



Twenty-Third IEEE International Vacuum Electronics Conference

IVEC 2022

April 25-29, 2022

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Marriott Conference Center

Monterey, CA 93940



Twenty-Third IEEE International Vacuum Electronics Conference

PROGRAM

April 25-29, 2022, Monterey Marriott, Monterey, California

Sponsored by the IEEE Electron Devices Society

www.ieeeivec.org

WELCOME

On behalf of the IVEC 2022 Committee and the IEEE Electron Devices Society (EDS) Technical Committee on Vacuum Electronics, I would like to welcome you to the 23rd IEEE International Vacuum Electronics Conference.

The IVEC meeting for over 20 years now continues to be an international scientific conference focused on vacuum electronics research and innovation. The meeting has been held at locations across the world, and for the last two years, in cyberspace. This year we are going to exist in both worlds, as we will both come together face-to-face for the in-person event in Monterey and in the virtual world, as we have created a hybrid meeting for the first time.

This conference has been arranged to facilitate the presentation and discussion of information useful to manufacturers, systems application engineers, academics, and students. Traditionally, IVEC attracts a diverse group of attendees. The technical sessions, social events, and interactive virtual meetings will provide unique opportunities to renew old or establish new contacts and friendships with colleagues, customers and end users, and students.

As in the past, we will open this year's conference with mini-course lectures on Monday, April 25. The mini-course lectures are: "Basics of TWT Amplifiers," presented by Dr. Frédéric André; "Additive Manufacturing of Vacuum Electronics," presented by Dr. Diana Gamzina; "Introduction to Thermionic Converters," presented by Drs. Peter Scherpelz and Roelof Groenewald; and "Electron Emission Physics at Ultrafast and Ultra-Small Scale," presented by Prof. Peng Zhang. Continuing education credit from IEEE can be obtained by attendance at these courses.

Our core conference is a three-day event, Tuesday, April 26, through Thursday, April 28. Tuesday morning, the first of two outstanding plenary sessions will be held. Our Tuesday plenary speakers will include Dr. Carter Armstrong, an RF vacuum electronics veteran, who will present "Vacuum Electronics

Continued next page

Industry Retrospective and Futurecast.” Dr. Vadim Sajaev, Associate Division Director for the Accelerator Systems Division at the Advanced Photon Source at Argonne National Laboratory, will describe “Building the World’s Brightest Hard X-ray Synchrotron Light Source Upgrade of the Advanced Photon Source at Argonne National Laboratory.” After the Tuesday plenary session, we will present the 2022 John R. Pierce Award for Excellence in Vacuum Electronics.

On Wednesday, the second plenary session will be held with Mr. Philipp Borchard of Dymenso LLC, delivering a timely talk, particularly applicable to the active research in high frequency devices, entitled “Precision Mechanical Interfaces for Boosting Millimeter-Wave Devices Performance.” Finally, Fr. Edward Foley, Capuchin, of the Catholic Theological Union, looks into the innovative, inspiring and imaginative aspects of the scientific quest in his talk, “Apologies to Galileo, a Theologian’s Homage to Science.” After Wednesday’s plenary session, we will announce the winner of the Best Student Paper Award. Lastly, we will present the 2022 Vacuum Electronics Young Scientist Award.

Our conference includes three days of outstanding oral and poster technical presentations, with sessions dedicated to TWTs, power supplies, klystrons, microfabrication, and much more. All the talks for each day will be captured, posted on the virtual platform, and made available for a period of two weeks for on-demand viewing after the conclusion of the conference.

Please be sure to visit our exhibitors, who will be on hand all three days of the event. And on Wednesday evening, April 27, join us as we gather at the hotel for a banquet with live jazz music. We will also take this opportunity to honor the contributions of Lou Falce and George Caryotakis to the field of vacuum electronics and this conference in particular.

As usual, the conference web site (ieeivec.org) is your best source of information about IVEC 2022 and will continue to serve as a clearinghouse for news and other IVEC-related information after the conference, along with the EDS Vacuum Electronics Web site (VacuumElectronics.org).

I would like to take this opportunity to thank the IVEC Committee members for their help and support, especially Max Mankin, the Technical Program Chair, for doing a lot of heavy lifting in the conference organization. Max, together with all the staff at Palisades Convention Management, built the meeting you are about to experience. I would also like to thank Monica Blank, the EDS Technical Committee Chair for helping to facilitate numerous issues over the past year. Jagadishwar Sirigiri laid the groundwork in 2020 for the virtual component for the meeting and continued to provide support and guidance beyond his tenure. Thank you also to Neville Luhmann and Daniel Busbaher for organizing the memorials to be presented at the banquet. I would be remiss for not highlighting and thanking our corporate financial contributors for their support. Please see our showcase for our generous corporate sponsors and exhibitors. Finally, I thank you, our presenters and exhibitors, for your participation either in-person or in the virtual world for providing the content of the conference.

Let’s do it!

Jack Tucek
General Chair
IVEC 2022

GENERAL INFORMATION

Registration

The registration fee includes admission to all technical sessions, a single ticket to the Wednesday Evening Banquet at the Monterey Marriott, all refreshment breaks, and digital access to the conference digest.

On-site registration takes place in the San Carlos Ballroom Foyer of the Monterey Marriott Hotel during the hours listed below.

Monday, April 25	8:30 am – 4:00 pm
Tuesday, April 26	7:00 am – 5:30 pm
Wednesday, April 27	7:30 am – 5:30 pm
Thursday, April 28	7:45 am – 5:30 pm

Wednesday Evening Banquet

All conference attendees are invited to attend a dinner banquet to be held on Wednesday evening, April 27, in the 5:00 pm Ferrantes Bay View area of the Monterey Marriott. Enjoy dinner and live music in a relaxing setting while interacting with your fellow conference attendees.

Awards

2022 John R. Pierce Award for Excellence in Vacuum Electronics

The John R. Pierce Award for Excellence in Vacuum Electronics was established in 2002 to recognize outstanding contributions to the field. Anyone or any group of persons working in the field of vacuum electronics is eligible for this award, which will be presented each year during the IVEC conference. Anyone in the field may nominate a colleague. Selection of the winner will be made by a vote of the members of the Technical Committee. Members of the Technical Committee who are nominees may not vote. Only living persons are eligible for the award. The winner will receive a commemorative plaque and an award of \$2000. If a group nomination is selected for the award they will each receive a plaque and share the \$2000.

Best Student Paper Award

IVEC 2022 will select the most outstanding student-authored and presented paper for the honor of “Best Student Paper Award.” Eligible papers are those with a student as the principal author and presenter. Students are considered as individuals pursuing a baccalaureate or graduate degree at the time of the conference or during the past year when the work was completed. After ranking by the Technical Program Committee, six student papers will be selected for finalist consideration. Finalist students will present a 10-minute synopsis talk on their work on Tuesday evening during the conference, and from these brief summary talks a winner will be selected. The award will include an engraved plaque and a \$500 check.

Conference Contact

Anyone requiring additional information should contact the Conference Coordinator, Samantha Tola, CMP, at (212) 460- 8090 ext. 203, or stola@pcm411.com.

IVEC 2022 Web Site

For additional information on IVEC 2022, individuals are encouraged to visit our web site at www.ieeeivec.org.

Jujama IVEC 2022

All registrants will receive a link to the Jujama IVEC 2022 website, from which they can view live streaming content during the conference, and content on-demand after the conference.

Mobile App

For a complete schedule, technical presentations abstracts, and more, download the IVEC 2022 mobile app, powered by Jujama, and search on IVEC 2022.



IVEC 2022 would like to express our sincere thanks to our supporting organizations and for the contributions from our very generous sponsors:

GOLD



SILVER



BRONZE



MONDAY, APRIL 25

2022 IVEC Mini-Courses

Continental breakfast and breaks will be held in the San Carlos ballroom

Continuing Education Credits

Earn free continuing education credits by attending the IVEC 2022 mini-courses! The IEEE Educational Activities Credentialing Program has approved all four courses for 1.5 continuing education units (CEUs) each. All you have to do is register, attend, and complete a short evaluation form, and your certificate will be emailed to the address you provide.

Instructors and Courses:

- **Basics of TWT Amplifiers**

Presented by Dr. Frederic Andre, Thales AVS

Dr. Frédéric André is presently acting as product line architect at Thales AVS. He develops traveling wave tubes for space applications in Vélizy-Villacoublay (France) and Ulm (Germany). His interests extend to advanced concepts including Hamiltonian time domain model of TWTs, carbon nanotube cathodes, and sub-terahertz TWTs.

- **Additive Manufacturing for Vacuum Electronics**

Presented by Dr. Diana Gamzina, Elve Speed

The construction of vacuum electronic devices is an artisan process; it requires extremes of high-precision machining and assembly and the tolerances and feature sizes become more exacting as the operating frequency increases. Designs are currently limited by conventional manufacturing processes, requiring components to be manufactured individually, then stacked into assemblies, and brazed. Additive manufacturing offers the ability to achieve vacuum integrity, enclosed complex cavity shapes, and high-power handling capability all at once. Additive manufacturing can be implemented for construction of fully integrated vacuum electronic devices, starting the next generation for low-cost and high-capability RF vacuum devices.

Dr. Diana Gamzina serves as CEO of Elve, Inc., developing millimeter-wave power amplifiers. Prior to that Diana was staff scientist at the SLAC National Accelerator Laboratory for five years and a development engineer at the UC Davis millimeter-wave research group for over eight years, leading research and development programs in millimeter-wave vacuum electronics. Her expertise includes micro to nano scale as well as additive fabrication techniques, multiscale multifunctional materials design and analysis, and development of compact high-frequency and high-power RF sources.

- **Introduction to Thermionic Converters**

Presented by Dr. Peter Scherpelz & Dr. Roelof Groenewald, Modern Electron, Inc.

Thermionic energy converters (TECs) convert heat to electricity through vacuum electron emission from a hot cathode onto a colder anode. Building an efficient converter has proven to be extremely challenging, however. An ultra-low work function anode is important for operation, and it must coexist in the device with a high-flux electron emitter. By default, electron emission will cause a large space

charge barrier to form, which must be mitigated in a manner that consumes little energy; solutions include plasmas or very small gaps. This short course will give an overview of TECs, the theory behind them, and the primary solutions to low work function collectors, high-flux emitters, and space charge mitigation. The course will also discuss approaches to modeling TEC performance, including the use of modern high-performance computing.

Peter Scherpelz is a senior computational physicist at Modern Electron, where he has experience in particle-in-cell modeling of thermionic converters, thermionic converter theory, and design and analysis of novel thermionic converter concepts and experiments. He holds a Ph.D. in physics from The University of Chicago, where he was supported by the Hertz Fellowship, and focused on theoretical descriptions of high-temperature superconductors and ultracold atomic superfluids. He completed a postdoctoral fellowship at The University of Chicago Pritzker School of Molecular Engineering, where he performed electronic structure calculations to support the development of novel materials and quantum computing architectures.

Roelof Groenewald is a senior computational physicist at Modern Electron, with experience in thermionic converter theory, particle-in-cell simulations of thermionic converters, models of plasmas used in thermionic converters, and experiments on thermionic converters. He has also performed electromagnetic modeling of radiative heat transfer for thermionic converter design. He holds an M.S. in computer science and a Ph.D. in physics from the University of Southern California, where he worked on computational condensed matter physics, including ab-initio studies and method development for computing many-body interactions.

- **Electron Emission Physics at Ultrafast and Ultra-Small Scale**
Presented by Prof. Peng Zhang, Michigan State University

Ultrafast laser-induced electron emission from nanostructures is fundamentally important to the development of coherent electron sources, compact radiation sources and accelerators, ultrafast electron microscopy, and novel nano-vacuum devices. This talk summarizes recent development on the modeling of electron emission physics at ultrafast and ultra-small scale. Our short-pulse emission model is valid for arbitrary pulse length from sub-cycle to CW excitation, and for arbitrary pulse repetition rate. The single formulation is valid from photon-driven electron emission to field-driven emission as optical intensity increases. Also presented are electron emission enhancement from coated surfaces and strong current rectification in an optical field-driven nanogap.

Peng Zhang is currently associate professor (assistant professor from 2016 to 2021) with the Department of Electrical and Computer Engineering, Michigan State University. He received his Ph.D. in nuclear engineering and radiological sciences from the University of Michigan, Ann Arbor, in 2012. His research interests are in theoretical and computational physics in nanoelectronics, plasmas, and accelerator technology. He was a recipient of the IEEE Nuclear and Plasma Sciences Society Early Achievement Award, the AFOSR Young Investigator Program Award, and the ONR Young Investigator Program Award. He is currently an Editorial Board Member of Scientific Reports and Plasma Research Express.

TUESDAY, APRIL 26

Coffee / 7:30 – 8:00 am / San Carlos Ballroom Foyer

PLENARY SESSION / 8:00 am – 12:30 pm

Welcome and Introduction (8:00)

Jack Tucek, General Chair
Northrop Grumman Corporation

PL1: Vacuum Electronics Industry Retrospective and Futurecast (8:10)

Carter M. Armstrong
Consultant

An unvarnished recap of a 40-plus year career in RF vacuum electronics – the majority of which was spent in industry. The good, the bad and the . . . Oh, never mind, you get the idea. The changes I saw and the current state of affairs/trends. I'll present my recommendations for the field's continued vitality including comments on the roles I see for its primary stakeholders: the users, government sponsors/national labs, the university community, suppliers and, of course, industry – both the legacy companies and new entrants. I'll cover some technology advances I experienced or observed – both breakthroughs and those remaining to be realized. I'll conclude with my take on some possible fruitful future markets and R&D investment areas.

PL2: Building the World's Brightest Hard X-ray Synchrotron Light Source (8:55)
Upgrade of the Advanced Photon Source at Argonne National Laboratory

Dr. Vadim Sajaev
Accelerator Systems Division at the Advanced Photon Source at Argonne National Laboratory

The Advanced Photon Source has been in operation since 1995 and consists of a storage ring where the synchrotron light is produced and an injector complex that generates electron bunches and accelerates them to the energy of 7 GeV. A full replacement of the storage ring has been designed and is being presently manufactured; it will result in up to a 500-fold increase in X-ray brightness. The injector complex is also being refurbished to ensure smooth operation over the next 20 years. The storage ring replacement work is planned to start in April 2023, and the first new light will be generated a year later.

Presentation of the 2022 John R. Pierce Award for Excellence in Vacuum (9:40)
Electronics and Lecture

Break (10:15)

TUESDAY, APRIL 26, TECHNICAL SESSIONS

Session 1:

TWTs I: Ka/Q-band

Tuesday, April 26 / 10:40 AM - 12:20 PM / San Carlos II

Chair:

Diana Gamzina, Stanford University

1.1 - High-Power V-Band TWT Development

- *Young-Min Shin, Brad Stockwell, Rasheda Begum, Andy Moyer, Kevin Childs, Christopher Nilsen, Loren Roeder, Michael Cusick, Peter Kolda, Tom Grant*
Microwave Power Product Division Communications and Power Industries (CPI) LLC

1.2 - Low-Voltage, Four-Beam Ka-Band TWT Experiment

- *Reginald Jaynes, Colin Joye, Franklin Wood, Igor Chernyavskiy, Alexander Vlasov, John Pasour, John Rodgers, Baruch Levush*
U.S. Naval Research Laboratory
- *Khanh Nguyen*
Beam-Wave Research, Inc.
- *John Petillo, Vadim Jabotinski*
Leidos Corp.

1.3 - Q-band 190W Helix TWT with Two Stage Collector

- *Sosuke Higashibata, Naofumi Kosugi, Daiki Matsumoto, Takatsugu Munehiro, Tetsuo Machida, Yoshinori Mori, Kenji Nakajima*
NEC Network and Sensor Systems, Ltd.
- *Travis Stewart*
NEC Corporation of America

1.4 - Q-Band Helix Traveling-Wave Tube for Next-Generation Wireless Communications

- *Chuanhao Wang, Pu Zhang, Silong Huang, Xuanming Zhang, Zhifang Lyu, Shaomeng Wang, Huarong Gong, Yubin Gong, Zhaoyun Duan*
University of Electronic Science and Technology of China
- *Guang Yang, Ying Li, Hongxia Cheng*
Nanjing Sanle Microwave Technology Development Co., Ltd.

1.5 - Design of Ka-Band Traveling-Wave Tube for Wireless Links

- *Rupa Basu, Purushothaman Narasimhan, Juan Sucuellamos, Claudio Paoloni*
Lancaster University

Session 2:

Power Supplies & Components I: Power Supplies and Windows

Tuesday, April 26 / 10:40 AM - 12:20 PM / San Carlos III

Chair:

Larry Sadwick, Innosys

2.1 - X-Band TWT Transmitter

- *Marcel P.J. Gaudreau, Luan Jashari, John Kinross-Wright, Bill Lindsay, Kevin Vaughan, Tim Hawkey, Michael Kempkes, Rebecca Simpson*
Diversified Technologies, Inc.

2.2 - COBRA DANE Radar Transmitter Group Replacement

- *Timothy Hawkey, Luan Jashari, Kevin Vaughan, Ynnesh Francis, Michael Kempkes, Rebecca Simpson
Diversified Technologies, Inc. (DTI)*

2.3 - High-Stability Klystron Modulator for Commercial Accelerator Application

- *Christopher Chipman, Anthony Heindel, Merouane Benjnane, Henry von Kelsch, IV, Ziliang Ruan, Marcel P.J. Gaudreau, Michael Kempkes, Rebecca Simpson
Diversified Technologies, Inc.*

2.4 - Design of Pulse Power Supply for High Current Density Electron-Beam Source

- *Anand Abhishek, Niraj Kumar, Vishant
CSIR-Central Electronics Engineering Research Institute*
- *Bhim Singh
Indian Institute of Technology, Delhi*

2.5 - Experimental Research on Output Window of S-Band High-Peak-Power Klystron

- *Yong Zhong, Yan Shu
Beijing Vacuum Electronics Research Institute*

2.6 - Design and Thermal Analysis of Broadband Output Window for W-Band Gyro-TWT

- *Dajun Zhao, Wei Jiang, Yu Wang, Yuhao Song, Guo Liu, Jianxun Wang, Yong Luo
University of Electronic Science and Technology of China*

Session 3:

Klystron / IOT

Tuesday, April 26 / 10:40 AM - 12:20 PM / San Carlos IV

Chair:

Aaron Jensen, Leidos

3.1 - A 3.0Mw, 402.5MHz, Pulsed Klystron for Use in the Spallation Neutron Source DTL-Linac at the Oak Ridge National Laboratory - keynote

- *Edward Eisen, Paul Krzeminsk, Jim McGrain, Rasheda Begum, Brad Stockwell, Takuji Kimura, Scott Forrest,
Merritt Chesnut, Steve Lenci
Communications & Power Industries LLC*

3.2 - DMLS Enables Rapid, Low-Cost Manufacture of an X-Band Klystron Circuit - keynote

- *Charlotte Wehner, Julian Merrick, Emilio Nanni, Brandon Weatherford, Brad Shirley
SLAC National Accelerator Laboratory*

3.3 - Multiple Beam-Power Grid Tubes

- *R. Lawrence Ives
Calabazas Creek Research, Inc.*
- *Mike Read, George Marsden, Thomas Habermann
Calabazas Creek Research, Inc.*
- *Thuc Bui, David Collins
Calabazas Creek Research, Inc.*
- *Ricky Ho, Tom Cox, Christopher McVey, Ed Davies, Nileshwar Chaudary
Communications & Power Industries, LLC*
- *James M. Potter
JP Accelerator Works*

3.4 - Compact Low-Voltage Klystrons for Integrated Linear Accelerator Systems

- *Brandon Weatherford, Erik Jongewaard, Julian Merrick, Chris Nantista, Alex Nguyen, Ann Sy, Sami Tantawi
SLAC National Accelerator Laboratory*

3.5 - A Multi-Mode Extended Interaction Amplifier

- *Zhiwei Chang, Guoxiang Shu, Yanyan Tian, Wenlong He
Shenzhen University*

3.6 - A 1.3 GHz 100 kW Ultra-high Efficiency Klystron

- *Michael Read, Thomas Habermann, David Marsden, Thuc Bui, George Collins, R. Lawrence Ives
Calabazas Creek Research Inc.*
- *Aaron Jensen
Leidos*

Session 4:

Microfabricated MMW Sources

Tuesday, April 26 / 01:20 PM - 03:20 PM / San Carlos II

Chair:

James Dayton, I6ZSL0

4.1 - Additive Manufacturing Methods for Millimeter-Wave Vacuum Electronics - keynote

- *Alan Cook, Colin Joye, Reginald Jaynes, Benjamin Albright, Frank Wood, Jeffrey Calame
U.S. Naval Research Laboratory*
- *David Schipf
NRC Research Assoc. Program*

4.2 - Test of D-Band Folded Waveguide Traveling-Wave Tube

- *Yujiang Liu, Feng Lan, Hongfei Li, Zugen Guo, Ruifeng Zhang, Huarong Gong
University of Electronic Science and Technology of China*

4.3 - D-Band Medium-Power Traveling-Wave Tube

- *Rupa Basu, Purushothaman Narasimhan, Rosa Letizia, Claudio Paoloni
Lancaster University*

4.4 - Design and Cold-Test of D-Band Planar Microstrip Meander Line Slow-Wave Structures and Adaptors

- *Yang Xie, Ningfeng Bai, Xiaohan Sun*
Southeast University
- *Hongxia Chen*
Nanjing Sanle Group Co. Ltd
- *Pan Pan, Jun Cai, Wenjie Yu, Jinjun Feng*
Beijing Vacuum Electronics Institution

4.5 - Study on a Microfabricated Slow-Wave Structure for the Millimeter-band Backward-Wave Oscillator Based on the Pseudospark-Source Electron Gun

- *Andrey Starodubov, Roman Torgashov, Viktor Galushka, Andrey Rozhnev, Nikita Ryskin*
Saratov Branch, V.A. Kotel'nikov Institute of Radio Engineering and Electronics RAS & Saratov State University
- *Anton Pavlov*
Saratov State University
- *Valeriy Emelyanov*
Saratov Branch, V.A. Kotel'nikov Institute of Radio Engineering and Electronics RAS & SC 'RPE 'Almaz'
- *Anand Abhishek, Vishant, Niraj Kumar*
CSIR-Central Electronics Engineering Research Institute

Session 5:

Gyrotron Amplifiers

Tuesday, April 26 / 01:20 PM - 03:20 PM / San Carlos III

Chair:

Monica Blank, CPI

5.1 - Experiment on Gyrotron Traveling Wave Tube with Inner Mode Converter in W-band TE₀₂ Mode

- *Efeng Wang, Xu Zeng, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

5.2 - Observation of Low-Frequency Oscillations in W-Band Gyro-TWTs caused by Weak and Strong Plasma

- *Guo Liu, Yu Wang, Wei Jiang, Jianxun Wang, Yong Luo*
University of Electronic Science and Technology of China

5.3 - Experiment Design of One-Octave Bandwidth Gyro-BWO with Zigzag Quasi-Optical Transmission Line

- *Sergey V. Samsonov, Grigoriy G. Denisov, Alexander A. Bogdashov, Igor G. Gachev, Maxim V. Kamenskiy, Kseniya A. Leshcheva*
Institute of Applied Physics, Russian Academy of Sciences

5.4 - Dielectric Loss Dissipation and Power Capacity Analysis for W-Band Gyro-TWT

- *Wei Jiang, Boxin Dai, Chaoxuan Lu, Jianxun Wang, Youlei Pu, Guo Liu, Zewei Wu, Yong Luo*
University of Electronic Science and Technology of China

5.5 - A Broadband TE₀₁ Mode Input Coupler for Ka-Band MW-Level Coaxial Gyrotron Traveling Wave Tubes

- *Yingjian Cao, Weijie Wang, Guo Liu, Yu Wang, Yong Luo*
University of Electronic Science and Technology of China

Session 6:

Scandate and Dispenser Cathodes

Tuesday, April 26 / 01:20 PM - 03:20 PM / San Carlos IV

Chair:

Daniel Busbahr, 3M

6.1 - Scandate Cathode Performance in Xenon Discharge

- *Bernard Vancil, Charles Osborne, Victor Schmidt, Michael Kleschuk*
E Beam, Inc.
 - *Wayne Ohlinger*
Consultant
-

6.2 - Evaluation of Work Function for Scandate Cathodes Produced from Nano-Scandia/Tungsten Composite

- *Daniel E. Bugaris, Claudia Goggin*
Engi-Mat Co.
 - *Antonio Mantica, T. John Balk*
University of Kentucky
 - *Ruslan Chubaruk, Daniel Busbahr*
3M Technical Ceramics
-

6.3 - Relative Thermodynamic Stabilities of Sc-Containing Surface Configurations in Scandate Cathodes

- *Mujan N. Seif, T. John Balk, Matthew J. Beck*
University of Kentucky
-

6.4 - Characterization of the Materials, Phases, and Morphology Typical of High-Performance Scandate Cathodes

- *T. John Balk, Michael J. Detisch, Huanhuan Bai, Xiaotao Liu, Mujan N. Seif, Matthew J. Beck*
University of Kentucky
 - *Bernard K. Vancil*
E Beam, Inc.
-

6.5 - Y2O3 -W Matrix Dispenser Cathodes with Activator Addition

- *Jinshu Wang*
Beijing University of Technology
-

Session 7:

Modeling I - Devices

Tuesday, April 26 / 03:40 PM - 05:40 PM / San Carlos II

Chair:

Peng Zhang, Michigan State University

7.1 - Effects of Magnetic Field on Stability and Attainable Power of VE Amplifiers - keynote

- *Vadim Jabotinski*
Leidos
 - *Igor A. Chernyavskiy, Alexander N. Vlasov*
Naval Research Laboratory
-

7.2 - Eigenmode Solution for Beam-Loaded Slow-Wave Structures Based on Particle-In-Cell Simulations

- *Tarek Mealy, Filippo Capolino*
University of California, Irvine

7.3 - Comprehensive and Increasingly Accurate Stability Study of the Experimental W-Band TWT with Code TESLA-Z Stability Framework

- *Igor A. Chernyavskiy, Alan M. Cook, John C. Rodgers*
US Naval Research Laboratory

7.4 - Impact of Asymmetric Beam Shapes on the Body Current and BWO Margin in Helix TWTs

- *Philip Birtel*
Thales Deutschland GmbH
- *Moritz Hägermann, Arne Jacob*
Hamburg University of Technology

7.5 - Characterization of Reflected RF Power in a Misaligned Ka-Band Serpentine Waveguide TWT

- *Kyle F. Kuhn, Thomas Antonsen, Brian Beaudoin*
University of Maryland, College Park
- *Philipp Borchard, Joseph Hoh*
Dymenso LLC
- *John Petillo, Aaron Jensen*
Leidos Corporation

7.6 - Beam Dynamics Modeling of an Electron Gun for an L-Band High-Efficiency IOT

- *Mohamed A. K. Othman, Brad Shirly, Ann Sy, Erik Jongewaard, Brandon Weatherford*
SLAC National Accelerator Laboratory
- *Michael Boyle, Holger Schult*
Stellant Systems

Session 8:
HPM - Devices

Tuesday, April 26 / 03:40 PM - 05:40 PM / San Carlos III

Chair:

David Abe, DARPA

Co-Chair:

Dev Palmer, Defense Advanced Research Projects Agency

8.1 - Generation of 565 MW of X-Band Power for Structure-Based Wakefield Acceleration Using a Metamaterial-Based Power Extractor

- *Julian Picard, Ivan Mastovsky, Michael A. Shapiro, Richard J. Temkin*
Massachusetts Institute of Technology
- *Xueying Lu*
Northern Illinois University & Argonne National Laboratory
- *Manoel Conde, Scott Doran, Gwanghui Ha, John G. Power, Jiahang Shao, Eric E. Wisniewski*
Argonne National Laboratory
- *Chunguang Jing*
Euclid Techlabs & Argonne National Laboratory

8.2 - Recent Advances on Magnetically Insulated Line Oscillator (MILO)

- *Drew A. Packard*
General Atomics
- *Y. Y. Lau, Emma N. Guerin, Chris J. Swenson, Stephen V. Langellotti, Abhijit Jassem, Dion Li, Nicholas M. Jordan, Ryan D. McBride, Ronald M. Gilgenbach*
University of Michigan
- *John W. Luginsland*
Air Force Office of Scientific Research

8.3 - Dual Recirculating Planar Crossed-Field Amplifier

- *Christopher J. Swenson, Ryan Revolinsky, Emma N. Guerin, Nicholas M. Jordan, Ryan D. McBride, Y. Y. Lau, Ronald M. Gilgenbach*
University of Michigan

8.4 - A Novel Scheme to Reduce the Electron Loss and Power Amplification in an Axial Virtual Cathode Oscillator

- *Sohail Mumtaz, Pradeep Lamichhane, Eun Ha Choi*
Kwangwoon University

8.5 - Efficiency Enhancement for an S-Band Axial Vircator Using Five-Stage Two-Step Tapered Radiators

- *Patrizia Livreri*
University of Palermo & M.E.C.S.A.
- *Francesco Bennardo, Benito F. Tusa*
University of Palermo
- *Pietro Bia, Marco Bartocci, Antonio Manna*
Elettronica S.p.A.
- *Lorenzo Valletti*
University of Rome Tor Vergata
- *Franco Di Paolo, Ernesto Limiti*
M.E.C.S.A. & University of Rome Tor Vergata

8.6 - Cherenkov Maser Amplifier Nonlinear Analysis and Simulations

- *Paul Argyle*
Brigham Young University
- *Phillip Sprangle, Thomas Antonsen*
University of Maryland

Session 9:

Cathodes II: Characterization

Tuesday, April 26 / 03:40 PM - 05:40 PM / San Carlos IV

Chair:

Ryan Jacobs, University of Wisconsin

9.1 - Impact of Patch Fields and Space Charge on the Shape of the Miram Curve

- *Dongzheng Chen, Ryan Jacobs, Dane Morgan, John Booske*
University of Wisconsin-Madison

9.2 - Heterogeneous Cathode Work Function Measurement and Interpretation: A Case Study with SrVO₃

- *Lin Lin, Ryan Jacobs, Dane Morgan, John Booske*
University of Wisconsin-Madison

9.4 - Emission Testing Facility for Dispenser Cathodes

- *Scott Faulkner, Daniel Busbahr*
3M Technical Ceramics Inc.
- *Wayne Ohlinger*
Independent Consultant

9.5 - M-Type Cathode Characterization Using a Kelvin Probe System in Vacuum Chamber

- *Antonio M. Mántica, Michael J. Detisch, T. John Balk*
University of Kentucky

9.6 - High-Efficiency S-Band Axial Vircator

- *Lorenzo Valletti*
University of Rome Tor Vergata
- *Franco Di Paolo, Ernesto Limiti*
University of Rome Tor Vergata & M.E.C.S.A.
- *Pietro Bia, Marco Bartocci, Antonio Manna*
Elettronica S.p.A.
- *Patrizia Livreri*
M.E.C.S.A. & University of Palermo

WEDNESDAY APRIL 27

Coffee / 7:30 – 8:00 am / San Carlos Ballroom Foyer (7:30)

PLENARY SESSION / 8:00 am – 12:30 pm

Welcome and Introduction (8:00)

Jack Tucek, General Chair
Northrop Grumman Corporation

PL3: Precision Mechanical Interfaces for Boosting Millimeter-Wave Devices Performance (8:10)

Mr. Philipp Borchard
Dymenso LLC

Recent advances in technology have demonstrated the capability of sub-micron level machining of individual parts, but the assembly of multiple parts into complete devices, while maintaining the tolerances required, continues to present a significant challenge in the manufacturing process. The use of precision alignment techniques, such as kinematic couplings, quasi-kinematic couplings, and elastic averaging has the potential to transform the mm-wave device fabrication process by providing increased device performance while reducing fabrication costs. Technology application examples will be presented, ranging from X-band to W-band and beyond.

PL4: Apologies to Galileo, a Theologian's Homage to Science (8:55)

Fr. Edward Foley, Capuchin
Catholic Theological Union

The relationship between Christianity and the sciences has not always been a mutual admiration society. Clergy are often suspicious of scientists who can seem to supplant faith with empiricism, and scientists can easily dismiss faith leaders as uncritical thinkers who look more to the past than the future. This reflection will attempt to bridge that gap in an appreciative mode by demonstrating how the innovative, inspiring and imaginative aspects of the scientific quest can be a boon, not only to Christian preachers and teachers, but to all of humanity

Best Student Paper Award (9:40)

2022 Vacuum Electronics Young Scientist Award and Lecture (9:50)

BREAK (10:15)

WEDNESDAY APRIL 27 TECHNICAL PRESENTATIONS (See end of today's listings for poster sessions.)

Session 11: Modeling - Emission

Wednesday, April 27 / 10:40 AM - 12:20 PM / San Carlos III

Chair:

John Petillo, Leidos

11.1 - Predicting Secondary Electron Yield of Metals and Their Alloys Using First-Principles Input - keynote

- *Maciej P. Polak, John Booske, Dane Morgan*
University of Wisconsin
- *Ivana Matanovic, Raul E. Gutierrez, Edl Schamiloglu*
University of New Mexico

11.2 - Shock-Induced Current Due to Charge Impact on a Conducting Surface

- *Dion Li, Y. Y. Lau*
University of Michigan
- *P. Wong*
Michigan State University
- *D. Chernin*
Leidos Inc.

11.3 - Quantum Efficiency of Photoemission from Biased Metal Surfaces with Lasers from UV to NIR

- *Yang Zhou, Peng Zhang*
Michigan State University

11.4 - Characterization of a Duo-Emitter Thermionic Diode

- *Roelof Erasmus Groenewald, Daniel Velazquez, Peter Scherpelz*
Modern Electron

11.5 - High-Fidelity Particle-in-Cell Simulations of Thermionic Converters

- *Peter Scherpelz, Roelof E. Groenewald, Kevin Zhu, Michael Kiebertz, Nicholas Ruof*
Modern Electron
- *Phil Miller*
Intense Computing
- *Amanda M. Lietz, Matthew M. Hopkins*
Sandia National Laboratories

Session 12: V/W-band TWT

Wednesday, April 27 / 10:40 AM - 12:20 PM / San Carlos IV

Chair:

Diana Gamzina, Stanford University

12.1 - Wideband Linearized E-Band MPM for Communication Applications

- *Julia Meinen, Russell Martin, Kevin Berg, Michael Ramay*
Stellant Systems, Inc.

12.2 - High Frequency Circuit for E-Band Sheet Beam TWT

- *Shasha Qiu, Yuan Zheng, Neville C. Luhmann*
University of California, Davis
- *Diana Gamzina, Mik Kuffel, Michelle Gonzalez, Blake Griffin*
Elve, Inc.

12.3 - Enhanced Linearity with Low AM-PM Conversion of InnoSys' Millimeter-Wave Solid-State Vacuum Device (SSVD) Traveling-Wave Tubes

- *Ruey-Jen Hwu, Jishi Ren, Tomas Gutierrez, Yun-Jan Hu, Larry P. Sadwick*
InnoSys, Inc.

12.4 - Frozen Mode in Three-Way Waveguide Slow-Wave Structure for Three-Mode Synchronization

- *Robert Marosi, Tarek Mealy, Alexander Figotin, Filippo Capolino*
University of California, Irvine

12.5 - Investigation on E-Band High Efficiency Folded Wave-Guide Traveling-Wave Tube

- *Li Fei, Zicheng Wang, Yuhui Sun, Hongxia Yi, Xinwen Shang*
Aerospace Information Research Institute, Chinese Academy of Sciences

12.6 - Regime of Traveling-Wave Amplification in an Oversized Circuit with Nonuniform Grating

- *Sergey S. Ponomarenko, Yuri S. Kovshov, Sergey A. Kishko, Alexandr A. Likhachev, Eduard M. Khutoryan, Alexandr F. Zabrodskiy, Sergey A. Vlasenko, Victoriia V. Stoyanova, Alexei N. Kuleshov*
O. Ya. Usikov Institute for Radiophysics and Electronics, NASU

Session 13: Gyrotron Oscillators

Wednesday, April 27 / 01:20 PM - 03:20 PM / San Carlos II

Chair:

Philipp Borchard, Dymenso LLC

13.1 - Progress on TH1509U 170GHZ 1MW European Gyrotron Program

- *Alberto Leggieri, David Bariou, François François, Gerald Lietaer, Christophe Lievin, Rodolphe Marchesin*
THALES
- *Ferran Albajar, Francisco Sanchez*
Fusion For Energy
- *Stefano Alberti*
Swiss Plasma Center
- *Andrea Allio, Rosa Difonzo, Laura Savoldi*
Politecnico di Torino
- *Kostantinos A. Avramidis, Gerd Gantenbein, Stefan Illy, John Jelonnek, Jianbo Jin, Tomasz Rzesnicki, Sebastian Stanculovic, Manfred Thumm*
Karlsruhe Institute of Technology
- *William Bin, Alex Bruschi, Francesco Fanale*
National Research Council
- *Ioannis Chelis, Zisis Ioannidis, George Latsas, Ioannis Tigelis*
National and Kapodistrian University
- *Tim Goodman, Jean-Philippe Hogge, Humberto Torreblanca*
Swiss Plasma Center EPFL

13.2 - Tunable Multi-Mirror Gyrotron for Direct Positronium Measurements

- *Vladislav Zaslavsky, Mikhail Glyavin, Irina Zotova
Insitute of Applied Physics RAS*

13.3 - Stepped Sub-THz Gyrotron Cavity with Improved Output Mode Purity

- *Dietmar Wagner
Max-Planck-Institute for Plasma Physics*
- *Manfred Thumm
Karlsruhe Institute of Technology*

13.4 - Design of a Two-Stage Depressed Collector for Continuous Wave Operation of MW-Class Gyrotrons

- *Benjamin Ell, Chuanren Wu, Gerd Gantenbein, Stefan Illy, Ioannis Gr. Pagonakis, Tomasz Rzesnicki, Sebastian Stanculovic, Manfred Thumm, Jörg Weggen, John Jelonnek
Karlsruhe Institute of Technology (KIT-IHM)*

13.5 - Fabrication of 110GHz, 1MW Gyrotron with Direct Coupled Output

- *Robert Lawrence Ives, David Marsden, George Collins
Calabazas Creek Research, Inc.*
- *Jeffrey Neilson
Lexam Research*
- *James Anderson, Kurt Zeller
General Atomics*

Session 14:

Components, Facilities, and Processes

Wednesday, April 27 / 01:20 PM - 03:20 PM / San Carlos III

14.1 - Demonstration of a 250GHz Quasi-Optical Ring Resonator/Pulse Compressor with High Gain

- *Jeremy Genoud, Elliot L. Claveau, Julian F. Picard, Guangjiang Li, Sudheer K. Jawla, Michael A. Shapiro, Richard J. Temkin
Plasma Science and Fusion Center, Massachusetts Institute of Technology*

14.2 - C-Band Engineering Test Facility: A New High Gradient Breakdown Test Stand at LANL

- *Evgenya I. Simakov, Dmitry V. Gorelov, Mark E. Middendorf, Mitchell E. Schneider, Tsuyoshi Tajima, MD Rashed Alam Zuboraj
Los Alamos National Laboratory*

14.3 - Improved Multipactor Coatings Using Atomic Layer Deposition

- *R. Lawrence Ives
Calabazas Creek Research, Inc.*
- *Christopher Oldham
VaporPulse Technologies, Inc.*
- *Mark Gilmore, Ian Kern
University of New Mexico*

14.4 - Preliminary Optimum Design of Process Parameters of Transient Liquid Phase Welding

- *Guangjiang Yuan, Wei Song, Xin Wang, Yuhui Sun, Jun He, Zhiqiang Zhang
Aerospace Information Research Institute, Chinese Academy of Sciences*

14.5 - Multi-Modes OAM Beam Generation Based on Reflective Holographic Technology

- *Jiahao Qian, Minxing Wang, Yuhang Peng, You Li, Huan Gao, Zewei Wu*
University of Electronic Science and Technology of China

14.6 - A Circular TE₀₂ Mode Filter for Ka-Band High Power Millimeter-Wave Transmission Line

- *Zewei Wu, Minxing Wang, Shuai Huang, Ran Zhang, Hongyu Song, Youlei Pu, Yong Luo*
University of Electronic Science and Technology of China

Session 15:

Cold Cathodes

Wednesday, April 27 / 01:20 PM - 03:20 PM / San Carlos I

Chair: Rahan Kapadia, University of Southern California

15.1 - High Current p-i-n-nanoC Diamond Diodes for Electron Emission

- *Franz A. Koeck, Harshad Surdi, Robert J. Nemanich*
Arizona State University

15.2 - High Field-Emission Performance of Carbon Nanotube Bundle Field Emitters

- *Jiayu Alexander Liu, Jiaqi Wang, Yonghai Sun, Siyuan Chen, Zhemiao Xie, John T.W. Yeow*
University of Waterloo

15.3 - Hot Electron Laser-Assisted Cathode Using Electronically Tunable Negative Electron Surfaces: Prospects and Challenges

- *Subrata Das, Hyun Uk Chae, Ragib Ahsan, Rehan Kapadia*
University of Southern California

15.4 - Field-Emission Characteristics of GaN Arrays

- *Ranajoy Bhattacharya, Jim Browning*
Boise State University
- *Pao-Chuan Shih, Tomás Palacios*
Massachusetts Institute of Technology

15.5 - Vacuum-Channel Field-Emission Transistor Array with Comb-Type Gate

- *Hairong Lai, Lei Xu, Ningfeng Bai, Changshen Shen, Hehong Fan, Zhaofu Chen, Xiaohan Sun*
Southeast University

Poster Session

Cathode Posters

Wednesday, April 27 / 08:10 AM - 08:55 AM / San Carlos I

Chair: Daniel Busbahr, 3M

Co-Chair: Max Mankin, Modern Electron

P1.1 - A High-Current Field-Emission Triode with Nested Ring Gate and Anode

- *Lei Xu, Hairong Lai, Ningfeng Bai, Xiaohan Sun*
Southeast University

P1.2 - Analysis of Y₂O₃ Content to Thermionic Emission Behavior of Rare-Earth Oxide Cathode

- *Xingqi Wang, Xiaoxia Wang, Jirun Luo, Yun Li*
Aerospace Information Research Institute
- *Shikai Qi*
Jiujiang University

P1.3 - A High Average Efficiency Depressed Collector for a 140GHz Sheet-Beam Traveling-Wave Tube with Low Back-Streaming Current

- *Zhaolun Liang, Ying Shang, Kaihang Huang, Guoxiang Shu, Wenlong He*
Shenzhen University
- *Cunjun Ruan*
Beihang University

P1.4 - A Method for Solving the Output Current of Traveling-Wave Tube Electron Gun

- *Xu Zhang, YuLu Hu, LuanFeng Gao, Quan Hu, XiaoFang Zhu, Tao Huang, Bin Li, ZhongHai Yang*
University of Electronic Science and Technology of China
- *WeiBo Huang*
China Academy of Space Technology (Xi'an)

P1.5 - Theory Description and Verification on 0.34THz Circular Electron Beam Gun

- *Yiyang Su, Cunjun Ruan*
School of Electronic and Information Engineering, Beihang University

P1.6 - Sc₂O₃-Y₂O₃ Co-Doped W Matrix Dispenser Cathode

- *Leqi Liu, Yunfei Yang, Jinshu Wang, Wei Liu, Zhikai Hu*
Beijing University of Technology

P1.7 - Simulation of Multiple Electron Beam Focusing Electron Optical System by MTSS

- *Peng Tian, Quan Hu, Xiaofang Zhu, YuLu Hu, Tao Huang, Bin Li*
University of Electronic Science and Technology of China
- *Lizheng Zhao*
Beijing Vacuum Electronics Research Institute

P1.8 - Trajectory Analysis and Experimental Set-Up for Studying Beam Misalignments in THz Multibeam Gyrotrons

- *Eduard Khutoryan, Alexei Kuleshov, Sergey Ponomarenko, Sergey Vlasenko*
O. Ya. Usikov Institute for Radiophysics and Electronics, NASU
- *Ilya Bandurkin, Mikhail Glyavin, Vladimir Manuilov, Irina Zotova*
Institute of Applied Physics, Russian Academy of Sciences
- *Masafumi Fukunari, Seitara Mitsudo*
FIR Center, University of Fukui

P1.9 - 340GHz EIK Electron-Optical System with High Compression Ratio

- *Zixuan Su, Jin Xu, Hongru Li, Hongbin He, Hairong Yin, Lingna Yue, Guoqing Zhao, Guo Guo, Tianzhong Zhang, W.X. Wang, Y.Y. Wei*
University of Electronic Science and Technology of China
- *Wenxin Liu*
Aerospace Information Research Institute, Chinese Academy of Science

P1.10 - First-Principle Calculation of Tin Oxide for Resistive-Wall Amplifier

- *Zhaoyi Zhu, Hairong Yin, Chenyang Li, Jin Xu, Lingna Yue, Guoqing Zhao, W. X. Wang, Y. Y. Wei*
University of Electronic Science and Technology of China

P1.11 - Dielectric Characteristic Measurement of Gyrotron Output Windows

- *Ziye Chen, Jirun Luo*
Aerospace Information Research Institute (Chinese Academy of Sciences) & University of Chinese Academy of Sciences
- *Wei Guo, Xiaoxia Wang, Chen Yang, Yu Fan*
Aerospace Information Research Institute (Chinese Academy of Sciences)

P1.12 - Design of a W-Band Sheet Beam Electron-Optics System and the Equivalent Theory of PCM

- *HongBin He, Jin Xu, Hongru Li, Zixuan Su, Hairong Yin, Lingna Yue, Guoqing Zhao, W.X. Wang, Y.Y. Wei*
University of Electronic Science and Technology of China

P1.13 - Modeling of a Sheet-Beam Electron Gun with High Compression Ratio

- *Hongru Li, Jin Xu, Hongbin He, Zixuan Su, Hairong Yin, Lingna Yue, Guoqing Zhao, W.X. Wang, Y.Y. Wei*
University of Electronic Science and Technology of China

P1.14 - Simulation Study of Annular Beam Electron Optical System Based on Carbon Nanotube Cold Cathode

- *Yifan Zu, Xuesong Yuan, Xiaotao Xu, Qingyun Chen, Bin Wang, Hailong Li, Yang Yan*
University of Electronic Science and Technology of China

P1.15 - High-Temperature Contact Potential Difference and Thermionic Emission Analysis Using Kelvin Probe Systems

- *Antonio Miguel Mantica, Michael Jesse Detisch, T. John Balk*
University of Kentucky

P1.16 - Low-Frequency Oscillator Circuit Using Si-Gated Field-Emitter Arrays

- *Ranajoy Bhattacharya, Robert Hay, Mason Cannon, Jim Browning*
Boise State University
- *Girish Rughoobur, Nedeljko Karaulac, Akintunde I. Akinwande*
Massachusetts Institute of Technology

P1.17 - Power Generation in a Pulsed Plasma Thermionic Diode Using a Barium Dispenser Cathode

- *Daniel Merthe, Mark Stone, Roelof Groenewald, Eric Clark, Andrew Koch*
Modern Electron Corporation

P1.18 - Development of a Cryocooler-Driven RF Cavity Test Facility

- *Paolo Pizzol, Tsuyoshi Tajima, Evgenya I. Simakov, Quinn R. Marksteiner*
Los Alamos National Laboratories

P1.19 - Photoinjector in IAP RAS: State and Prospects

- *Ilya Bandurkin, Vladimir Bratman, Alexey Gorbachev, Kirill Mineev, Nikolai Peskov, Andrei Savilov, Alexander Vikharev*
Institute of Applied Physics, Russian Academy of Sciences

P1.20 - Observations of Temperature-Induced Material Transformations in Impregnated Scandate Cathode Samples During *in situ* Heating in the SEM

- *Huanhuan Bai, T. John Balk*
University of Kentucky

P1.21 - M-Type Cathode Emission Degradation Simulation Based on Surface-Coating Degradation Mechanisms

- *Hehong Fan, Wenrui Sun, Shuai Tang, Xiaohan Sun*
Southeast University
- *Ying Wei*
Beijing Vacuum Electronics Research Institute

P1.22 - Theory Description and Verification on 0.34THz Circular Beam

- *Yiyang Su, Cunjun Ruan, Feng Zhang*
BEIHANG University

P1.23 - Correlation of Emission Characteristics of Dispenser Cathodes with Structure of Aluminates

- *Haoyue Li, Qiang Zheng, Yafen Shang, Jianxun Wang, Yong Luo*
University of Electronic Science and Technology of China

Poster Session

Gyrotrons & Magnetrons Posters

Wednesday, April 27 / 08:10 AM - 08:55 AM / San Carlos I

P2.1 - Design of an Ultra-Broadband Meta-Surface Output Window for W-Band Confocal Gyro-Amplifiers

- *Yibin Sun, Yelei Yao, Wenzhang Li, Wenqi Gao, Guo Liu, Jianxun Wang, Yong Luo*
University of Electronic Science and Technology of China

P2.2 - Study on 220GHz Confocal Gyro-Amplifier Circuits with Wedges-Loaded Mirrors

- *Wenzhang Li, Yelei Yao, Jianxun Wang, Yong Luo*
University of Electronic Science and Technology of China

P2.3 - Experimental Test of the Field-Emission Cathode for Low-Power Gyrotrons

- *Evgeny Taradaev, Gennadii Sominskii*
Peter the Great St.Petersburg Polytechnic University
- *Mikhail Glyavin*
IAP RAS

P2.4 - Experimental Test Results of 170GHz Gyrotron-Driver for Frequency Locked MW Gyrotron

- *Gregory Denisov, Andrey Kufin, Alexey Chirkov, German Golubyatnikov, Mikhail Morozkin, Boris Movshevich, Mikhail Glyavin*
Institute of Applied Physics of the Russian Academy of Sciences
- *Mikhail Bakulin, Elena Soluyanova, Eugeny Tai*
GYCOM Ltd.

P2.5 - Design and Measurement of a Novel Overmoded TE₀₁ Mode Converter for a Rectangular Gyro-TWT

- *Chaoxuan Lu, Wei Jiang, Zewei Wu, Jianxun Wang, Guo Liu, Youlei Pu, Yong Luo*
University of Electronic Science and Technology of China

P2.6 - Design of High-Power S-Band Pulsed Magnetron for Linear Accelerator System

- *Patibandla Anilkumar, Dobbidi Pamu*
Indian Institute of Technology Guwahati
- *Tapeshwar Tiwari*
Centre for High Power Microwave Tube and Component Technology, SAMEER Guwahati

P2.7 - Concept of a Frequency-Tunable Sub-THz Gyrotron Based on the Partial Reflection of the Output Radiation from an External Mirror

- *Ilya Bandurkin, Yuriy Kalynov, Nikolay Peskov, Andrei Savilov, Ivan Osharin, Dmitriy Shchegolkov*
Institute of Applied Physics, Russian Academy of Sciences

P2.8 - Electron-Optic Systems for Gyrotrons with Multi-Mirror Cavities

- *Mikhail Glyavin, Kseniya Leshcheva, Vladimir Manuilov*
Institute of Applied Physics of the Russian Academy of Sciences

P2.9 - Study on a 140GHz, 170GHz Dual-Frequency Gyrotron for Plasma Heating

- *Yichi Zhang, Xu Zeng, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

P2.10 - Design of a Quasi-Optical Launcher for a 135/170GHz, Dual-Frequency Gyrotron

- *Pu Chen, Xu Zeng, Yichi Zhang, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

P2.11 - Research on Low-Frequency Oscillations Caused by Outgassing from Attenuated Dielectric

- *Yuhao Song, Wei Jiang, Guo Liu, Yu Wang, Dajun Zhao, Yong Luo*
University of Electronic Science and Technology of China

P2.12 - High-Power RF Loads for Gyrotrons

- *Lawrence Ives, Thuc Bui, Thomas Habermann, David Marsden, George Collins*
Calabazas Creek Research, Inc.
- *Jeff Neilson*
Lexam Research
- *Tim Horn*
N.C. State University
- *Christopher Rock*
N.C.State University

P2.13 - Frequency Self-Modulation in the W-Band Gyrotron Traveling-Wave Tube Hot Test

- *Yu Wang, Guo Liu, Wei Jiang, Jianxun Wang, Yong Luo*
University of Electronic Science and Technology of China

P2.14 - Comparison of Excitation Voltage-Waveforms for Millimeter-Wave Magnetron

- *Minsheng Song, Yu Qin, Haixia Liu, Yin Yong, Lin Meng, Bin Wang, Hailong Li*
University of Electronic Science and Technology of China

P2.15 - Main Approaches to Suppress Velocity Spread in the Gyrotron Helical Electron Beams

- *Vladimir Manuilov*
Institute of Applied Physics of the Russian Academy of Sciences

P2.16 - Design of High-Efficiency Megawatt Power Level X-Band Coaxial Magnetron

- *Sandeep Kumar Vyas*
Shree Chavo Veero Girls PG College,

P2.17 - Frequency Tuning in a Gyrotron with a Cavity of Variable Cross Section

- *Ilya Bandurkin, Yuriy Kalynov, Ivan Osharin, Andrei Savilov, Dmitriy Shchegolkov*
Institute of Applied Physics of the Russian Academy of Sciences

P2.18 - Multi-Physical Parameter Particle Simulation Analysis of Ka-Band Gyro-TWT

- *Yong Zhong, Efeng Wang*
Beijing Vacuum Electronics Research Institute

P2.19 - Quasi-analytical Theory of Gyro-BWO with a Zigzag Electrodynamical System

- *Ekaterina Novak, Sergey Samsonov, Andrei Savilov*
Institute of Applied Physics, Russian Academy of Sciences

P2.20 - Preliminary Study of Array Magnetron Phase-Locking Performance Measurement Based on Perturbation Theory

- *Yu Qin, Yong Yin, Minsheng Song, Haixia Liu, Bin Wang, Hailong Li, Lin Meng*
University of Electronic Science and Technology of China

P2.21 - Design of Quasi-Optical Microwave Pulse Compressor with Laser-Driven GaAs Switch

- *Gregory Denisov, Alexey Palitsin, Dmitriy Sobolev, Vladimir Parshin, Mikhail Glyavin*
IAP RAS
- *Sergey Morozov*
IPM

P2.22 - Modified Spectral Approach with Linearized Boundary Condition for Gyrotron Cavity Modeling

- *Andrey G. Rozhnev, Maria M. Melnikova, Nikita M. Ryskin*
Saratov Branch Kotelnikov Institute of Radioengineering and Electronics RAS & Saratov State University

P2.23 - Concept of Compact Millimeter Wavelength Range Gyrotron-Based Active Coherent Radar for Moon and Space Debris Detection

- *Alexander Tsvetkov, Lev Lubyako, Egor Gospodchikov*
Institute of Applied Physics, Russian Academy of Sciences

P2.24 - Influence of Non-Resonant Reflection on Mode Competition in a Megawatt-Power Gyrotron

- *Vladimir Lazarevich Bakunin, Grigory Gennadievich Denisov, Yulia Vladimirovna Novozhilova*
Institute of Applied Physics of Russian Academy of Sciences

P2.25 - Enhanced Bandwidth for Gyro-Amplifiers Using Periodic Structures

- *Brenda Scheufele, Thomas Antonsen Jr., Phillip Sprangle*
University of Maryland

P2.26 - Interaction of an Electromagnetic Wave with a Counter-Propagating Electron Beam Under the Condition of Cyclotron Resonance Absorption: Nonlinear Periodic Waves, Modulation Instability, and Generation of Solitons

- *Alena Aleksandrovna Rostuntsova*
Saratov State University & Institute of Applied Physics RAS & Saratov State University
- *Nikita Mikhailovich Ryskin*
Saratov Branch, Kotelnikov Institute of Radioengineering and Electronics RAS & Saratov State University

P2.27 - Oversized Electrodynamic Systems for Powerful Long-Pulse Sub-THz/THz Band FEL: Simulations and “Cold” Tests

- *Nikolai Yu. Peskov, Vladimir I. Belousov, Naum S. Ginzburg, Yuliya S. Oparina, Andrey V. Savilov, Dmitry I. Sobolev, Vladislav Yu. Zaslavsky*
Institute of Applied Physics Russian Academy of Sciences
- *Andrey V. Arzhannikov, Danila A. Nikiforov, Evgeny S Sandalov, Stanislav L. Sinitsky*
Budker Institute of Nuclear Physics Russian Academy of Sciences

P2.28 - Investigation on Mode Converter Based on All-Dielectric Metamaterial for Gyrotron

- *Meng Han, Wenjie Fu, Dun Lu, Chi Chen, Chaoyang Zhang, Xiaotong Guan*
University of Electronic Science and Technology of China

P2.29 - A Dual-Beam Magnetron Injection Gun for a Terahertz Gyrotron

- *Tara R. Sirigiri, Anshul Chandel, Jagadishwar R. Sirigiri*
Bridge12 Technologies, Inc.

Poster Session

HPM - Posters

Wednesday, April 27 / 01:20 PM - 03:20 PM / San Carlos I

Chair:

David Abe, DARPA

Co-Chair:

Dev Palmer, Defense Advanced Research Projects Agency

P3.1 - Experimental Studies of an Overmoded Millimeter-Wave BWO

- *Ahmed Elfrgani, Artem Kuskov, John Rose, Christopher Rodriguez, Delia Hernandez, Edl Schamiloglu*
University of New Mexico

P3.2 - Conception of a Coaxial Ku-Band Transit Time Oscillator with Novel Hollowed Inner Conductor

- *Yannick Delvert, Antoine Chauloux, Jean-Christophe Diot, Nicolas Ribière-Tharaud*
CEA Gramat

P3.3 - Study of Coaxial Magnetron for X-Band Linear Accelerator

- *Arjun Kumar, Tapeshwar Tiwari*
SAMEER, Guwahati

P3.4 - Sub-GW Power Spatially Extended Surface-Wave Oscillators of Cylindrical Geometry with Two-Dimensional Distributed Feedback Operating at Ka and W Bands

- *Nikolai Yu. Peskov, Edward B. Abukirov, Andrey N. Denisenko, Naum S. Ginzburg, Mikhail D. Proyavin, Vladislav Yu. Zaslavsky*
Institute of Applied Physics Russian Academy of Sciences

P3.5 - Automatic Test System for HPM Effect Injection Experiment

- *Chunguang Ma, Mingwen Zhang, Yuanci Gao, Junyu Zhao, Yong Luo*
University of Electronic Science and Technology of China
- *Qingqing Zhen*
An Fang Gao Ke Electromagnetic Safety Technology (Beijing) Co., Ltd.

Poster Session

TWT - Posters

Wednesday, April 27 / 01:20 PM - 03:20 PM / San Carlos I

Chair:

Rich Kowalczyk, Multibeam

P4.1 - Experiment on Radial Beam Angular Log-Periodic Strip-Line Traveling Wave Tube

- *Tenglong He, Shaomeng Wang, Zhanliang Wang, Yubin Gong*
University of Electronic Science and Technology of China
-

P4.2 - Analysis of Broad-Band Inter-Digital Structure for mm-Wave Traveling-Wave Tubes

- *M. Sumathy, Mita Jana, S. K. Datta*
Microwave Tube Research and Development Centre
-

P4.3 - Experiment of a High Fill Ratio Electro-Optical System for a Ka-Band Traveling-Wave Tube

- *Duo Xu, Hexin Wang, Shaomeng Wang, Zhanliang Wang, Zhigang Lu, Huarong Gong, Zhaoyun Duan, Yubin Gong*
University of Electronic Science and Technology of China
-

P4.4 - A Novel Coplanar Double V-Shaped Slow-Wave Structure for E-Band Backward-Wave Oscillator

- *Yuxin Wang, Yang Dong, Duo Xu, Jingyu Guo, Shaomeng Wang, Zhanliang Wang, Zhigang Lu, Huarong Gong, Zhaoyun Duan, Yubin Gong*
University of Electronic Science and Technology of China
-

P4.5 - A 71-76GHz TWTA for Wireless Communication

- *Shishuo Liu, Qingmei Xie, Zhaofei Chen, Yujuan Wu, Yinxing Chen, Zhangxiong Zi, Jun Cai, Jinjun Feng*
Beijing Vacuum Electronics Research Institute
-

P4.6 - Design, Simulation, and Test of a 1.7kW W-Band Sheet Beam Staggered Double-Grating TWT

- *Yu Fan*
Aerospace Information Research Institute, Chinese Academy of Sciences
-

P4.7 - 3D PIC Simulation of High-Power Traveling-Wave Tube with Multiple-Tunnel Meander-Line Slow-Wave Structure

- *Roman A. Torgashov, Nikita M. Ryskin, Andrey G. Rozhnev*
Saratov Branch Kotelnikov Institute of Radioengineering and Electronics RAS & Saratov State University
-

P4.8 - Simulation of W-Band Folded Waveguide Traveling-Wave Tube with Improved Gain Flatness

- *Luqi Zhang, Yi Jiang, Rui Song, Wenqiang Lei, Peng Hu, Mawu Ma*
Institute of Applied Electronics China Academy of Engineer Physics
-

P4.9 - Preliminary Design of an 8-38GHz Helix x TWT

- *Wei Li, Lingna Yue, Wenbo Shan, Lewei Xu, Jin Xu, Hairong Yin, Guoqing Zhao, Yanyu Wei, Wenxiang Wang*
University of Electronic Science and Technology of China

P4.10 - Development of a 50-Watt Ultra-Broadband TWT

- *Jianyong Kou, Baoliang Hao, Xiaojun Meng, Jianling Cui, Jun Lv, Weihong Ren, Tianying Chang, Yixue Wei, Hongzhi Zhang, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

P4.11 - A Novel Cold Characteristics Simulation for Wide-Band Helix TWTs

- *Suresh Kumar*
Bharat Electronics Limited
- *Mukesh Kumar Alaria, Sanjay Kumar Ghosh*
CSIR-CEERI

P4.12 - Protecting Dielectric SWS Channel from Charging

- *Yuriy Nikitich Pchel'nikov*
Retire

P4.13 - Planar Helix Slow-Wave Structure for K-Band Traveling-Wave Tube

- *Giacomo Ulisse, Viktor Krozer*
Goethe University Frankfurt
- *Roman A. Torgashov, Nikita M. Ryskin*
Saratov Branch, Kotelnikov Institute of Radioengineering and Electronics RAS & Saratov State University

P4.14 - The New Precision Bead-Pull Bench at Thales

- *Fred Oulefki, Frédéric André*
Thales AVS/MIS

P4.15 - Reliability Status of Domestic Space TWTA Analysis and Promotion in China

- *Ning Xiao Wang, Bao Xiao Su*
Aerospace Information Research Institute, Chinese Academy of Sciences

P4.16 - Design of a 250W Ku-Band High-Efficiency Space TWT

- *Wenkai Deng, Yulu Hu, Xiaobing Wang, Shilong Zhu, Quan Hu, Xiaofang Zhu, Luanfeng Gao, Tao Huang, Bin Li, Zhonghai Yang*
University of Electronic Science and Technology of China
- *Xinwen Shang*
Aerospace Information Research Institute

P4.17 - Design of Dynamic Variable Power with High Efficiency and Reliability for Ku-Band TWT

- *Xinwen Shang, Hongxia Yi, Feng Jin, Liu Xiao, Zicheng Wang*
Aerospace Information Research Institute, Chinese Academy of Sciences
- *Weibo Huang*
China Academy of Space Technology (Xi'an)

P4.18 - Development of Components of Multi-Beam Based E-Band TWT

- *Hong Eun Choi, Wonjin Choi, EunMi Choi*
Ulsan National Institute of Science and Technology (UNIST)

P4.19 - Realization Method of Permanent Magnet Focusing System for Improving Electron Injection Flow Rate in High-Frequency Traveling-Wave Tube

- *Shaofei Liu, Quan Hu, Xiaofang Zhu, Xiaolin Jin, YuLu Hu, Tao Huang, Li Xu, Bin Li, Zhonghai Yang*
University of Electronic Science and Technology of China
- *Li Qiu*
Beijing Vacuum Electronics Research Institute

P4.20 - Increasing the Output Power of Helix TWTs

- *Yuriy Nikitich Pchelnikov*
Retired

P4.21 - An Application of Metasurface in U-shape Meander-line Slow Wave Structure

- *Zhouqijun Li, Zheng Wen, Jirun Luo*
Aerospace Information Research Institute (Chinese Academy of Sciences) & University of Chinese Academy of Sciences
- *Zhiqiang Zhang*
Aerospace Information Research Institute (Chinese Academy of Sciences)

P4.22 - Study of High-Power Uniform-Structure Helix Traveling Wave Tube

- *Lexin Yang, Ningfeng Bai, Xiaohan Sun*
Southeast University
- *Xiaoran Zhang, Meng Sun, Hongxia Chen*
Nanjing Sanle Group Co. Ltd
- *Xuemei Cao, Wenjie Yu*
Beijing Vacuum Electronics Institution

P4.23 - The Study on the Key Parameter in Beam-Wave Resynchronization Method of the Non-Periodic FW-SWS for TWTs

- *Zheng Wen, Jirun Luo*
Aerospace Information Research Institute, Chinese Academy of Sciences & University of Chinese Academy of Sciences
- *Fang Zhu*
Aerospace Information Research Institute, Chinese Academy of Sciences

P4.24 - Optimization Method of High-Efficiency Collector Based on Energy Distribution Measurement

- *Xiaobing Wang, Quan Hu, Wenkai Deng, Shilong Zhu, Xiaofang Zhu, Yulu Hu, Tao Huang, Bin Li, Zhonghai Yang*
University of Electronic Science and Technology of China
- *Xinwen Shang*
Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing

P4.25 - Small Signal Analysis of Open Planar Tape Helix SWS with Straight Edge Rectangular and Cylindrical

- *NAVEEN BABU GNANAMOORTHI, MADHUR UPADHYAY, Jitendra Prajapati*
Shiv Nadar University

P4.26 - Numerical Method for Coil Magnetic Field of Traveling-Wave Tube

- *Weibing He, Quan Hu, Shilong Zhu, Xiaofang Zhu, Yulu Hu, Bin Li, Zhonghai Yang*
University of Electronic Science and Technology of China

P4.27 - High Efficiency and Low Loss Investigation of an Advanced Dual-cavity SB-EIO

- *Shaoqian Qin, Jianxun Wang, Xinjie Li, Yixin Wan, Zewei Wu, Guo Liu, Chunguang Ma, Wei Jiang, Yong Luo*
University of Electronic Science and Technology of China

P4.28 - G-Band Wide-Bandwidth Traveling-Wave Tube Based on Sine Waveguide

- *Ziqi Guo, Yanyu Wei, Jin Xu, Jian Zhang, Hairong Yin, Lingna Yue, Guoqing Zhao, Wenxiang Wang*
University of Electronic Science and Technology of China

THURSDAY, APRIL 28

THURSDAY, APRIL 28, TECHNICAL PRESENTATIONS

(See end of today's listings for poster sessions.)

Coffee / 7:30 – 8:00 am / San Carlos Ballroom Foyer

(7:30)

Session 16:

Modeling - Methods

Thursday, April 28 / 08:10 AM - 10:20 AM / San Carlos III

Chair:

Eric Nelson, Los Alamos National Laboratory

16.1 - Adjoint Approach to Optimization of TWT Design

- *Alexander N. Vlasov, Igor A. Chernyavskiy*
US Naval Research Laboratory
- *Thomas M. Antonsen, Jr., David P. Chernin*
Leidos Inc.

16.2 - Development and Application of Adjoint Methods in the Presence of Static Electric and Magnetic Fields in the MICHELLE Beam Optics Code

- *John Petillo, Serguei Ovtchinnikov, Aaron Jensen*
Leidos
- *Thomas Antonsen, Brian Beaudoin, Kyle Kuhn*
University of Maryland
- *Philipp Borchard*
Dymenso LLC

16.3 - Shapelets with Optimization in Beam Optics Analyzer

- *Thuc Bui, Robert Lawrence Ives*
Calabazas Creek Research Inc.
- *Chris McKenzie*
Oxford Instruments X-ray Technology, Inc.

16.4 - Enhanced Transmission Phenomenon of Subwavelength-Hole Arrays Under Electron Beam Excitation

- *Shuhe Zhang, Ping Zhang, Shu Jing, Shaomeng Wang, Lin Meng, Yubin Gong*
University of Electronic Science and Technology of China

16.5 - Inverse Design of Folded-Waveguide SWS with Bidirectional Fully Connected Neural Network

- *Yijun Zhu, Ningfeng Bai, Xiaohan Sun*
Southeast University
- *Pan Pan, Jun Cai, Jinjun Feng*
Beijing Vacuum Electronics Institution

Session 17:

Electron Gun Development

Thursday, April 28 / 08:10 AM - 10:20 AM / San Carlos IV

Chair:

John Petillo, Leidos

17.1 - Direct Comparison of Analytically Derived Fedosov Solution with Numerical Simulations of Intense Relativistic Electron-Beam Generation in Magnetically Insulated Coaxial Diode of SINUS-6 High-Current Electron-Beam Accelerator

- *Andrey D. Andreev, K. Nusrat Islam, Edl Schamiloglu*
University of New Mexico

17.2 - Two Benchmark Simulations of Intense Annular High-Current Electron Beam Generation, Acceleration, and Transport in a Smooth Cylindrical Waveguide Driven by the SINUS-6 Accelerator at UNM

- *K. Nusrat Islam, Andrey D. Andreev, Edl Schamiloglu*
University of New Mexico

17.3 - Design of an Electron Gun and PPM Focusing System for Low-Voltage W-Band TWTs

- *Huanli Ji, Jinsheng Yang, Ji Chen, Jun Cai, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

17.4 - Design and Optimization of a Sheet-Beam Electron Gun for Terahertz SDV-TWTs

- *Ying Shang, Guoxiang Shu, Zhaolun Liang, Kaihang Huang, Wenlong He*
Shenzhen University & Beihang University
- *Cunjun Ruan*
Beihang University

17.5 - Experiment of a Grid-Controlled Electron Gun for the Reversed Cherenkov Radiation Oscillator

- *Zhifang Lyu, Shengkun Jiang, Xuanming Zhang, Chuanchao Wang, Zhanliang Wang, Yubin Gong, Zhaoyun Duan*
University of Electronic Science and Technology of China
- *Dejun Jin*
Nanjing Sanle Microwave Technology Development Co., Ltd.

Session 18:

TWT

Thursday, April 28 / 10:40 AM - 12:20 PM / San Carlos III

Chair:

Rich Kowalczyk, Multibeam

18.1 - The Hot Test of High-Power Ku/K Dual-Band TWT

- *Hongxia Yi, Fei Li, Xinwen Shang, Liu Xiao*
Aerospace Information Research Institute, Chinese Academy of Sciences

18.2 - Fabrication of Traveling-Wave Tube Amplifier Circuit using Elastic Averaging Precision Alignment Techniques

- *Philipp Borchard, Joseph Hoh*
Dymenso LLC
- *Kyle Kuhn, Brian Beaudoin, Thomas Antonsen Jr.*
University of Maryland
- *John Petillo, Aaron Jensen*
Leidos Corporation

18.3 - 500-Watt, 4 to 10GHz, Meander-Line Elliptical Beam Traveling-Wave Tube

- *Xiaoling Zhai, James Michael Martin, Alexander May, Sean Douglass, Russell Martin*
Stellant Systems, Inc.

18.4 - 140-Watt, 50% Efficient Ku-Band Microwave Power Module for Improved Airborne Data Link Range Capability

- *Sean Douglass, Julia Meinen, Thomas Hargreaves, Dan Springmann*
Stellant Systems, Inc.

18.5 - Development of C/X/Ku-Band High-Power Helix Traveling-Wave Tube

- *Zhun Xu, Yuan Wang, Xiaoping He, Hongyan Yang, Wengjing Zou, Daxi Ji, Tian Liang, Hui Xu, Yang Chen*
Nanjing Sanle Group Company Ltd.
- *Gangxiong Wu*
Nantong University

Session 19:
Magnetrons and Fast-Wave Components

Thursday, April 28 / 10:40 AM - 12:20 PM / San Carlos IV

Chair:

Nicholas Jordan, University of Michigan

19.1 - 8MW Light-Weight, High-Power, Vane and Strap Magnetron

- *Michael S. Worthington, John C. Cipolla, Hugh Shultz, Joe Musheno, Bethany Maihle, Todd Hansen*
Stellant Systems

19.2 - Low-Voltage Magnetrons with Two Energy Outputs

- *Gennadiy I. Churyumov*
O.Ya. Usikov Institute for Radiophysics and Electronics of National Academy of Science of Ukraine
- *Shuang Qiu*
Tsinghua University
- *Nan-nan Wang*
Harbin Institute of Technology

19.3 - ICEPIC Simulations of Microwave Power Increase from 2.45GHz Magnetron

- *Andrey D. Andreev, Edl Schamiloglu*
University of New Mexico
- *Sean M. Torrez, Brendan E. Nunan*
Physical Sciences Inc.

19.4 - Fabrication and Characterization of TE₆₂ Mode Generator for W-Band Gyrotron

- *Nani Medicherla, Naveen Sharma, R. Seshadri*
MTRDC, DRDO
- *Machavaram V. Kartikeyan*
IIT TP

19.5 - Higher Order Mode Generator Direct-Coupled with a Dielectric Rod Waveguide at W-band

- *TaeGyu Han, EunMi Choi*
Ulsan National Institute of Science and Technology
- *JinHo Lim*
The University of Suwon

Session 20:**Microfabricated THz Regime Sources**

Thursday, April 28 / 01:20 PM - 03:20 PM / San Carlos III

Chair:**Alan Cook, NRL**

20.1 - 0.34THz Continuous-Wave Microwave Power Module - keynote

- *Pan Pan, Lin Zhang, Jinjun Feng*
Beijing Vacuum Electronics Research Institute

20.2 - Design and Fabrication of Devices for Characterization of Cold Parameters in Self-Assembled Metal Helices

- *Divya J. Prakash, Francesca Cavallo*
University of New Mexico
- *Marcos Martinez-Argudo, Shiva Hajitabarmarznaki, Max G. Lagally, Daniel W. van der Weide*
University of Wisconsin-Madison

20.3 - 3D Study of the Hybrid Bulk-Surface Eigen Modes in THz Cherenkov Oscillator

- *Eduard M. Khutoryan, Alexei N. Kuleshov, Sergey S. Ponomarenko, Kostyantyn A. Lukin*
O. Ya. Usikov Institute for Radiophysics and Electronics, NAS of Ukraine
- *Yoshinori Tatematsu, Masahiko Tani*
Research Center for Development of Far-Infrared Region, University of Fukui

20.4 - Research on G-Band Extended Interaction Klystron with Broad Bandwidth and High Output Power

- *Feng Zhang, Yaqi Zhao, Cunjun Ruan*
Beihang University

20.5 - Design of a High-Frequency System for a Dual-Mode 220GHz Sheet-Beam TWT

- *Jingcong He, Guoxiang Shu, Jiakai Liao, Junchen Ren, Zhiwei Chang, Jujian Lin, Guangxin Lin, Qi Li, Wenlong He*
Shenzhen University
- 291.7 GHz). The designed high-frequency-system is currently under machining using the nano-computer numerical control milling technique.

Session 21:**Multipactor**

Thursday, April 28 / 01:20 PM - 03:20 PM / San Carlos IV

Chair:**Dev Palmer, Defense Advanced Research Projects Agency**

21.1 - Susceptibility of Single-Surface Multipactor Driven by Non-sinusoidal Transverse RF Electric Field

- *De-Qi Wen, Asif Iqbal, Corey Scutt, Peng Zhang, John P. Verboncoeur*
Michigan State University

21.2 - Investigation of Two-Surface Multipactor with Two-Frequency RF Fields and Space-Charge Effects

- *Asif Iqbal, John Verboncoeur, Peng Zhang*
Michigan State University

21.3 - Multipactor Susceptibility and Suppression in Microstripline Transmission Line

- *Mirhamed Mirmozafari, Nader Behdad, John Booske*
University of Wisconsin-Madison

21.4 - Experiments on Multipactor Suppression in a Coaxial Transmission Line

- *Stephen V. Langellotti, Nicholas M. Jordan, Y.Y. Lau, Ronald M. Gilgenbach*
University of Michigan
- Multipactor discharges are capable of damaging and disrupting RF vacuum electronic devices. Developing new techniques for suppressing and preventing multipactor discharges is essential to ensure reliable, long-term operations. We explore two methods to prevent multipactor in a coaxial transmission line by altering the surface morphology. We evaluate the multipactor suppression properties of textured 3D printed versus porous conductor surfaces.

Session 22:

Space TWT

Thursday, April 28 / 03:40 PM - 05:40 PM / San Carlos III

Chair:

Lawrence Ives, CCR

22.1 - High-Power High-Frequency Space Traveling-Wave Tube

- *Frédéric André, Sophie Kohler, Justin Demory, Jean Gastaud*
THALES AVS France
 - *Jérôme Puech, Cedric Tottolo*
CNES
 - *Roberto Dionisio*
ESA/ESTEC
-

22.2 - Space 35-Watt Q-Band Linearized Traveling-Wave Tube Amplifier Flight Set

- *Neal Robbins, Xiaoling Zhai, William Menninger, Eddie Rodgers*
Stellant Systems, Inc.
-

22.3 - K-Band Helix TWT for NASA Artemis Project

- *Miki Nishioka, Naofumi Kosugi, Daiki Matsumoto, Takatsugu Munehiro, Tetsuo Machida, Yoshinori Mori, Kenji Nakajima*
NEC Network and Sensor Systems, Ltd.
 - *Travis Stewart*
NEC Corp. of America
-

22.4 - Dual Mini-TWT for Active Array Antenna

- *Frédéric André, Jean-Claude Racamier, Gaël Derven, Amel Maati, Stephane Cholet, Antoine Mollard, Florian Corbel, Franck Beillevaire*
Thales AVS/MIS
 - *Martin Hecht, Peter Ehret*
Thales Germany
-

22.5 - Space Radar TWTs for New Applications

- *Ernst Bosch, Philip Birtel*
Thales Deutschland GmbH

Poster Session

Microfabrication/THz (Poster)

Thursday, April 28 / 08:10 AM - 10:20 AM / San Carlos I

Chair:

John Booske, University of Wisconsin

Co-Chair:

Colin Joye, Naval Research Laboratory

P5.1 - A 0.65THz Extended Interaction Klystron Amplifier

- *Yang Dong, Shaomeng Wang, Jingyu Guo, Zhanliang Wang, Zhigang Lu, Huarong Gong, Zhaoyun Duan, Yubin Gong*
University of Electronic Science and Technology of China

P5.2 - 0.22THz Traveling-Wave Tube Based on a V-Shaped Rectangular Groove Staggered Double-Grating Waveguide Slow-Wave Structure

- *Youfeng Yang, Yang Dong, Jingyu Guo, Duo Xu, Shaomeng Wang, Zhanliang Wang, Zhigang Lu, Huarong Gong, Zhaoyun Duan, Yubin Gong*
University of Electronic Science and Technology of China

P5.3 - Design of a Terahertz Multi-Beam BWO Based upon Sine Waveguide

- *Shuanzhu Fang*
China Electronic Product Reliability and environmental Testing Research Institute, CEPREI, Zhucun Street, Guangdong, China
- *Xianghong Hu, Yue Zhi, Baojun Qiu, Xiaoqiang Wang, Daojun Luo*
China Electronic Product Reliability and environmental Testing Research Institute, CEPREI
- *Yanyu Wei*
University of Electronic Science and Technology of China

P5.4 - Study for a 0.34THz Filleted Staggered Double Vane SWS

- *Jingyu Guo, Yang Dong, Zhanliang Wang, Zhigang Lu, Huarong Gong, Zhaoyun Duan, Yubin Gong, Shaomeng Wang*
University of Electronic Science and Technology of China

P5.5 - One Technological Process Design of Planar Slow Wave Structure by Using MEMS Method

- *Hexin Wang, Shaomeng Wang, Zhanliang Wang, Duo Xu, Tenglong He, Huarong Gong, Zhaoyun Duan, Yubin Gong*
University of Electronic Science and Technology of China
- *Yanyan Tian*
Shenzhen University

P5.6 - Research for High Power G-Band Transformed Folded Waveguide Pulsed Traveling Wave Tube

- *Lei Wenqiang, Jiang Yi, Song Rui, Zhang Luqi, Hu Peng, Ma Guowu*
Institute of Applied Electronics China Academy of Engineer

P5.7 - Design and Test High-Frequency System of G-band Folded Waveguide Traveling-wave Tube

- *Hongfei Li, Yujiang Liu, Feng Lan, Zugen Guo, Ruifeng Zhang, Huarong Gong*
University of Electronic Science and Technology of China
- *Rui Guo*
Guoguang Electric Co., Ltd., Chengdu

P5.8 - A G-Band Compact Folded Waveguide Traveling Wave Tube Operating at 3π Phase Shift

- *Yang Xie, Ningfeng Bai, Xiaohan Sun*
Southeast University
- *Hongxia Chen*
Nanjing Sanle Group Co. Ltd
- *Pan Pan, Jun Cai, Wenjie Yu, Jinjun Feng*
Beijing Vacuum Electronics Institution

P5.9 - Progress of the G-Band Sheet-Beam TWT

- *Changqing Zhang, Xueliang Chen, Pan Pan, Xingwang Bian, Weisi Meng, Bowen Song, Siming Su, Ying Li, Na Li, Ke Zhang, Jun Cai, Jinjun Feng*
Beijing Vacuum Electronics Research Institute (BVERI)

P5.10 - 3-D Particle-in-Cell Simulation of a Multiple-Beam 0.22-THz Traveling Wave Tube

- *Vladimir N. Titov, Andrey E. Ploskih, Nikita M. Ryskin*
Saratov Branch, Kotelnikov Institute of Radio Engineering and Electronics RAS & Saratov State University

P5.11 - Development Progress of a 220-GHz Extended Interaction Klystron

- *Zhaowei Qu, Zhiqiang Zhang, Shuzhong Wang, Qingsheng Li, Ding Zhao, Zicheng Wang*
Aerospace Information Research Institute, Chinese Academy of Sciences

P5.12 - Resonance Characteristics of Ridge-Loaded Barbell Cavity with Transverse-Mode Overlapping

- *Han Wang, Qianzhong Xue*
Aerospace Information Research Institute, Chinese Academy of Sciences & University of Chinese Academy of Sciences
- *Ding Zhao, Zhaowei Qu*
Aerospace Information Research Institute, Chinese Academy of Sciences

P5.13 - Enhancing Radiation of Grating by Defect Structure

- *Jing Shu, Ping Zhang, Shuhe Zhang, Hongyang Guo, Shaomeng Wang, Yong Yin, Lin Meng, Yubin Gong*
University of Electronic Science and Technology of China

P5.14 - Preparation of SnO_x Thin Films for Vacuum Electronic Amplifier Applications

- *Yue Ouyang, Yanyu Wei, Hairong Yin, Lingna Yue, Jin Xu, Guoqing Zhao*
University of Electronic Science and Technology of China

P5.15 - Theoretical Research on a TM₀₂ Mode Terahertz Extended Interaction Oscillator

- *Qinwen Xue, Yifan Zu, Qingyun Chen, Xuesong Yuan, Yang Yan*
University of Electronic Science and Technology of China

P5.16 - Design and Research of a 150GHz Extended Interaction Oscillator with Sheet Beam Working in High-order Mode

- *Rongxing Zeng, Jie Qing, Qinwen Xue, Lu Liu, Tianzhong Zhang, Xinjian Niu*
University of Electronic Science and Technology of China

P5.17 - Preliminary Study of a Sub-terahertz Orthogonal Grating Waveguide for High-order Mode Backward Wave Oscillators

- *Jiacai Liao, Guoxiang Shu, Jingcong He, Junchen Ren, Zhiwei Chang, Jujian Lin, Guangxin Lin, Qi Li, Wenlong He*
Institute of Microelectronics, College of Electronics and Information Engineering of Shenzhen University

P5.18 - A Novel Ridge-Loaded Sine Waveguide for 0.22THz Sheet Electron-Beam Traveling-Wave Tube

- *Shuanzhu Fang, Jun Luo, Tiejang Wang, Xiaoqiang Wang, Baojun Qiu, Daojun Luo*
China Electronic Product Reliability and Environmental Testing Research Institute, CEPREI

P5.19 - Electrostatic Charged-Particle Guides for μm -Scale Beam-Wave Interactions

- *Benjamin J. Slayton, Ryan S. Kim, William P. Putnam*
University of California, Davis

P5.20 - Design of a 140GHz Sheet-Beam Traveling-wave Tube with a Cutoff Sever

- *Kaihang Huang, Guoxiang Shu, Ying Shang, Zhaolun Liang, Wenlong He*
Shenzhen University
- *Cunjun Ruan*
Beihang University

P5.21 - Analysis of Frequency Shift Due to Misalignment Between Upper and Lower Plates of W-Band Planar Interaction Structure

- *Monodipa Sarkar*
Academy of Scientific and Innovative Research (AcSIR)
- *Niraj Kumar*
Academy of Scientific and Innovative Research (AcSIR) & CSIR-Central Electronics Engineering Research Institute

P5.22 - Investigation of G-Band Array Sheet-Beam Meander-Line Backward-Wave Oscillator

- *Yuxin Wang, Shaomeng Wang, Yang Dong, Jingyu Guo, Duo Xu, Hexin Wang, Yubin Gong*
University of Electronic Science and Technology of China

P5.23 - Design and Experiment of the Electron-optical System for 0.67 THz TWT

- *Yi Jiang, Wenqiang Lei, Peng Hu, Rui Song, Zhang Luqi, Ma Guowu, Hongbin Chen, Xiao Jin*
Institute of Applied Electronics, China Academy of Engineering Physics

P5.24 - Enhancement of Smith-Purcell Radiation from Bound States in the Continuum

- *Leilei Mao, Zhaofu Chen, Ningfeng Bai, Xiaohan Sun*
Southeast University

P5.25 - Research on Smith-Purcell Radiation Characteristics of Cylindrical Metallic Grating

- *Mengmeng Jin, Zhaofu Chen, Ningfeng Bai, Xiaohan Sun*
Southeast University

P5.26 - Research Progress on Double-Mode Staggered Double-Vane Traveling-Wave Tube in G-Band

- *Wenbo Wang, Zheng Zhang, Cunjun Ruan*
Beihang University

P5.27 - Study of OAM Mode Identification by Electric Field Intensity Measurements at E-Band

- *Seok Ju Moon, EunMi Choi*
Ulsan National Institute of Science and Technology (UNIST)
- *JinHo Lim*
University of Suwon

P5.28 - CFDTD PIC Simulation of a Dielectric-Loaded Rectangular Waveguide for THz Wave Generation

- *Ming-Chieh Lin*
Hanyang University
- *David N. Smithe*
Tech-X Corporation

P5.29 - Reflective Amplification of Powerful Terahertz Pulse by Relativistic Electron Bunch

- *Andrei Savilov, Yuliya Oparina, Dominika Krygina*
Institute of Applied Physics, Russian Academy of Sciences

P5.30 - Development of Electron-Optic System with Compression of Multiple Elliptic Electron Beam

- *Igor A. Navrotsky*
Saratov Branch, Kotelnikov Institute of Radio Engineering and Electronics RAS
- *Nikita M. Ryskin*
Saratov Branch, Kotelnikov Institute of Radio Engineering and Electronics RAS & Saratov State University

Poster Session

Klystron / IOT Posters

Thursday, April 28 / 08:10 AM - 10:20 AM / San Carlos I

P6.1 - Particle Simulation for the X-Band Multi-Injection Klystron

- *Zhou Zhao, Dagang Liu, Laqun Liu, Huihui Wang*
University of Electronic Science and Technology of China

P6.2 - A High-Efficiency, High-Average-Power, Multiple-Beam-Inductive Output Tube

- *Henry P. Freund, R. Lawrence Ives, Thuc Bui, Michael Read, Thomas Habermann*
Calabazas Creek Research, Inc.
- *Walter Sessions*
Georgia Tech Research Institute

P6.3 - A New Method to Improve the Efficiency of High-Peak-Power Klystron

- *Yong Zhong, Yan Shu*
Beijing Vacuum Electronics Research Institute

P6.4 - Design of Triple-Gap Cavity Output Circuit for X Band Klystron

- *Xin Guo, Honghong Gu, Yaogen Ding, Yuan Liang, Bin Shen, Haibing Ding, Zhiqiang Zhang*
Aerospace Information Research Institute, Chinese Academy of Sciences

P6.5 - Study of Two-Beam Loading on an Input Cavity for High-Power Ka-Band Klystron

- *Xinyu Jiang, Liangjie Bi, Yong Yin, Bin Wang, Hailong Li, Lin Meng*
University of Electronic Science and Technology of China

P6.6 - Mitigating Cathode Overcurrent Faults at the Spallation Neutron Source

- *John Moss, George Toby*
Spallation Neutron Source, Oak Ridge National Laboratory

P6.7 - Development of S-Band High Power Amplifier Klystron

- *Dmitriy A. Komarov, Evgeny P. Yakushkin, Yury N. Paramonov, Denis A. Kalashnikov*
JSC 'RPC 'Toriy'

P6.8 - A Miniaturized Metamaterial Klystron for Accelerator Application

- *Xuanming Zhang, Zhifang Lyu, Yubin Gong, Zhaoyun Duan*
University of Electronic Science and Technology of China
- *Shaozhe Wang, Jianjun Zou, Yurong Liu, Yongming Li*
Kunshan Guoli High Power Device Industrial Technology Research Institute Co. Ltd.

Poster Session

Power Supplies, Windows, Components, and Other - Posters

Thursday, April 28 / 01:20 PM - 03:20 PM / San Carlos I

Chair:

Larry Sadwick, Innosys

P7.1 - Millimeter-Wave Interferometric for Low-Loss Nonmetallic Sheet Thickness Measurement

- *Liangping Chen, Yu Qin, Liangjie Bi, Yong Yin, Bin Wang, Hailong Li, Lin Meng*
University of Electronic Science and Technology of China

P7.2 - A Broadband Smooth-Walled Spline-Profile Horn with a Stable Radiation Field

- *Hongyu Song, Zewei Wu, Shuai Huang, Mingxing Wang, Youlei Pu, Yong Luo*
University of Electronic Science and Technology of China

P7.3 - Effects of Realistic Magnetic Field in Ferrite on the Waveguide Circulator for Industrial Applications

- *Kaviya Aranganadin, Ming-Chieh Lin*
Hanyang University
- *Hua-Yi Hsu*
National Taipei University of Technology

P7.5 - Investigation of Brewster Window for Broadband Terahertz Backward-Wave Oscillator

- *Ziqing Bai, Lingna Yue, Linqi Feng, Jin Xu, Hairong Yin, Yanyu Wei, Wenxiang Wang*
University of Electronic Science and Technology of China

P7.6 - Design of Uniform Intensity Field Forming System Based on Improved G-S Algorithm

- *Quanli Li, Zewei Wu, Minxing Wang, Hongyu Song, Youlei Pu, Yong Luo*
School of Electronic Science of Engineering, University of Electronic Science and Technology of China

P7.7 - Study on the Application of Oversized Horn Antenna in Array

- *Haixia Liu, Minsheng Song, Yu Qin, Yong Yin, Lin Meng, Bin Wang, Hailong Li*
University of Electronic Science and Technology of China

P7.8 - Simulation of Copper Plating on Coupler Bellows Under Different Current Densities

- *Zhang Shuai, Xiaoxia Wang, Jirun Luo, Rui Zhang*
Aerospace Information Research Institute, Chinese Academy of Sciences

P7.9 - Design of 220GHz TE₀₁-TE₁₁ Mode Converter

- *Lu Liu, Rongxing Zeng, Yunfei Huang, Yinghui Liu, Jianwei Liu*
University of Electronic Science and Technology of China

P7.10 - Design and Simulation of Ferrite-Based High-Power X-Band RF Load

- *Akash Akash, Narugopal Nayek, Tapeshwar Tiwari*
IIT Guwahati

Poster Session

Modeling - Posters

Thursday, April 28 / 01:20 PM - 03:20 PM / San Carlos I

Chair:

Lawrence Ives, CCR

P8.1 - Research on Parallel Algorithm of High-Power Microwave Device Simulation Based on MSMPI

- *Yulan Hu, Dagang Liu, Laqun Liu, Huihui Wang*
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P8.2 - Smith-Purcell Radiation with Different Grating Parameters and Beam Bunching Frequencies

- *Md Arifuzzaman Faisal, Asif Iqbal, Peng Zhang*
Michigan State University

P8.3 - Deep Neural Network Modeling for Traveling-Wave Tube

- *Zheng Tan, Yulu Hu, Luanfeng Gao, Quan Hu, Xiaofang Zhu, Tao Huang, Bin Li, Zhonghai Yang*
University of Electronic Science and Technology of China
- *Weibo Huang*
China Academy of Space Technology (Xi'an)

P8.4 - Finite-Element Analysis of Slow-Wave System with Rotated Periodic Structure

- *Yiyan He, Li Xu, Hao Wang, Hangxin Liu, Bin Li*
University of Electronic Science and Technology of China

P8.5 - Structural Static Analysis of Microwave Tubes Based on Multi-Level Preconditioner

- *Junhui Yin, Li Xu, Tao Huang, Zhonghai Yang, Bin Li*
University of Electronic Science and Technology of China

P8.6 - The Impact Response Analysis of High-Frequency Circuit in Microwave Tube Based on Finite-Element Method

- *Zaichao Yang, Li Xu, Zhonghai Yang, Bin Li*
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P8.7 - A Design of Measuring Module for the Loss of Clamping Rod in K-Band

- *Ruimin Feng*
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- *Hongxia Yi, Zhiliang Chen, Yanwei Li, Xinwen Shang, Liu Xiao*
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- *Jiandong Zhao, Xinling Zhang*
Shandong Microwave Vacuum Technology Co., Ltd.

P8.8 - An Exact Linear Theory of Backward Wave Oscillations in a Traveling-Wave Tube Including Space-Charge Effects

- *Patrick Y. Wong, Peng Zhang*
Michigan State University
- *Abhijit Jassem*
Niowave, Inc.

P8.9 - Research on Two-Dimensional Electrostatic Particle Simulation Method Based on superLU

- *Qiang Wang, Laqun Liu, Dagang Liu, Huihui Wang*
University of Electronic Science and Technology of China

P8.10 - A Ceramic Surface-Charging Model for Accurate Prediction of E-Beam Trajectory in Field-Emission Digital X-Ray Sources

- *Yujung Ahn, Eunsol Go, Jeong-Woong Lee, Yoon-Ho Song*
University of Science and Technology & Electronics and Telecommunications Research Institute (ETRI)
- *Sora Park, Jin-Woo Jeong, Jae-Woo Kim, Jun-Tae Kang, Seong Jun Kim, Ki Nam Yun, Sunghoon Choi, Ji-Hwan Yeon, Sunghee Kim*
Electronics and Telecommunications Research Institute (ETRI)

P8.11 - Temperature Measurement and Simulation Comparison of Collector of Traveling-Wave Tube

- *Yongliang Liu, Jirun Luo, Guoxing Miao, Cha Gao, Qingxiang Wang, Dehui Zhai, Jian Wang*
Aerospace Information Research Institute, Chinese Academy of Sciences

P8.12 - Preliminary Investigation of the Explosive Field-Emission Model Using Vircator Particle-in-Cell Simulation

- *Shen Shou Max Chung*
National Penghu University of Science and Technology
- *Shih-Chung Tuan*
Asia Eastern University of Science and Technology

P8.13 - A Discrete Cavity Analysis for Coupled-Cavity Traveling Wave Tubes

- *Ayush Paudel, Patrick Wong, Peng Zhang*
Michigan State University
- *John Luginsland*
Air Force Office of Scientific Research
- *Matthew Franzi*
Air Force Research Laboratory

P8.14 - Model of Helix Traveling-Wave Tube Including Slow-Wave Structure Dispersion Characteristics and Space-Charge Effect

- *Kasra Rouhi, Robert Marosi, Tarek Mealy, Ahmed F. Abdelshafy, Alexander Figotin, Filippo Capolino*
University of California, Irvine

P8.15 - Study on a Theoretical Model of the Empty Orbit for Atomic Bonding Layer of Graphene Covered Metal Surface

- *Min Peng, Yongdong Li, Chunliang Liu, Shu Lin, Meng Cao, Dawei Wang*
Xi'an Jiaotong University

P8.16 - Issues with the Explosive Field Emission Model in PIC Code-Unlimited Current Density

- *Shen Shou Max Chung*
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- *Shih-Chung Tuan*
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P8.17 - Simulation of the High Power L-4953 Crossed-Field Amplifier

- *Marcus Pearlman, Jim Browning*
Boise State University
- *Jack Watrous*
Confluent Sciences
- *David Smithe, Christine Roark*
TechX
- *Mike Worthington*
Stellant Systems
- *Allen Garner*
Purdue University

P8.18 - Simulating Defects and Reflections in a Traveling-Wave Tube with DIMOHA

- *Khalil Aliane*
CNES & Thales AVS/MIS & AixMarseille Université
- *Frédéric André*
Thales AVS/MIS
- *Yves Elskens*
AixMarseille Université

P8.19 - Transmission Loss of a Millimeter-Wave Pulse through a Waveguide Window

- *Ruei-Fu Jao*
Guangdong Industry Polytechnic
- *Kaviya Aranganadin, Ming-Chieh Lin*
Hanyang University
- *Hua-Yi Hsu*
National Taipei University of Technology
- *John P. Verboncoeur*
Michigan State University

P8.20 - A Mini-Marx Generator Powered by a Cockcroft-Walton Voltage Multiplier for a Compact X-Ray Source

- *Kaviya Aranganadin, Zhaofeng Zhang, Ming-Chieh Lin*
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- *Po-Yu Chang*
National Cheng Kung University
- *Hua-Yi Hsu*
National Taipei University of Technology

P8.21 - Design and Simulation on D-Band Broadband Mode Converter for Gyro-TWT

- *Tao Wang, Rutai Chen, Hang Ren, Rongxing Zeng, Lu Liu, Zheng Wang, Sheng Yu*
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P8.22 - Data Feedback and Recalculation Analysis for the Helix of Space TWT

- *Xiaochen Wei, Yulu Hu, Wenkai Deng, Dapeng Gong, Tao Huang*
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- *Yuan Wang*
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