazurenko, Ralf Heidemann, Peter Holtmann, Heiko Stalzer, Philip Birtel** Thales Deutschland GmbH, Electron Devices, Soeflinger Str. 100, 89077 Ulm, Germany Corresponding author: Gabriel.SUSKE@thalesgroup.de
16:05 *L1.4-2*	**REMOVAL OF PERSISTENT MICROPOLLUTANTS FROM WASTEWATER BY HYBRID TREATMENT WITH LOW-ENERGY ELECTRONS AND OZON** **Lotte Ligaya Schaap, Tobias Teichmann, André Poremba, Gösta Mattausch, Simone Schopf, Elizabeth von Hauff** Fraunhofer Institute for Electron Beam and Plasma Technology FEP, Winterbergstr. 28, 01277 Dresden, Germany Corresponding author: Lotte.Ligaya.Schaap@fep.fraunhofer.de
16:30 *L1.4-3*	**VACUUM-SEALED ELECTRON BEAM MICROCOLUMN FOR HIGH VACUUM MEMS DEVICES** **Michał Krysztof, Paweł Urbański, Piotr Szyszka, Tomasz Grzebyk** Wroclaw University of Science and Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland Corresponding author: michal.krysztof@pwr.edu.pl
16:55 *L1.4-4*	**TEMPERATURE-STABILIZED MICRO WIRE PIRANI** **Julian Eiler[1], Stefan Weber[2], Peter Gerlesberger[2], Heinz Plöchinger[2], Rupert Schreiner[1]** [1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]Thyracont Vacuum Instruments GmbH, 94036 Passau, Germany Corresponding author: julian.eiler@oth-regensburg.de

17:20 *L1.4-5*	**SCANNING ENHANCEMENT OF STM-TUNGSTEN PROBES BY COLLOIDAL GRAPHITE COATINGS** **Mohammad M. Allaham[1,2], Alexandr Knápek[2]** [1]Central European Institute of Technology, Brno University of Technology, Purkyňova 123, 612 00 Brno, Czech Republic. [2]Institute of Scientific Instruments of Czech Academy of Sciences, Královopolská 147, 612 64 Brno, Czech Republic. Corresponding author: allaham@isibrno.cz

18:30	**Workshop Dinner & Evening Discussion** Physikzentrum Bad Honnef: Restaurant „**Lichtenberg“** (in the Cellar)

Workshop Program, 2nd Day

Friday, August 30, 2024

Location: **Lecture Hall “Wilhelm und Else Heraeus”**

from 08:00	**Check-out at PBH** - **with the payment for drinks and optional:** - **for an individual additional overnight stay with breakfast at the PBH until Saturday, August 31, 2024 (free choice for all workshop participants)**

	***Session 2.1*: Harmonic Gyrotron, Vacuum Electronic Amplifiers and Traveling-Wave Tubes (TWTs)** Chairman: **Dietmar Gentsch**
08:30 *L2.1-1*	**DESIGN OF A MW LEVEL 2nd HARMONIC COAXIAL GYROTRON CAVITY WITH VARIABLE CORRUGATION DEPTH OF THE INNER CONDUCTOR** **Lukas Feuerstein[1], Konstantinos A. Avramidis[2], Ioannis Chelis[2], Stefan Illy[1], John Jelonnek[1], Dimitrios Peponis[2], Ioannis Tigelis[2], Manfred Thumm[1], Chuanren Wu[1]** [1]Institute for Pulsed Power and Microwave Technology, Karlsruhe Institute of Technology (KIT), Germany [2]Department of Physics, National and Kapodistrian University of Athens (NKUA), 15784, Athens, Greece Corresponding author: lukas.feuerstein@kit.edu

08:55 *L2.1-2*	**ONGOING DEVELOPMENT OF A HELICAL-TYPE GYRO-TWT FOR 263 GHz DNP-NMR AT IHM** **Max Vöhringer[1], Alexander Marek[2], Stefan Illy[1], Gerd Gantenbein[1], Manfred Thumm[1,3], Chuanren Wu[1], John Jelonnek[1,3]** [1]IHM, [3]IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany [2]Fraunhofer FHR, Fraunhoferstr. 20, 53343 Wachtberg, Germany Corresponding author: max.voehringer@kit.edu
09:20 *L2.1-3*	**BREAKING BARRIERS IN SPACE OBSERVATION: HIGH-POWER VACUUM TUBE AMPLIFIERS FOR TIRA** **Alexander Marek, Daniel Leinz, Robert Perkuhn** Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, Fraunhoferstr. 20, 53343 Wachtberg, Germany Corresponding author: alexander.marek@fhr.fraunhofer.de
09:45 *L2.1-4*	**DEVELOPMENT OF HIGH-POWER PULSES TRAVELING WAVE TUBES AT THALES** **Philip Birtel, Wolfgang Duerr, Klaus Zimmermann, Erdogan Cakir** Thales Deutschland GmbH, Soeflinger Str. 100, 89077 Ulm Corresponding author: philip.BIRTEL@thalesgroup.de
10:10	**Coffee Break**
	***Session 2.2*: Vacuum Interrupters (II)** Chairman: **Rupert Schreiner**
10:40 *L2.2-1*	**LOW- AND VERY LOW FREQUENCY SHORT-CIRCUIT CURRENT INTERRUPTION WITH VACUUM** **Dietmar Gentsch[1], E. D. Taylor[2], Andreas Lawall[2], Sergey Gortschakow[3]** [1] ABB AG, Electrification – Distribution Solutions (ELDS), 40472 Ratingen, Germany [2]Siemens AG, Smart Infrastructure, Berlin, Germany [3]Leibniz Institute for Plasma Science and Technology, 17489 Greifswald, Germany Corresponding author: dietmar.gentsch@de.abb.com
11:05 *L2.2-2*	**ADDITIVE MANUFACTURED FIELD CONTROL RING FOR IMPROVING EXTERNAL DIELECTRIC OF VACUUM INTERRUPTER** **Karen Flügel[1], Dietmar Gentsch[2], Michael Kurrat[1]** [1]elenia – Institute for High Voltage Technology and Power Systems, TU Braunschweig, Schleinitzstr. 23, 38106 Braunschweig, Germany [2]Electrification – Distribution Solutions (ELDS), ABB AG, Oberhausener Str. 33, 40472 Ratingen, Germany Corresponding author: k.fluegel@tu-braunschweig.de
11:30 *L2.2-3*	**BREAKDOWN CURRENT MEASUREMENT FOR DETECTING THE INITIATION OF TWO-STAGE EXTERNAL FLASHOVERS OF A VACUUM INTERRUPTER** **Tobias Jesberger[1], Karen Flügel[1], Dietmar Gentsch[2], Michael Kurrat[1]**

	[1]elenia – Institute for High Voltage Technology and Power Systems, TU Braunschweig, Schleinitzstr. 23, 38106 Braunschweig, Germany [2]Electrification – Distribution Solutions (ELDS), ABB AG, Oberhausener Str. 33, 40472 Ratingen, Germany Corresponding author: tobias.jesberger@tu-braunschweig.de
11:55 *L2.2-4*	**STUDY OF SWITCHING CONTACTS BY OPTICAL TECHNIQUES** **Sergey Gortschakow[1], Andreas Lawall[2], Frank Graskowski[2]** [1]Leibniz Institute for Plasma Science and Technology, Greifswald, Germany [2]Siemens AG, Berlin, Germany Corresponding author: sergey.gortschakow@inp-greifswald.de
12:20	**Lunch**
	***Session 2.3*: Plasma Technologies and Field Emission Cathodes (II)** Chairman: **Wolfram Knapp**
13:20 *L2.3-1*	**EFFECT OF MINIATURIZATION ON RING-TYPE PLASMA ACTUATORS** **Abdurrahman Musazay, Matthias Lindner, Julian Eiler, Fabian Hecht, Rupert Schreiner** Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany Corresponding author: Abdurrahman.Musazay@oth-regensburg.de
13:45 *L2.3-2*	**STUDY OF ALD GROWN MULTILAYERS EXHIBITING VACANCY INDUCED CONDUCTIVITY FOR ELECTRON EMITTERS** **Daniel Burda[1,2], Mohammad M. Allaham[1,3], Alexandr Knápek[1], Marwan S. Mousa[4]** [1]Institute of Scientific Instruments of CAS, Královopolská 147, 612 64 Brno, Czech Republic [2]Faculty of Electrical Engineering and Communication, BUT Brno, Technická 2848/8, 616 00 Brno, Czech Republic [3]Central European Institute of Technology, BUT Brno, Purkyňova 123, 612 00 Brno, Czech Republic [4]Department of Renewable Energy Engineering, Jadara University, Irbid 21110, Jordan Corresponding author: burda@isibrno.cz
14:10 *L2.3-3*	**GROWTH OF NANOSCALE DEPOSITS ON SURFACES UNDER THE INFLUENCE OF HIGH ELECTRIC FIELDS OR LIGHT INTENSITIES DURING OPERATION IN ORGANIC GAS ENVIRONMENTS** **Fabian Hecht[1], Elmar Baur[2], Thomas Kippes[2], Josef Sellmair[1], Rupert Schreiner[1]** [1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]ams-OSRAM International GmbH, Regensburg Corresponding author: fabian.hecht@oth-regensburg.de
14:35 *L2.3-4*	**SILICON NANOWIRE FIELD EMITTERS WITH INTEGRATED EXTRACTION GATES MADE FROM BENZOCYCLOBUTENE AS AN INSULATOR** **Philipp Buchner[1], Alexander Kaiser[1], Matthias Hausladen[1], Mathias Bartl[1], Michael Bachmann[2], Rupert Schreiner[1]**

	[1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]Ketek GmbH, 82737 Munich, Germany Corresponding author: philipp.buchner@oth-regensburg.de
15:00 *L2.3-5*	**EMISSION PROPERTIES OF SILICON NANOWIRE FIELD EMITTERS** **Mathias Bartl[1], Philipp Buchner[1], Matthias Hausladen[1], Michael Bachmann[2], Rupert Schreiner[1]** [1]Faculty of Applied Natural Sciences and Cultural Studies, OTH Regensburg, 93053 Regensburg, Germany [2]Ketek GmbH, 82737 Munich, Germany Corresponding author: philipp.buchner@oth-regensburg.de
15:25	**Closing Words: Wolfram Knapp**, Workshop Chairman

15:30	**Coffee Break** → **End of Workshop: 16:30**

Poster Presentation

Thursday, August 29, 2024 and Friday, August 30, 2024

Location: **In the Entrance Area of the Lecture Hall "Wilhelm und Else Heraeus"**

P1	**STUDY OF COSTRICTION PHENOMENA IN HIGH CURRENT VACUUM ARCS** **Naghme Dorraki, Sergey Gortschakow** Leibniz Institute for Plasma Science and Technology, Greifswald, Germany Corresponding author: sergey.gortschakow@inp-greifswald.de
P2	**APPLICATION OF A NOVEL ADDRESSABLE-ARRAY X-RAY SOURCE TO MEDICAL IMAGING OF EXTREMETIES** **D. Keith Bowen, James D. Cameron, Conrad Dirckx, Paul Edwards , Manuel Fohler, Isabel A. Gomes, Jacob Ludlam, Aquila M. Mavalankar, Sian Phillips, Kate L. Renforth, Steven P. Richards, Vadim Y. Soloviev, Silvia Sottini, Alexis Tello Valero, Nivedita Yumnam, Stephen G. Wells** Adaptix Ltd, Oxford University Begbroke Science Park, Centre for Innovation and Enterprise (CIE), Woodstock Road Begbroke, Oxfordshire, OX5 1PF UK Corresponding author: manuel.fohler@adaptix.com
P3	**PORTABLE SCANNING AND ACQUISITION SYSTEM FOR MINIATURE SEM** **Marcin Białas**

	Wroclaw University of Science and Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland Corresponding author: marcin.bialas@pwr.edu.pl
P4	**A FULLY CHIP-SCALE INTEGRATED X-RAY SOURCE** **Paweł Urbański, Michał Krysztof, Piotr Szyszka, Tomasz Grzebyk** Wroclaw University of Science and Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland Corresponding author: pawel.urbanski@pwr.edu.pl
P5	**UNIVERSAL SYSTEM OF MODULAR LAB EQUIPMENT DESIGNED WITH VACUUM ELECTRONICS IN MIND** **Michał Zychla, Jan Sobków** Wroclaw University of Science and Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland Corresponding author: 268597@student.pwr.edu.pl