

8th ITG International Vacuum Electronics Workshop 2022

September 2 – 3, 2022, Physikzentrum Bad Honnef (www.pbh.de), Germany

Workshop, Previous Day

Thursday, September 1, 2022

15:00	ITG (VDE)-Fachausschuss MN6 “Vakuumelektronik und Displays”, 140th Meeting Physikzentrum Bad Honnef (PBH), Conference 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

Friday, September 2, 2022

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: Rupert Schreiner
08:35 <i>L1.1-1</i>	SURFACE ELECTRON EMISSION MODEL OF Ba DISPENSER CATHODES, ESPECIALLY OF Ba SCANDATE CATHODES Georg Gaertner Consultant, 52078 Aachen, Reinhardstr. 66A, Germany, Email: georg.f.gaertner@t-online.de
09:00 <i>L1.1-2</i>	INFLUENCE OF INSTRUMENTAL FACTORS ON AUGER QUANTIFICATION APPLIED TO DISPENSER CATHODES Jean-Michel Roquais Thales AVS France, Microwave & Imaging Sub-systems, 2 rue Marcel Dassault, 78141 Vélizy-Villacoublay Cedex Email: jean-michel.roquais@thalesgroup.com
09:25 <i>L1.1-3</i>	INNOVATIVE MINICHANNEL COOLING SYSTEM FOR GYROTRON CAVITIES Alberto Leggieri¹, Ferran Albajar², Stefano Alberti³, Kostantinos A. Avramidis⁴, Rosa Difonzo⁵, Lukas Feuerstein⁶, Eleonora Gajetti⁵, Gerd Gantenbein⁶, Jérémy Genoud³, Jean-Philippe Hogge³, Stefan Illy⁶, John Jelonnek⁶, George Latsas⁴, François Legrand¹, Christophe Lievin¹, Rodolphe Marchesin¹, Tomasz Rzesnicki⁶, Ioannis Tigelis⁴,

<p>09:50 <i>L1.1-4</i></p>	<p>Francisco Sanchez², Laura Savoldi⁵, Sebastian Stanculovic⁶, Athanasios Zekas⁴ and Manfred Thumm⁶ ¹Microwave & Imaging Sub-Systems, THALES Vélizy-Villacoublay, France, F-78141 ²Fusion for Energy, Barcelona, Spain, E-08019 ³Swiss Plasma Center, EPFL, Lausanne, Switzerland CH-1015 ⁴Department of Physics, National and Kapodistrian University of Athens, Athens, Greece, GR-157 84 ⁵Dipartimento Energia “Galileo Ferraris”, Politecnico di Torino, Torino, Italy, I-10129 ⁶IHM, Karlsruhe Institute of Technology, Karlsruhe, Germany, D-76131 E-mail: alberto.leggieri@thalesgroup.com</p> <p>PRESSURE INSENSITIVE TRANSFERRED GRAPHENE-OXIDE-SEMICONDUCTOR ELECTRON FIELD EMITTER Florian Herdl¹, Andreas Schels¹, Laura Höltingen¹, Simon Edler², Michael Bachmann², Alexander Mai², Dominik Wohlfartsstätter², Felix Düsberg², Florian Dams², Andreas Pahlke², Rupert Schreiner³, Georg Duesberg¹ ¹Institute of Physics, University of the Bundeswehr Munich, 85577 Neubiberg, Germany ²KETEK GmbH, 81737 Munich, Germany ³OTH Regensburg, 93053 Regensburg, Germany Email: florian.herd@ketek.net</p>
<p>10:15</p>	<p>Coffee Break</p>
<p>10:45 <i>L1.2-1</i></p> <p>11:10 <i>L1.2-2</i></p> <p>11:35 <i>L1.2-3</i></p>	<p>Session 1.2: Gyrotrons (I) Chairman: Andreas Lawall</p> <p>PRESENT STATUS AND FUTURE PROSPECTS OF HIGH POWER CW GYROTRON DEVELOPMENT AT KIT S. Illy¹, K.A. Avramidis¹, B. Ell¹, L. Feuerstein¹, G. Gantenbein¹, Z. Ioannidis¹, J. Jin¹, L. Krier¹, A. Marek¹, S. Stanculovic¹, T. Ruess², T. Rzesnicki¹, M. Thumm^{1,2}, C. Wu¹, and J. Jelonnek^{1,2} ¹IHM, ²IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany Email: stefan.illy@kit.edu</p> <p>INFLUENCE OF PARASITIC BACKWARD WAVES ON GYROTRON OPERATION Lukas Feuerstein¹, Alexander Marek¹, Stefan Illy¹, Manfred Thumm^{1,2}, and John Jelonnek^{1,2} ¹IHM, ²IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany Email: lukas.feuerstein@kit.edu</p> <p>EXPERIMENTAL RESULTS OF A PLL-STABILIZED MW-CLASS 140 GHz GYROTRON AT W7-X L. Krier¹, K. A. Avramidis¹, H. Braune², G. Gantenbein¹, S. Illy¹, J. Jelonnek^{1,3}, H. P. Laqua², S. Marsen², D. Moseev², F. Noke², T. Ruess^{1,3}, T. Stange², M. Thumm^{1,3}, R. C. Wolf² and W7-X Team⁴ ¹IHM, ³IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, D-76131 Karlsruhe,</p>

	<p>Germany ²Max-Planck-Institute for Plasma Physics (IPP), Wendelsteinstr. 1, D-17491 Greifswald, Germany, ⁴for full author list see: T. Klinger, et al., Nucl. Fusion 59, 112004 (2019) <u>Email</u>: laurent.krier@kit.edu</p>
12:00	Lunch
	<p>Session 1.3: Gyrotrons (II) and Electric Propulsion Chairman: Günter Kornfeld</p>
13:30 L1.3-1	<p>ELECTRIC FIELD SWEEPING CONCEPT FOR HIGH POWER GYROTRON COLLECTORS <u>Benjamin Ell</u>¹, <u>Chuanren Wu</u>¹, <u>Gerd Gantenbein</u>¹, <u>Stefan Illy</u>¹, <u>Moritz Misko</u>¹, <u>Ioannis Gr. Pagonakis</u>¹, <u>Manfred Thumm</u>^{1,2}, and <u>John Jelonnek</u>^{1,2} ¹IHM, ²IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany <u>Email</u>: benjamin.ell@kit.edu</p>
13:55 L1.3-2	<p>DEVELOPMENT OF A CUSP-TYPE ELECTRON GUN FOR A W-BAND HELICAL GYRO-TWT <u>Max Vöhringer</u>¹, <u>Alexander Marek</u>¹, <u>Stefan Illy</u>¹, <u>Gerd Gantenbein</u>¹, <u>Manfred Thumm</u>^{1,2}, <u>Chuanren Wu</u>¹ and <u>John Jelonnek</u>^{1,2} ¹IHM, ²IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany <u>Email</u>: uukpb@student.kit.edu</p>
14:20 L1.3-3	<p>PASSIVE MODE-LOCKING OF TWO HELICAL-TYPE GYRO-TWTs AT SUB-THz-FREQUENCIES <u>Alexander Marek</u>¹, <u>Lukas Feuerstein</u>¹, <u>Stefan Illy</u>¹, <u>Manfred Thumm</u>^{1,2}, <u>Chuanren Wu</u>¹ and <u>John Jelonnek</u>^{1,2} ¹IHM, ²IHE, Karlsruhe Institute of Technology (KIT), Kaiserstr. 12, 76131 Karlsruhe, Germany <u>Email</u>: alexander.marek@kit.edu</p>
14:45 L1.3-4	<p>HEMPT – ELECTRIC PROPULSION – RECENT RESULTS AND PRODUCT STRATEGY <u>Ernst Bosch</u>¹, <u>Stefan Weis</u>¹, <u>Alexey Lazurenko</u>¹, <u>Angelo Genovese</u>¹, <u>Ralf Heidemann</u>¹, <u>Peter Holtmann</u>¹, <u>Heiko Stalzer</u>¹ ¹Thales Deutschland GmbH, Electron Devices, Soeflinger Str. 100, D-89077 Ulm, Germany <u>Email</u>: ernst.bosch@thalesgroup.com</p>
15:10	<p>Coffee Break with Workshop Photo Session in Front of the PBH</p>

	<p>Session 1.4: Vacuum Interrupters Chairman: Ernst Bosch</p>
<p>15:40 L1.4-1</p>	<p>PERFORMANCE OF IN-SERVICE SHUNT CAPACITOR SWITCHING DEVICES Dietmar Gentsch¹, Dukkaiappan Subbiah Thevar¹, Martin Stefanka², Andreas Brandt³, Elisabeth Lindell⁴ ¹ABB AG Medium Voltage (MV), R&D Electrification - Distribution Solution (ELDS), Germany ²ABB s.r.o., R&D Electrification - Distribution Solution (ELDS); Brno, Czech Republic ³ABB AG MV, Global Product Manager, Electrification - Distribution Solution (ELDS); Germany ⁴ABB AB; R&D Corporate Research; Västerås, Sweden <u>Email: dietmar.gentsch@de.abb.com</u></p>
<p>16:05 L1.4-2</p>	<p>TMF-CONTACTS IN VACUUM INTERRUPTERS WITH GAPS ABOVE 20 mm Benjamin Weber¹, Dietmar Gentsch² and Michael Kurrat¹ ¹TU Braunschweig, elenia –Institute for High Voltage Technology and Electrical Power Systems ²ABB AG Medium Voltage (MV), R&D Electrification - Distribution Solution (ELDS), Germany <u>Email: benjamin.weber@tu-braunschweig.de</u></p>
<p>16:30 L1.4-3</p>	<p>SURFACE TEMPERATURE DYNAMICS OF SWITCHING RMF AND AMF CONTACTS S. Gortschakow¹, D. Gonzalez¹, R. Methling¹, St. Franke¹, D. Uhrandt¹, A. Lawall², E. D. Taylor², F. Graskowski² ¹Leibniz Institute for Plasma Science and Technology, Greifswald, Germany ²Siemens AG, Smart Infrastructure, Rohrdamm 88, 13629 Berlin, Germany <u>Email: sergey.gortschakow@inp-greifswald.de</u></p>
<p>16:55 L1.4-4</p>	<p>APPLICATION OF THE VOLTAGE HOLDING PREDICTION MODEL TO FLOATING AND FIXED SHIELD VACUUM INTERRUPTERS N. Marconato^{1,2}, T. Patton¹, P. Bettini^{1,2}, A. De Lorenzi¹, R. Gobbo², A. Lawall³ and E. D. Taylor³ ¹Consorzio RFX, CNR, ENEA, INFN, Università di Padova, Acciaierie Venete SpA, Corso Stati Uniti 4, 35127 Padova, Italy ²Dipartimento di Ingegneria Industriale (DII), Università di Padova, 35131 Padova, Italy ³Siemens AG, Smart Infrastructure, Rohrdamm 88, 13629 Berlin, Germany <u>Email: andreas.lawall@siemens.com</u></p>
<p>17:20 L1.4-5</p>	<p>INVESTIGATIONS OF LIGHTNING IMPULS VOLTAGE ON VACUUM CIRCUIT BREAKERS AND COMPARISON OF EFFECTS BETWEEN INDUSTRY AND RESEARCH Karen Flügel¹, Dietmar Gentsch² and Michael Kurrat¹ ¹TU Braunschweig, elenia –Institute for High Voltage Technology and Electrical Power Systems ²ABB AG Medium Voltage (MV), R&D Electrification - Distribution Solution (ELDS),</p>

	Germany Email: k.fluegel@tu-braunschweig.de
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18:30	Workshop Dinner & Evening Discussion Physikzentrum Bad Honnef: Restaurant „Lichtenberg“ (in the Cellar)
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Workshop Program, 2nd Day

Saturday, September 3, 2022

Location: Lecture Hall “Wilhelm und Else Heraeus”

from 08:00	Check-out at PBH <ul style="list-style-type: none"> - with the payment for drinks and optional: - for an individual additional overnight stay with breakfast at the PBH until Sunday, September 4 (free choice for all workshop participants)
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	Session 2.1: Traveling-Wave Tubes (TWTs) and E-Beam Technologies Chairman: Manfred Thumm
08:30 <i>L2.1-1</i>	ASYMMETRIC ELECTRON BEAMS IN HELIX TRAVELING WAVE TUBES Philip Birtel¹, Jürgen Wegener¹ ¹ Thales Deutschland GmbH, Electron Devices, Soeflinger Str. 100, D-89077 Ulm, Germany Email: philip.birtel@thalesgroup.com
08:55 <i>L2.1-2</i>	BROADBAND L-BAND TRAVELING WAVE TUBES FOR NAVIGATION SATELLITES Philip Birtel¹, Wolfgang Dürr¹, Ernst Bosch¹, ¹ Thales Deutschland GmbH, Electron Devices, Soeflinger Str. 100, D-89077 Ulm, Germany Email: Wolfgang.DUERR@thalesgroup.com
09:20 <i>L2.1-3</i>	ADVANCES IN ELECTRON BEAM TECHNOLOGY FOR THERMAL PROCESSING, BIOTECHNOLOGICAL AND ENVIRONMENTAL APPLICATIONS => Lecture was not held because of illness! Gösta Mattausch, Tobias Teichmann, Lotte Ligaya Schaap, Ralf Blüthner, Falk Winckler, Simone Schopf, Ulla König, Burkhard Zimmermann Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Winterbergstr. 28, D-01277 Dresden, Germany Email: Goesta.Mattausch@fep.fraunhofer.de

<p>09:45 L2.1-4</p>	<p>POTENTIAL OF ELECTRON BEAM SUSTAINED HYBRID PLASMAS FOR POWER-TO-X PROCESSES: AN OUTLOOK <u>David Schreuder</u>, Lars Dincklage, Burkhard Zimmermann, Ralf Blüthner, Björn Meyer, Gösta Mattausch Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Winterbergstr. 28, D-01277 Dresden, Germany Email: David.Schreuder@fep.fraunhofer.de</p>
<p>10:10</p>	<p>Coffee Break</p>
<p>10:40 L2.2-1</p> <p>11:05 L2.2-2</p> <p>11:30 L2.2-3</p> <p>11:55 L2.2-4</p>	<p>Session 2.2: Vacuum Measurements and Field Emission Cathodes (II) Chairman: Rupert Schreiner</p> <p>USB VACUUM TRANSDUCER <u>Dominik Plöchinger</u> Thyracont Vacuum Instruments GmbH, Max-Emanuel-Str. 10, 94036 Passau Email: dominik.ploechinger@thyracont.de</p> <p>ACTIVE HEAT-LOSS COMPENSATED MICRO-PIRANI GAUGE FOR VACUUM PACKAGES <u>Dominik Berndt</u>¹, Mohd Fuad Rahiman¹, Julian Eiler¹, Heinz Plöchinger², Rupert Schreiner¹ ¹University of Applied Sciences, OTH Regensburg, Seybothstr. 2, D-93053 Regensburg, Germany ²Thyracont Vacuum Instruments GmbH, Max-Emmanuel-Str. 10, D- 94036 Passau, Germany Email: Dominik.berndt@oth-regensburg.de</p> <p>CURRENT DEPENDENT FIELD EMISSION PERFORMANCE TEST USING A CMOS IMAGING SENSOR <u>Simon Edler</u>², Andreas Schels¹, Florian Herdl¹, Walter Hansch¹, Michael Bachmann², Dominik Wohlfartsstätter², Felix Düsberg², Andreas Pahlke², Matthias Hausladen³, Philipp Buchner³, Rupert Schreiner³ ¹Institute of Physics, Universität der Bundeswehr München, 85577 Neubiberg, Germany ²KETEK GmbH, 81737 Munich, Germany ³OTH Regensburg, 93053 Regensburg, Germany Email: Simon.Edler@ketek.net</p> <p>BENZOCYCLOBUTENE AS A DIELECTRIC SPACER FOR FIELD EMISSION ELECTRON SOURCES <u>Lena Fuchshuber</u>¹, Philipp Buchner¹, Matthias Hausladen¹, Michael Bachmann² and Rupert Schreiner¹ ¹Faculty of Applied Natural Sciences and Cultural Studies, Seybothstr. 2, OTH Regensburg, D-93053 Regensburg, Germany ²KETEK GmbH, 81737 Munich, Germany Email: lena.fuchshuber@oth-regensburg.de</p>

12:20	Lunch
	Session 2.3: Plasma Technologies and Field Emission Cathodes (III) Chairman: Manfred Thumm
13:20 L2.3-1	INTERPRETATION OF THE CHARGE-VOLTAGE PLOT DERIVATE FOR SURFACE DIELECTRIC BARRIER DISCHARGES Matthias Lindner¹, Fabian Hecht¹, Rupert Schreiner¹ ¹ Faculty of Applied Natural Sciences and Cultural Studies, Seybothstr. 2, OTH Regensburg, D-93053 Regensburg, Germany <u>Email</u> : matthias.lindner@oth-regensburg.de
13:45 L2.3-2	EMISSION PROPERTIES OF PtSi-COATED SILICON NANOCONES IN THE TRANSITION REGIME D. Jonker^{1,3}, R.M. Tiggelaar², K. Sotthewes³, M. Siekman³, A. Van Houselt³, H.J.W. Zandvliet³, J.G.E. Gardeniers¹ ¹ Mesoscale Chemical Systems, University of Twente, Enschede, The Netherlands ² MESA+ Institute, University of Twente, Enschede, The Netherlands ³ Physics of Interfaces and Nanomaterials, University of Twente, Enschede, The Netherlands <u>Email</u> : d.jonker@utwente.nl
14:10 L2.3-3	STUDIES AND OPTIMIZATION OF FIELD EMITTER FROM Si NANOWIRES ON MICRO TUBES Philipp Buchner¹, Lena Fuchshuber¹, Matthias Hausladen¹, Michael Bachmann² and Rupert Schreiner¹ ¹ Faculty of Applied Natural Sciences and Cultural Studies, Seybothstr. 2, OTH Regensburg, D-93053 Regensburg, Germany ² Ketek GmbH, D-81737 Munich, Germany <u>Email</u> : philipp.buchner@oth-regensburg.de
14:35 L2.3-4	CONTROLLED MICRO-ARC TREATMENTS IN VACUUM ELECTRON SOURCES WITH CNT CATHODES FOR LONG-TERM EMISSION STABILITY Wolfram Knapp Knaptron GmbH - Vakuumelektronik, Privatweg 3, D-39291 Moeser, Germany <u>Email</u> : dr.who.knapp@t-online.de
15:00	Closing Words: Manfred Thumm, Workshop Chairman

15:05	Coffee Break	→ End of Workshop: 16:30
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Poster Presentation

Friday, Sept. 2, 2022 and Saturday, Sept. 3, 2022

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

P1	<p>INNOVATIVE MINICHANNEL COOLING SYSTEM FOR GYROTRON CAVITIES</p> <p>Alberto Leggieri¹, Ferran Albajar², Stefano Alberti³, Kostantinos A. Avramidis⁴, Rosa Difonzo⁵, Lukas Feuerstein⁶, Eleonora Gajetti⁵, Gerd Gantenbein⁶, Jérémy Genoud³, Jean-Philippe Hogge³, Stefan Illy⁶, John Jelonnek⁶, George Latsas⁴, François Legrand¹, Christophe Lievin¹, Rodolphe Marchesin¹, Tomasz Rzesnicki⁶, Ioannis Tigelis⁴, Francisco Sanchez², Laura Savoldi⁵, Sebastian Stanculovic⁶, Athanasios Zekas⁴ and Manfred Thumm⁶</p> <p>¹Microwave & Imaging Sub-Systems, THALES Vélizy-Villacoublay, France, F-78141 ²Fusion for Energy, Barcelona, Spain, E-08019 ³Swiss Plasma Center, EPFL, Lausanne, Switzerland CH-1015 ⁴Department of Physics, National and Kapodistrian University of Athens, Athens, Greece, GR-157 84 ⁵Dipartimento Energia “Galileo Ferraris”, Politecnico di Torino, Torino, Italy, I-10129 ⁶IHM, Karlsruhe Institute of Technology, Karlsruhe, Germany, D-76131 E-mail: alberto.leggieri@thalesgroup.com</p>
P2	<p>INVESTIGATION OF THE QUASI-HARMONIC FIELD EMISSION BEHAVIOR OF EPOXY-COATED FIELD EMISSION TIPS</p> <p>Alexandr Knápek</p> <p>Institute of Scientific Instruments of the Czech Academy of Sciences, Královopolská 147, 612 64, Brno, Czech Republic E-mail: knapek@isibrno.cz</p>