Contents

Foreword .................................................................................................................................................. iii
IVEC-2011 Organising Committees ........................................................................................................ v
EDS Technical Committee on Vacuum Devices ....................................................................................... vi

Inaugural Session

PL-1: Relativistic Effects in Microwave Vacuum Electronics ................................................................. 1
   Michael I. Petelin (Institute of Applied Physics, Nizhny Novgorod, Russia)

Plenary Session–1

PL-2: Microwaves and Particle Accelerators: A Fundamental Link ......................................................... 5
   Swapan Chattopadhyay (Cockcroft Institute of Accelerator Science & Technology, UK)
PL-3: Vacuum Electronics in India ........................................................................................................ 7
   Lalit Kumar (Microwave Tube R&D Centre, Bangalore, India)
PL-4: Vacuum Electronic Sources for High Power Terahertz-Regime ..................................................... 11
   John Booske (University of Wisconsin-Madison, USA )

Session–1: Traveling-Wave Tubes

1.1: Design and Development of 2 to 3 Octave Band Helix Mini-TWTs ................................................... 15
   Tushar K. Ghosh, Anthony J. Challis, Anthony Tokeley, Michael J. Duffield,
   Kevin Rushbrook, Ian Poston, Daniel Scott, Alan Jacob and Darrin Bowler
   (e2v Technologies Ltd., UK)
1.2: Development of Ka-Band 500 W CW Helix TWT ............................................................................. 17
   Tetsuo Machida, Wako Suzuki, Minoru Yoshida, Junichi Matsuoka and
   Kunio Tsutaki (Netcomsec Co. Ltd., Japan)
1.3: RF Output Multipaction Margin of Travelling Wave Tubes ........................................................... 19
   W. Diirr, J. Wegener and E. Bosch (Thales Electron Devices, Germany)
1.4: Performance Enhancement of W-Band CW TWT ............................................................................. 21
   Yinfi Hui, Jinjun Feng, Jun Cai, Yinhua Du, Ye Tang and Xianping Wu
   (Beijing Vacuum Electronics Research Institute, China)
1.5: Design of a K-Ka Band Helix TWT .................................................................................................. 23
   Sushi Raina, A.K. Agrawal, M. Vijay Kumar, Ashok Bansiwal, M.K. Geetha, George
   Abraham, Kiran Kumar and Lalit Kumar (Microwave Tube R&D Centre, India)

Session–2: Klystron and Inductive Output Tube

2.1: Design and Development of a 6 MW Peak, 24 kW Average ......................................................... 25
   Power S-band Klystron
   L.M. Joshi, Rakesh Meena, Subhash Nangru, Deependra Kant,
   Debashis Pal, O.S. Lamba, Vishnu Jindal, Sushil Kumar Jangid
   (Central Electronics Engineering Research Institute, India)
   D.P. Chakravarthy and Kavita Dixit (Bhabha Atomic Research Centre, India)
2.2: Development of High Power CW 3.7 GHz Klystrons for Fusion Experiments on Tore Supra
R. Magne, A. Armitano, G. Berger-By, F. Bouquey, E. Corbel, L. Delpéch, P. Mollard, M. Prou, F. Samaille, D. Volpe (CEA, IRFM, Durance, France)
A. Beunas (Thales Electron Devices, France), F. Kazarian (ITER Organization, France)

2.3: The Wideband Inductive Output Tube
Richard D. Kowalczyk, Mark F. Kirshner, Chris R. Walz, Michael A. Boyle, Holger Schult, John C. Cipolla, Craig B. Wilcox, and Richard B. True (L-3 Communications Electron Devices, USA)

2.4: Simulation and Characterization of Cylindrical RF Cavity with Output Section Coupling for 250 kW CW C-Band Klystron
O.S. Lamba, Meenu Kaushik, L.M. Joshi, Rakesh Meena, Debasis Pal, Vishnu Jindal, Priyanka Jangir, Vijay Singh, Sunit Kumar and Depender Kant (Central Electronics Engineering Research Institute, India)

2.5: Development of the S-Band High Power Klystron with Bandwidth of 12%
Yong Wang, Jian Zhang, Ying Wang and Zhi-qiang Zhang (Institute of Electronics, Chinese Academy of Sciences, China)

Session-3: Cathodes
3.1: High Current Density Reservoir Cathode Development
R. Lawrence Ives, George Collins, David Marsden, George Miram (Calabazas Creek Research, USA), Louis R. Falce (Surprise AZ, USA)

3.2: Fabrication and Testing of Sintered Wires Reservoir Cathodes at Semicon Associates
Daniel Busbaher (Semicon Associates, USA)

3.3: Tungsten-Rhenium Mixed Metal Matrix Cathodes
M. Ravi, K. Santhosh Kumar and K. S. Bhat (Microwave Tube R&D Centre, Bangalore, India)

3.4: Scandate Dispenser Cathode for 220 GHz 50 W Sheet Beam Travelling Wave Tube Amplifier
Jinfeng Zhao, Larry Barnett, Mike Banducci, Diana Gamzina, N.C. Luhmann Jr. (Department of Applied Science, University of California-Davis, USA)
Na Li, Ji Li (Beijing Vacuum Electronics Research Institute, China)

3.5: High Current Density Ternary-Alloy-Film Dispenser Cathode for Terahertz Vacuum Devices
R.S. Raju, Supriyo Das (Central Electronics Engineering Research Institute, India)
R.K. Barik, A.K. Tanwar, G.S. Park (Seoul National University & Center for THz Bio Application Systems, South Korea)

Session-4: High Power Microwaves
4.1: Energy Calculation for Magnetically Insulated Line Oscillator
Smriti Dwivedi and P.K. Jain (Center of Research in Microwave Tubes, Banaras Hindu University, India)

4.2: High Power Microwave Generation from a Reflex Triode Virtual Cathode Oscillator
Amitava Roy, Archana Sharma, Rakhee Menon, Sabyasachi Mitra, K.V. Nagesh, D.P. Chakravarthy, Vishnu Sharma, S.K. Singh (Bhabha Atomic Research Centre, India), D. Senthil Kumar, Saket Khandekar, Vijay Bhaskar Soma, Srinivas Nekkanti, Ajay Kumar Saini (Microwave Tube R&D Centre, India), Shiva Rai, Dheeraj Kumar Singh (Electronics & Radar Development Establishment, India)
4.3: Smaller Spot Size Flash X-Ray Generation from KALI 5000 System ........................................... 49
Rakhee Menon, Amitava Roy, Sabyasachi Mitra, Senthil Kumar,
Vishnu Sharma, Archana Sharma, K.V. Nagesh and D.P. Chakravarthy
(Bhabha Atomic Research Centre, India)

4.4: Development of High Voltage Pulser for High Power ............................................................. 51
Electromagnetic (HPEM) Simulation
Vijay H. Bhosale and D.C. Pande
(Electronics & Radar Development Establishment, India)

4.5: Research, Design and Development Activities on High Power Pulsed RF/Microwave Systems and Test Facilities for Particle Accelerators
Purushottam Shrivastava, Y.D. Wanmode, D. Basy, V. Rajput,
P. Mohania, A. Mahawar, M. Acharya, J. Mulchandani and H.G. Singh
(Raja Ramanna Centre for Advanced Technology, India)

Session-5: THz Devices

5.1: The OPTHER Project: Progress toward the THz Amplifier ......................................................... 55
C. Paoloni, F. Brunetti, A. Di Carlo, M. Mineo, E. Tamburri, M.L Terranova,
G. Ulisse (Dept. Electronic Engineering, University of Rome Tor Vergata, Italy)
A. Durand, R. Marchesin, K. Pham (Thales Electron Devices, Véliby, France)
V. Krozer, M. Kotiranta (Physikalisches Institut, Goethe-Universität, Germany)
A. de Rossi, D. Dolfi, P. Guiset, P. Legagneux, J.P. Schnell
(Thales Research & Technology, Palaiseau, France)
A. Fiorello, M. Dispenza, A. Secchi (Selex-SI, Rome, Italy)
V. Zhurbenko (Technical University of Denmark, Kgs. Lyngby, Denmark)
S. Megtert, F. Bouamrane (UMR137 CNRS/Thales, Palaiseau, France)
C.-S. Cojocaru, A. Gohier (LPIAC — École Polytechnique, France)

5.2: On Power Consumption Reduction in 700 GHz BWO ............................................................. 57
A.V. Galdetskiy, I.I. Golenitskiy, V.U. Myakinkov,
A.A. Negirev and U.B. Rudy (FSUE Istok, Fryazino, Russia)

5.3: Design Studies of a 460 GHz, 30-50 W, CW Second Harmonic Gyrotron ..................................... 59
Chinmay A. Jain, Ankit Verma, Ashish Kumar, M.V. Kartikeyan
(Indian Institute of Technology, Roorkee, India)
E. Borie, M. Thumm (Karlsruhe Institute of Technology, Germany)

5.4: 0.22 THz Sheet Beam TWT Amplifier: System Design and Analysis ........................................ 61
Young-Min Shin, Larry R. Barnett, Anisullah Baig, Wen-Ching Tsai,
Neville C. Luhmann Jr. (Department of Applied Science, University of California-Davis, USA)

5.5: Analysis of Rectangular Metal Grating RF Structure for Orotron ............................................. 63
Arindrajit Chaudhury (Department of Physics, Burdwan University, India)
P.C. Panda and Vishnu Srivastava
(Central Electronics Engineering Research Institute, India)

Session-6: Electron Optics

6.1: High-Performance Computing to the Electron Optics Simulator .................................................. 65
Tao Huang, Quan Hu, ZhongHai Yang, JianQing Li, XiaoLin Jin,
XiaoFang Zhu and Bin Li (School of Physical Electronics, University of Electronic Science and Technology of China, China)
MingHua Yang (Beijing Vacuum Electronics Research Institute, China)
6.2: Heat Transfer Integration with Beam Optics Analyzer ........................................ 67
    Thuc Bui, Lawrence Ives and Michael Read (Calabazas Creek Research Inc., USA)

6.3: XMAGUN: An Iron Pole Piece PPM Design and Analysis FEM Code ...................... 69
    César C. Xavier (Instituto de Pesquisas Energéticas e Nucleares/CNEN-SP, Brazil)
    Cláudio C. Motta (University of Sao Paulo, Brazil)

6.4: Design and Development of Thermionic Emission Microscope ................................ 71
    R.S. Raju, Supriyo Das, Sneh Rathore (Central Electronics Engineering Research Institute, India), R.K. Barik (Seoul National University, South Korea)

6.5: QPT, a Simple Particle Tracker for Tube Simulation ........................................ 73
    A. Grede and H. Henke (Technische Universität, Berlin, Germany)

Session-7: Space Traveling-Wave Tubes

7.1: 170 kW Ka-Band TWT for Space Applications ................................................... 75
    Jean Gastaud, Evelyne Gérard and Alain Laurent (Thales Electron Devices, France)

7.2: Development of 60 W C-Band TWT for Space .................................................. 77
    R. Lokshminarasimhan, V. Venkatesh, M. Ruvindra and T.S. Nanjundaswamy (ISRO Satellite Centre, Bangalore, India)

7.3: High-Efficiency, Production 40–130 W K-Band Traveling-Wave Tubes for Satellite Communications Downlinks ................................................................. 79
    D.R. Dibb, S. Aldana-Gutierrez, R.T. Benton, W.L. McGeary, W.L. Menninger and X. Zhai (L-3 Communications Electron Technologies Inc., USA)

7.4: An Updated Evaluation of Space TWT Gain Change Over Life ................................ 81
    Michael Kaliski (Space Systems/Loral, Palo Alto, CA, USA)

7.5: Statistical Characterization of Isolation Performance of Multiport Amplifiers: A Critical Discussion ................................................................. 83
    Marinella Aloisio, Piero Angeletti and Salvatore D'Addio (European Space Agency, The Netherlands)

Session-8: Extended Interaction Klystron and Sheet Beam Devices

8.1: Compact High Power Klystrons for the CoReH20 Earth Explorer ............................. 85
    Candidate Core Mission
    Peter Horoyski, Dave Berry and Brian Steer (Communications and Power Industries, Canada)

8.2: W-Band Sheet Beam Extended Interaction Klystron (EIK) ...................................... 87
    John Pasour, Khanh Nguyen, Edward Wright, Adam Balkcum and Baruch Levush (US Naval Research Laboratory, USA)

8.3: Validation Study of the TESLA Model for Extended Interaction Klystron .................. 89
    Igor A. Chernyavskiy, Jr. David Chernin, Peter Horoyski, (SAIC, McLean, USA)
    Alexander N. Vlasov, Baruch Levush (Naval Research Laboratory, USA)
    Thomas M. Antonzen (University of Maryland, USA)
    Mark Hyttinen, Albert Roitman, Richard Dobbs, Dave Berry (CPI, Canada)

8.4: Development of W-Band Sheet Beam Klystron with High Transmission Rate Electron Optics System ................................................................. 91
    Cunjun Ruan, Shaohong Wang, Wang Ruan and Xiaofeng Zhang (Institute of Electronics, Chinese Academy of Sciences, China)

8.5: Stability Review of SLAC's L-Band Sheet Beam Klystron ................................... 93
    A. Jensen, C. Adolfsen, K. Bane, A. Haase, E. Jongewaard, Z. Li, D. Martin, D. Sprehn, G. Stupakov (SLAC National Accelerator Laboratory, USA)
    A. Burke (SAIC, Burlington, USA)
Session-9: Nano-Electronics—Field Emitters

9.1: Examination of Field Emission from Lanthanum Hexaboride—Coated Knife Edge Cathodes
Matt Kirley, Bozidar Novakovic, Marcus Weber, Nishant Sule, John Scherer, Irena Knezevic and John H. Booske (Electrical and Computer Engineering Department, University of Wisconsin-Madison, USA)

9.2: Field Emission and Photo-Enhanced Field Emission Investigations of CdS Nanowires Array
P.G. Chavan, M.A. More, D.S. Joag (Department of Physics, University of Pune, India)
S.S. Badadhe, I.S. Mulla (National Chemical Laboratory, Pune, India)

9.3: Improved Field Emission from Cs Coated Carbon Nanotubes
K. Santosh Kumar, M. Ravi, S. Prasanna Kumar and K.S. Bhat (Microwave Tube R&D Centre, India)

9.4: On the Turn-on Field of Carbon Nanotube Cathode
Shen Shou Max Chung (Department of Electronics Engineering, Southern Taiwan University, Taiwan)

9.5: An Improved Self-Consistent Fitting Model for Characterizing Field Emitters
M.C. Lin, P.S. Lu (Department of Physics, Fu Jen Catholic University, Taiwan)
J.P. Verboncoeur (Department of Nuclear Engineering, University of California-Berkeley, USA)

Session-10: Gyrotron

10.1: 140 GHz, 1 MW, CW Gyrotron Development for the ECRH System of the Stellarator Wendelstein 7-X
M. Thumm, G. Gantenbein, S. Illy, S. Kern, W. Leonhardt, A. Samartsev, A. Schlaich, M. Schmid (Karlsruhe Institute of Technology, Germany)
V. Erckmann (Max-Planck-Institut fuer Plasmaphysik, Teilinstitut Greifswald, Germany), W. Kasperek, C. Lechte (Universitaet Stuttgart, Institut fuer Plasmaforschung (IPF), Germany), C. Lievin (Thales Electron Devices, France)

10.2: Recent Progress on a Co-Harmonic Gyrotron
David A. Constable, Kevin Ronald, Wenlong He, Alan D.R. Phelps, Adrian W. Cross, (SUPA, Department of Physics, University of Strathclyde, UK)
Ilya V. Bandurkin, Andrey V. Savilov, Vladimir L. Bratman (Institute of Applied Physics, Russian Academy of Science, Nizhny Novgorod)

10.3: Recent Results in Collaborative Studies on the Design of Application Specific Gyrotrons
M.V. Kartikeyan (Indian Institute of Technology Roorkee, India)
E. Borie, Manfred Thumm (Karlsruhe Institute of Technology, Germany)

10.4: Cylindrical Wave Decomposition in Launchers of Gyrotron Quasi-Optical Mode Converters
J. Flamm, J. Jin and M. Thumm (Karlsruhe Institute of Technology, Germany)

10.5: Design of Interaction Cavity for 170 GHz, 1 MW ITER Gyrotron
Anil Kumar, V. Vyas (Department of Physics, Banasthali University, India)
Nitin Kumar, Hasina Khatun, Udaybir Singh, A.K. Sinha (Central Electronics Engineering Research Institute, India)
Session-11: Device Modeling

11.1: Minimization of Effects of Backscattered Electrons in Gyrotrons with Depressed Collectors

Amarjit Singh (Institute of Research in Electronics and Applied Physics, USA)
William B. Herrmannsfeldt (Stanford Linear Accelerator Centre, Stanford University, USA), R. Lawrence Ives (Calabazas Creek Research, Inc., USA)

11.2: Study on Low-Frequency Oscillations in a Gyrotron Using a 3D CFDTD PIC Method

M.C. Lin and D.N. Smithe (Tech-X Corporation-Boulder, USA)

11.3: A Fast and Efficient Multigrid Eigensolver for Modeling Microwave Tubes Using Hierarchical Vector Finite Elements

Li Xu, Zhen Ye, Zhonghai Yang, Jianqing Li and Bin Li
(University of Electronic Science and Technology of China, China)

11.4: Study of BWO Power Holes in Helix Traveling Wave Tubes

Zhaoyun Duan, Yubin Gong, Yan Yu Wei, Hairong Yin, Wenzhang Wang
(University of Electronic Science and Technology of China, China)
Yanmei Wang (Beijing Vacuum Electronics Research Institute, China)

11.5: Mode Interaction in Resonant Clinotron

Konstantin A. Lukin and Eduard M. Khutoryan
(National Academy of Sciences of Ukraine, Ukraine)

POSTER SESSION-1

P1-1: Even Sampling for the Simulation of the Electron Devices with Irregular Electrodynamic Systems

Alexander A. Kurayev, Tatyana L. Popkova, Alexey O. Rak
(Belarusian State University of Informatics and Radioelectronics, Belarus)

P1-2: Compounded Algorithms for the Simulation of the Electron Devices with Irregular Waveguides

Alexander A. Kurayev, Tatyana L. Popkova, Alexey O. Rak
(State University of Informatics and Radioelectronics, Belarus)

P1-3: Simulation of Thermodynamic Process with Share of Thermo Emission Matter

A. Kovalenko Yu and D.S. Korolev
(All-Russia Electronic Technical Institute, State Science Center, Russia)

P1-4: Comparison of Plasma Frequency Reduction Factors Simulated via 1D Time Domain Lagrangian Code and Expressions in the Literature

Daniel T. Lopes and Cláudio C. Motta (University of Sao Paulo, Brazil)

P1-5: Study of Non-Relativistic Klystron Amplifier Using a 1D Time Domain Lagrangian Code Considering Both AC and DC Space Charge Effects

Daniel T. Lopes, Robson K. B. e Silva (Instituto de Pesquisas Energéticas e Nucleares, Brazil), Cláudio C. Motta (University of Sao Paulo, Sao Paulo, SP, Brazil)

P1-6: Design of Depressed Collector for 94 GHz CCBWO

Anirban Bera, Ranjan Kumar Barik (School of Electrical Engineering and Computer Sciences, Seoul National University, Korea)
Ohjoon Kwon, Anil Tanwar, M.A. Sattorov, Gun-Sik Park (Department of Physics and Astronomy, Seoul National University, Korea)
P1-7: Modelling of Experimental Set-up for Material Studies Based on a Periodic Lattice with a Defect Operating in the 215 GHz to 230 GHz Frequency Range
Amy MacLachlan, I.V. Konoplev, C.W. Robertson, A.W. Cross, K. Ronald, A.D.R. Phelps and C.R. Donaldson
(Department of Physics, University of Strathclyde, UK)

P1-8: Numerical Modeling Analysis of 0.22 THz Sheet Beam TWT Circuit
(Department of Applied Science, University of California-Davis USA)
John Pasour, Paul Larsen (Naval Research Laboratory (NRL), USA)

P1-9: A Useful Design Technique of Helix Pitch Profile for High Efficiency TWTs
YuLu Hu, ZhongHai Yang, JianQing Li, XiaoFang Zhu, Bin Li
(University of Electronic Science and Technology of China, China)
YanMei Wang (Beijing Vacuum Electronics Research Institute, China)

P1-10: A Nonlinear Time-Dependent Simulation for Helix Traveling Wave Tubes
WeiFong Peng, YuLu Hu, ZhongHai Yang, JianQing Li, Bin Li
(University of Electronic Science and Technology of China, China)
YiXue Wei (Beijing Vacuum Electronics Research Institute, China)

P1-11: The Derivation of Space-Charge-Limited Current between Concentric Sphere
Li Fei, Xiao Liu, Liu Pu-Kun and Yi Hong-Xia
(Institute of Electronics, Chinese Academy of Sciences, China)

P1-12: The Small Signal Theory Assistant Analysis of Negative-Positive Phase Velocity Tapering
Liu Xiao, Pu-kun Liu, Hong-xia Yi and Fei Li
(Institute of Electronics, Chinese Academy of Sciences, China)

Xiao Liu, Liu Pu-Kun (Institute of Electronics, Chinese Academy of Science, China)
Li Fei, Yi Hong-Xia (Graduate University of Chinese Academy of Science, China)

P1-14: Investigation on Intense Sheet Electron Beam Transport with Macroscopic Cold-Fluid Model
Ying Han, Cunjun Ruan, Yong Wang and Xiaofeng Zhang
(Institute of Electronics, Chinese Academy of Sciences, China)

P1-15: Effect of Thermal Strain on Electron Gun with Control Grid
Lieming Yao, Kai Zhang, Hailong Yu, Tao Huang and Bin Li
(Univ. of Elec. Sci. & Tech. of China, China)

P1-16: Effects of Loss Materials on the Output Characteristic of Gyro-TWT
EFeng Wang, BenTian Liu, ZhiLiang Li, LiJun Qian, JinJun Feng and Xin Zeng (Vacuum Electronics National Laboratory, Beijing Vacuum Electronics Research Institute, China)

P1-17: Simulation of the W-Band Gyroklystron with Open Spherical Resonators
Liu Bentian, Wang Efeng, Qian Lijun, Zeng Xu, Li ZhiLiang and Feng Jinjun (Vacuum Electronics National laboratory, Beijing Vacuum Electronics Research Institute, China)

P1-18: Research on Traveling Wave Tube Body Temperature Distribution
Xingyun Zhao, Pu Wei, Ningfeng Bai, Xiaohan Sun (Research Center for Electronic Device and System Reliability, Southeast University, China)
Shilu Zhao, Yanmei Wang, Tiechang Yan (Beijing Vacuum Electronics Research Institute, China)
P1-19: Design Optimization of Non Linear Tapers for High Power Gyrotrons
Using Hybrid Space Mapping Techniques
Nischey Grover, Satish Gajawada and Kartikeyan V. Machavaram
(Department of Electronics and Computer Engineering, Indian Institute of Technology, Roorkee, India)

P1-20: Electro-Thermal Analysis of 250 kW Coaxial RF Window at 350 MHz
S.K. Vyas, S. Maurya, N. Shekhawat and V.V.P. Singh
(Central Electronics Engineering Research Institute, India)

P1-21: Electron Gun Simulation for 95 GHz Gyrotron
Udaybir Singh, Nitin Kumar, Ashok K. Sinha
(Central Electronics Engineering Research Institute, India)

P1-22: Analysis of Cavity and Window for THz Gyrotron
Mukesh Kumar Alaria, P. Mukherjee, R.R. Rao and A.K. Sinha
(Central Electronics Engineering Research Institute, India)

P1-23: Performance Improvement Study of a Relativistic Magnetron
Using MAGIC-3D
S. Maurya, V.V.P. Singh (Central Electronics Engineering Research Institute, India)
P.K. Jain (CRMT, IT-BHU, Varanasi, India)

P1-24: Simulation Study of Modified Coaxial Vircator for Improved Power Efficiency
Debabrata Biswas and Raghwendra Kumar
(Theoretical Physics Division, Bhabha Atomic Research Centre, India)

P1-25: Selection of Helix Tape Parameters for Ku-Band 140 W SL-TWT
Abhishek Jain, Dheeraj Kumar, R.S. Tomar, S.K. Ghosh, R.K. Sharma and Vishnu Srivastava
(Central Electronics Engineering Research Institute, India)

P1-26: Monte Carlo Simulation of a Finite Thickness Neutralized Electron Beam
Nidhi Parmar, P. Deshpande, Y. Choyal
(School of Physics, Devi Ahilya University, Indore, India), K.S. Bhat
(Microwave Tube R&D Centre, India)

P1-27: Design of a TM01 - TE11 Circular Bend Mode Converter
Operating at 3 GHz
K. Shiva Sai Prasad, Shiv Aasheesh Singh, S.S. Shanmukha, M.V. Kartikeyan
(Department of Electronics and Computer Engineering, Indian Institute of Technology, Roorkee, India)
P. Seshadri
(Microwave Tube R&D Centre, India)

P1-28: Temporal Particle-In-Cell Analysis in Beam Optics Analyzer
Thuc Bui, Michael Read and Lawrence Ives
(Calabazas Creek Research, Inc., USA)

P1-29: The Analytical Model for Multi-Stage Depressed Collectors
A. Mercy Latha, R.K. Gupta and S.K. Ghosh
(Central Electronics Engineering Research Institute, India)

P1-30: Prediction of Thermal Contact Resistances and Temperature Distribution
at Different Joints in Helix Traveling-Wave Tubes
(Central Electronics Engineering Research Institute, India)

P1-31: Propagation of Electromagnetic Waves Guided by an Open Tape Helix
N. Kalyanasundaram and G. Naveen Babu
(Department of Electronics and Communication, Jaypee Institute of IT, India)

P1-32: Effect of Aperture in a Pole Piece for Focusing of Multi Beam Electron Gun
Ashok Nehra, L.M. Joshi, S. Kaushik and R.K. Gupta
(Central Electronics Engineering Research Institute, India)
P1-33: Effective Emission Area Calculation for Single Tip CNT Cathode ................................. 189
M. Ravi, K.S. Bhat (Microwave Tube R&D Centre, Bangalore, India)
Mantha Khaneja, P.K. Chowdhury, Harsh (Solid State Physics Laboratory, India)

P1-34: Quasi-Optical Mode Converter for High Power Gyrotron ........................................... 191
B.K. Shukla and Dhiraj Bora (Institute for Plasma Research, India)

P1-35: Analysis of a Rectangular Folded-Waveguide SWS with Grating ................................. 193
on the Broad Wall
M. Sumathy, S.K. Datta (Microwave Tube R&D Centre, Bangalore, India)
K.J. Vinoy (Indian Institute of Science, Bangalore, India)

P1-36: A Simple Method for the Design of a Coupler for Helix TWTs ..................................... 195
A.K. Agrawal, Sushil Raina and Lalit Kumar
(Microwave Tube R&D Centre, Bangalore, India)

P1-37: Demountable Testing of Beam Focusing by Electrostatic Fields .................................. 197
M. Vijay Kumar, M.K. Geetha, A.K. Agrawal, Sushil Raina and Lalit Kumar
(Microwave Tube R&D Centre, Bangalore, India)

P1-38: Design of a Broad Band Matched Termination for an Overmoded Waveguide ................. 199
S.K. Chhotray, M. Sumathy, K.S. Bhat and Lalit Kumar
(Microwave Tube R&D Centre, Bangalore, India)

P1-39: Study of the Collector of W-Band Gyrotron ................................................................. 201
Zhi-Hui Geng, Yi-Nong Su, Pu-Kun Liu, Shi-Chang Zhang, Wei Gu, Shou-Xi Xu and Zhi-Chao Zeng (Institute of Electronics, Chinese Academy of Sciences, China)

P1-40: A Conceptual Scheme for Focusing of High Power Microwaves in SYMPLE .............. 203
Renu Bahl, K. Sathyanarayna, V.P. Anitha, Priyavandna J. Rathod and Y.C. Saxena (Institute for Plasma Research, India)

P1-41: Plasmonic Metamaterial: With Cut-Wire and Labyrinth Resonators ......................... 205
at Ka-Band
Subal Kar, Tapashree Roy, Souvik Pal and Promit Gangooly
(Institute of Radio Physics and Electronics, University of Calcutta, India)

Session–12: TWT Slow-Wave Structure

12.1: Design of a Planar Helix with Straight-Edge Connections ................................................. 207
for Travelling-Wave Tube Applications
Ciersiang Chita, Sheel Aditya, Zhongxiang Shen (School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore)
Min Tang and Julius Tsai (Institute of Microelectronics, Singapore)

12.2: Coupling a Waveguide Input into a Sheet-Beam Coupled-Cavity ......................................... 209
Slow-Wave Structure
Paul B. Larsen, David K. Abe, Baruch Levush (Naval Research Laboratory, USA)
Thomas M. Antonsen Jr. (University of Maryland, USA)

12.3: Investigation into a Metamaterial Supported Helix Slow-Wave Structure ........................... 211
Subrata Kumar Datta, Lalit Kumar (Microwave Tube R&D Centre, India)
Baidyanath Basu (College of Engineering and Technology, Moradabad, India)

12.4: RF-Structure Design for the W-Band Folded Waveguide TWT Project of CEERI ............ 213
A. Grede, H. Henke (Technische Universitaet Berlin, Germany)
R.K. Sharma (Central Electronics Engineering Research Institute, India)

12.5: Optimization Design of Slow Wave Structure Using Genetic Algorithm ....................... 215
Hong-xia Yi, Liu Xiao, Pu-kun Liu and Fei Li
(Institute of Electronics, Chinese Academy of Sciences, China)
Session–13: Plasma-Filled Devices

13.1: A Plasma Source for System for Microwave Plasma Experiments (SYMPLE) .......... 217
   Anitha V.P., Renu Bahl, Priyavandna J. Rathod, Jayesh Raval and
   Y.C. Saxena (Institute for Plasma Research, India)

13.2: Effect of Plasma on the Gain Coefficient of Compton/ Raman Amplifier ................. 219
   K.P. Maheshwari, Harish Malav (Vardhaman Mahaveer Open University, Kota, India), P. Choyal (Devi Ahilya Vishwavidyalaya, India)

13.3: Analysis of Beam-Wave Interaction in Plasma Assisted BWO .......................... 221
   Niraj Kumar, M. Kumar, B.L. Meena, M.S. Tyagi, A.K. Sharma, V. Srivastava
   and U.N. Pal (Central Electronics Engineering Research Institute, India)

13.4: Equivalent Circuit Analysis of a Plasma-Filled Helix Slow-Wave Structure .......... 223
   P. Raja Ramana Rao, S.K. Datta (Microwave Tube R&D Centre, India)
   V.A. Deshmukh (Defence Institute of Advanced Technology, Pune, India)

13.5: Investigation of Discharge Parameters in Xenon Filled Coaxial DBD Tube ......... 225
   U.N. Pal, P. Gulati, Niraj Kumar, M. Kumar, M.S. Tyagi, B.L. Meena,
   A.K. Sharma (Central Electronics Engineering Research Institute, India)
   Ram Prakash (Birla Institute of Technology-Jaipur, India)

POSTER SESSION–2

P2-1: Linear Theory of Large-Orbit Gyrotron Traveling Wave Amplifiers ................. 227
   with Misaligned Electron Beam
   Chong-Qing Jiao (School of Electrical and Electronic Engineering,
   North China Electric Power University, China)

P2-2: Sheet Beam 94 GHz Extended Interaction Oscillator Design ........................... 229
   Junyi Xing and Jinjun Feng (Vacuum Electronics National Laboratory, China)

P2-3: Analysis of a Two-Section Folded Waveguide of Extend .......................... 231
   Interaction Oscillator
   Wenxin Liu, Rui Zhang, Yong Wang, Cunjun Ruan and Pukun Liu
   (Institute of Electronics, Chinese Academy of Science, China)

P2-4: Characteristic Impedances in Output Cylindrical Coaxial Cavity ................. 233
   Resonator of Klystron
   Yuhe Dong (School of Science, Inner Mongolia University of Science &
   Technology, China), Xingjuan Xie and Chuante Huqiu
   (Institute of Electronics, Chinese Academy of Sciences, China)

P2-5: Parasitic Mode Suppression in Coaxial Resonator for MBK ........................ 235
   Hui-Peng Han and Yong Wang
   (Institute of Electronics, Chinese Academy of Sciences, China)

P2-6: Experimental Results of Feedback Attenuation in Traveling ......................... 237
   Wave Tube Regenerative Oscillators
   Peng Gao (University of Electronic and Science Technology of China, China)
   John H. Booske (Department of Electrical and Computer Engineering,
   University of Wisconsin, USA)

P2-7: A Diode-Based Predistortion Linearizer for Traveling Wave Tube Amplifiers ........ 239
   Xin Hu, Zi-Cheng Wang, Ji-Run Luo (Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences, China), Gang Wang (Space Traveling Wave Tube Research and Development Center, Institute of Electronics, Chinese Academy of Sciences, China)
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2-8</td>
<td>Development of a W-Band Gyrotron Backward Wave Oscillator</td>
<td>Chao-Hai Du, Pu-Kun Liu, Qian-zhong Xue and Shichang Zhang (Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences, China)</td>
</tr>
<tr>
<td>P2-9</td>
<td>Design of a S-Band High Average Power Klystron's Output Window</td>
<td>Baoli Shen, Zhaochuan Zhang and Yunping Huang (Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences, China)</td>
</tr>
<tr>
<td>P2-10</td>
<td>X-Band Sheet Beam Klystron Design</td>
<td>Xiaofeng Zhang, Cunjun Ruan, Ji-run Luo, Wang Ruan, Ying Han and Ding Zhao (Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences &amp; Graduate University of Chinese Academy of Sciences, China)</td>
</tr>
<tr>
<td>P2-11</td>
<td>Development of a Ka-Band Space TWT</td>
<td>Bo Chen, QiongPing Zhao, ShaoLun Cai, Ji-nun Feng and Ming Q. Ding (Vacuum Electronics National Laboratory, Beijing Vacuum Electronics Research Institute, China)</td>
</tr>
<tr>
<td>P2-12</td>
<td>About Compensation the Electronic Beam Dynamic Stratification</td>
<td>Alexander A. Kurayev, Alexey O. Rak and Anatoly K. Sinitsyn (Belarusian State University of Informatics and Radioelectronics, Belarus)</td>
</tr>
<tr>
<td>P2-13</td>
<td>Multisection Folded Waveguide TWT In the Range 0.6–3 THZ</td>
<td>Anatoli V. Aksenchyk and Irina F. Kirinovich (Byelorussian State University of Informatics and Radioelectronics, Belarus)</td>
</tr>
<tr>
<td>P2-14</td>
<td>Klinoirbictron—Terahertz Range Oscillator</td>
<td>Victor D. Yeryomka (Usikov Institute for Radiophysics and Electronics of National Academy of Sciences of Ukraine, Ukraine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alexandr V. Gurevich, Alexandr A. Kurayev and Anatoly K. Sinitsyn (Belarusian State University of Informatics and Radioelectronics, Belarus)</td>
</tr>
<tr>
<td>P2-15</td>
<td>Coaxial Gyroklinotron</td>
<td>A.A. Kurayev, D.V. Lukashonok and A.K. Sinitsyn (Belarusian State University of Informatics and Radioelectronics, Belarus)</td>
</tr>
<tr>
<td>P2-16</td>
<td>Amplifiers and Multipliers on GYRO-TWT</td>
<td>S.V. Kolosov, A.A. Kurayev and A.V. Senko (Belarus State University of Informatics and Radioelectronics, Belarus)</td>
</tr>
<tr>
<td>P2-17</td>
<td>Coherent Resonance in Klystron Oscillators</td>
<td>B.S. Dmitriev, Ju. D. Zharkov, V.N. Skorokhodov, A.O. Stepanov and S.A. Sadovnikov (Saratov State University, Russia)</td>
</tr>
<tr>
<td>P2-18</td>
<td>Wavelet Analysis of Transient Processes in the Delayed Feedback</td>
<td>A.V. Yakovlev and N.M. Ryskin (Department of Nonlinear Physics, Saratov State University, Russia)</td>
</tr>
<tr>
<td>P2-19</td>
<td>Radiation Generation at 94 GHz from a Pseudospark-Sourced Electron Beam</td>
<td>A.W. Cross, D. Bowes, H. Yin, W. He, K. Ronald, A.D.R. Phelps (SUPA Department of Physics, University of Strathclyde, Glasgow, UK)</td>
</tr>
<tr>
<td>P2-20</td>
<td>Backward Wave Oscillators for THz Applications Based on Corrugated Waveguide</td>
<td>Mauro Mineo and Claudio Paoloni (Department of Electronic Engineering, University of Roma Tor Vergata, Italy)</td>
</tr>
</tbody>
</table>
P2-21: Backward-Wave Vacuum Amplifier for THz Amplification ................................. 267
Mauro Mineo, Claudio Paoloni (Department of Electronic Engineering,
University of Roma Tor Vergata, Italy), David Bariou, Jean-François David,
Alain J. Durand (Thales Components & Subsystems, France)

P2-22: Development of Frequency Step Tunable 1 MW Gyrotron ................................. 269
A. Samartsev, G. Gantenbein, G. Dommeriz, S. Illy, S. Kern, W. Leonhardt,
A. Schlaich, M. Schmid and M. Thumm (Karlsruhe Institute of Technology,
Institute for Pulsed Power & Microwave Technology & Institute of High
Frequency Techniques and Electronics, Germany)

P2-23: Design of Matching Optics Unit (MOU) for Coaxial ITER Gyrotron ......................... 271
Jianbo Jin, Gerd Gantenbein, Stefan Kern, Tomasz Rzesnicki and Manfred Thumm
(Karlsruhe Institute of Technology, Germany)

P2-24: Development of a 402.5 MHz 140 kW Inductive Output Tube .............................. 273
Michael Read, Thuc Bui, Robert Jackson, Lawrence Ives (Calabazas Creek Research
Inc., San Mateo, CA, 94404), Henry Freund (Science Applications International
Corp., McLean, Virginia 22102, USA)

P2-25: Experimental Characterization of LIGA Fabricated 0.22 THz TWTCircuits ............... 275
Anisullah Baig, Diana Gamzina, Michael Johnson, Calvin W. Domier,
Alexander Spear, Larry R. Barnett, Neville C. Luhmann and Young-Min Shin
(Department of Engineering & Applied Science, University of California, USA)

P2-26: Coupled-Cavity Monotron .............................................................................. 277
Joaquim J. Barroso (National Institute for Space Research-INPE, Brazil)

P2-27: Design of Dielectric Loaded Sheet Beam Klystron Cavity ................................. 279
A.S. Nirmala Devi, L.M. Joshi and S.K. Ghosh
(Central Electronics Engineering Research Institute, India)

P2-28: A Non-Conventional Multi-Stage Depressed Collector ........................................ 281
for High Efficiency Applications
Nisha Goyal (Department of Electronics and Communication, Banasthali University,
Banasthali, India), Nitin J. Shrivastav, Vishant Gahlaut, R.K. Gupta, V. Srivastava
and S.K. Ghosh (Central Electronics Engineering Research Institute, India)

P2-29: Experimental Verification of the Performance of a Depressed Collector for a Linear Beam Tube ................................. 283
S. Senthil Kumar, V. Shankarappa, Srinivasa Prasad (Microwave Tube Division, Bharat Electronics, Jalalahalli, Bangalore, India)
P. Rajaraman Rao, S.K. Datta (Microwave Tube R&D Centre, India)

P2-30: Design of Coaxial Transformer for Ku-Band Short Length TWT .............................. 285
R.S. Tomar, Pardeep, S. Ghosh, S.M. Sharma, R.K. Sharma and V. Srivastava
(Central Electronics Engineering Research Institute, India)

P2-31: Beam-Wave Interaction Analysis of a 42 GHz, 200 kW CW Gyrotron ........................ 287
Ashutosh, Rupendra Singh and P.K. Jain (Center of Research
in Microwave Tubes, Banaras Hindu University, India)

P2-32: Study of Electron Bunching in Gyroklystrons .................................................. 289
M.S. Chauhan and P.K. Jain
(Center of Research in Microwave Tubes, Banaras Hindu University, India)

P2-33: Design Studies of the Output System of a 95 GHz, 100 KW, CW Gyrotron ........................ 291
P. Vamshi Krishna, M.V. Kuttikkeyan (Dept. Electronics & Computer
Engineering, Indian Institute of Technology, Roorkee, India)
M. Thumm (Karlsruhe Institute of Technology, Germany)
P2-34: Mode Selection and Resonator Design Studies of a 95 GHz, 100 KW, CW Gyrotron

P. Vamshi Krishna, M.V. Kartikeyan (Dept. Electronics & Computer Engineering, Indian Institute of Technology, Roorkee, India)
M. Thumm (Karlsruhe Institute of Technology, Germany)

P2-35: Cold Cavity Analysis for 35 GHz Gyrotron Interaction Cavity Using Free Space Method

Nitin Kumar, Sudeep Saran, Udaybir Singh, Vivek Yadav, Ashok K. Sinha (Central Electronics Engineering Research Institute, India)
B. Jha, P.K. Jain (Center of Research in Microwave Tubes, Banaras Hindu University, India), T.P. Singh (Department of Physics, JV College, Baraut, India)

P2-36: Helix TWT with Dielectric Corrective of the Slowing

Alexander A. Kurayev, Anatoly A. Navrotsky and Anatoly K. Sinitsyn (Belarusian State University of Informatics and Radioelectronics, Belarus)

P2-37: Stable Transport of Intense Elliptical Sheet Electron Beam through Elliptical Tunnel under Uniform Magnetic Field

Purna C. Panda, Vishnu Srivastava (Central Electronics Engineering Research Institute, India)
Anil Vohra (Department of Electronics Science, Kurukshetra University, India)

P2-38: Development of a 100 KW CW, S-Band, PPM Focused Klystron

Patrick Ferguson, Michael E. Read, David Marsden and R. Lawrence Ives (Calabazas Creek Research Inc., USA)

Session-14: Traveling-Wave Tube Modeling

14.1: SUNRAY-2.5 D Code for Multi-Signal Large-Signal Analysis of a Complete Helix TWT
Vishnu Srivastava (Central Electronics Engineering Research Institute, India)

Simon J. Cooke, Alexander N. Vlasov, Baruch Levush (Naval Research Laboratory, USA), Igor A. Chernyavskiy (Science Applications International Corporation, USA)
Thomas M. Antonsen Jr. (University of Maryland, USA)

14.3: Efficient 2.5-D Non-Stationary Simulations of a Helix TWT
Pierre Bernardi, Frédéric André, David Barion, Jean-François David, Alain Le Clair (Thales Electron Devices, France)
Fabrice Doveil (Laboratoire de PIIM, Université de Provence, France)

14.4: Linearity Performance of Multi-Stage TWT Amplifiers: Cascade vs. Series
Khanh Nguyen, John Pasour, Edward Wright, David Abe, Lars Ludeking, Dean Pershing and Baruch Levush (US Naval Research Laboratory, USA)

14.5: Analysis of Two Dimensional Metal Electromagnetic Band Gap (EBG) Structure Using Finite Difference Time Domain Method
M. Thottappan and P.K. Jain (Center of Research in Microwave Tubes, Banaras Hindu University, India)

Session-15: Multi-Beam Devices

15.1: Research Progress on the S-Band High-Power Broadband Multi-Beam Klystrons
Zhaochuan Zhang, Yaogen Ding, Bin Shen, Honghong Gu, Jing Cao and Haibing Ding (Chinese Academy of Sciences, China)

15.2: 1.3 GHz, 10 MWp Long Pulse Multibeam Klystrons: A Long Heritage and Proven Reliability
R. Marchesin, A. Beumas, F. Legrand, P. Thouvenin, M. Caplot and E. Boghossian (Thales Electron Devices, France)
15.3: On the Opportunity of Bandwidth Increasing in Multibeam Klystron with Planar Layout of the Beams
A.V. Galdetsky (FSUE Istok, Russia)

15.4: A 350 MHz, 200 kW CW, Multiple Beam IOT
Lawrence Ives, Michael Read, David Marsden, R.H. Jackson, Thuc Bui (Calabazas Creek Research Inc., USA)
Takiji Kimura, Edward Eisen (Communications & Power Industries, USA)

15.5: Design of a High Frequency Miniature Multi Beam Klystron (MBK)
Mithilesh Kumar, M. Vijay Kumar, Ashok Bansiwal, A.K. Agrawal, Ravi Ninavath, Venkat, Sushil Raina and Lalit Kumar (Microwave Tube R&D Centre, India)

Session-16: Subsystems, Materials and Technologies
16.1: High Temperature Brazing of Porous Tungsten with Nano Structured Mo-Ni for a Dispenser Cathode Application
Daniel Busbaher (Semicon Associates, USA)
Wen Liu, Dusan P. Sekulic (Mechanical Engineering Department, University of Kentucky, USA), David Mocher (Department of Earth and Environmental Sciences, University of Kentucky, USA)

16.2: Vacuum System of the Cyclotrons in VECC, Kolkata

16.3: Klystron Based High Power RF System for Proton Accelerator
Manjiri Pande, Sandip Shrotriya, Sonal Sharma, Niranjan Patel and Verander Handu (Technical Physics Division, Bhabha Atomic Research Center, Mumbai, India)

16.4: Temperature Dynamic Response of Slow-Wave Structure of Space Traveling Wave Tube
Xingqun Zhao, Siuren Wan, Ningfeng Bai, Xiaohan Sun (Research Center for Electronic Device and System Reliability, Southeast University, China)
Yixue Wei, Shilu Zhao, Tiechang Yan (Beijing Vacuum Electronics Research Institute, China)

16.5: 1 KW Ka-Band Folded Waveguide Traveling-Wave Tube
Huarong Gong, Yubin Gong, Tao Tang and Wenxiang Wang (University of Electronic Science and Technology, China)

Session-17: Gyro-Traveling-Wave Tube
17.1: Manufacture and Evaluation of a GyroTWA Amplifier
Michael J. Duffield and Richard North (e2v Technologies Ltd, UK)

17.2: Study of a W-Band Second-Harmonic Gyro-TWT Amplifier
Zhiliang Li, Jinjun Feng, Efeng Wang and Bentian Liu (Vacuum Electronics National Laboratory, China)

17.3: Small-Signal Field Analysis of Gyro-TWT Amplifier
N. Kalyasundaram, Jasmine Saini and G. Naveen Babu (Department of Electronics and Communication Engineering, Jaypee Institute of IT, India)

17.4: Sapphire Windows for High-Power Microwave and mm-Wave Applications
Narugopal Nayek, K. Subhadra, Arvind Nalik and Subrata Das (SAMEER, India)
17.5: Measurement of Dispersion and Azimuthal Interaction Impedance of Vane-Loaded Coaxial Wave Guiding Structures
V. Bhanu Naidu, P. Raja Ramana Rao, Narasimha Murthy, S.U.M. Reddy, Lalit Kumar (Microwave Tube Research and Development Centre, India)
P.K. Jain (Department of Electronics Engineering, Banaras Hindu University, India)

Session–18: THz Technology

18.1: Microfabrication of Wideband Distributed Beam Amplifiers at 220 GHz
Colin D. Joye, Jeffrey P. Calame, Paul B. Larsen, Doewon Park, Robert Bass, Baruch Levish (US Naval Research Laboratory, USA)
Khánh T. Nguyen, Dean Pershing (Beam Wave Research Inc., USA)
Morag Garven (Scientific Applications International Corp., USA)

18.2: Nano CNC Milling Technology for Terahertz Vacuum Electronic Devices
Diana Gamsina, Robert Barchfeld, Larry R. Barnett, Neville C. Luhmann Jr. and Young-Min Shin (Department of Applied Science, University of California-Davis, USA)

18.3: Measurement of Surface Roughness Effects on Conductivity in the Terahertz Regime with a High-Q Quasioptical Resonator
Benjamin B. Yang, Sarah L. Katz and John H. Booske (Department of Electrical and Computer Engineering, University of Wisconsin-Madison, USA)

18.4: Investigation of the Attenuating Effects of Atmospheric Water Content at 400 GHz
Marcus J. Weber, Benjamin B. Yang, Sarah L. Katz and John H. Booske (University of Wisconsin-Madison, Wisconsin, USA)

18.5: Beam Transport Modeling of PPM Focused THz Sheet Beam TWT Circuit
Anisullah Baig, Jian-Xun Wang, Larry R. Barnett, Neville Luhmann Jr. and Young-Min Shin (Department of Engineering, Applied Science, University of California, USA)

POSTER SESSION–3

P3-1: Excitation Equations for the Arbitrarily-Irregular Coaxial Waveguide
Alexander A. Kurayev, Tatiana L. Popkova and Alexey O. Rak (Belarusian State University of Informatics and Radioelectronics, Belarus)

P3-2: Cold test of Slow Wave Structure with Modified Photonic Band Gap
Xi Gao, Simin Li, Weiping Cao, Yannan Jiang and Xinhua Yu (Information and Communication College, Guilin University of Electronic Technology, China)

P3-3: Secondary Electron Emission on Alumina Output Windows with Longitudinal RF Electric Field
Zhu Fang, Zhang Zhao-Chuan and Luo Ji-run (Institute of Electronics, Chinese Academy of Sciences, China)

P3-4: Ill-Posed Problems of Vacuum Physical Electronics
Sergey V. Korolev (All-Russia Electronic Technical Institute, State Science Center, Russia)

P3-5: Field Emission Current from Multipoint Nanoemission Matrix, Taking into Account the Statistical Nature of the Distribution of the Field Enhancement Factor. Determination of the Statistic Distribution of the Field Enhancement Factor of Nanoemission Matrix of Field Emitter from Results of Emission Investigation
Sergey V. Korolev (All-Russia Electronic Technical Institute, State Science Center, Russia)
P3-6: Great and Shaft of Beam Cathode-Heating Units for Powerful Microwave Device and Relativistic Electron Injectors
Sergy V. Korolev, Vera I. Alekhina, Artur N. Ermilov, Yurij A. Kovalenko, Alexandr L. Shapiro and Alexandr P. Shumilin
(All-Russia Electronic Technical Institute, State Science Center, Russia)

P3-7: M-Type Cathode Life Tests
Cheng Cheng, Ji Li, Zhiqiang Yu and Hui Wang
(Beijing Vacuum Electronics Research Institute, China)

P3-8: Dielectric Properties Measurements of FC-75
Vivek Yadav, Sudheep Sharan, Nitin Kumar, M.K. Alaria, A.K. Sinha (Central Electronics Engineering Research Institute, India)
Narugopal Nayek, Subrata Das (Society for Applied Microwave Electronics Engineering and Research, India)
S.C. Deorani (Department of Physics, R.R. College, Alwar, India)

P3-9: Influence of Plasma Spraying on Emission of Oxide Cathode
Min Zhang, Xiaoxia Wang, Jinjun Luo and Qinglan Zhao
(Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences, China)

P3-10: Life Test Studies on RV Dispenser Cathode
Mingchen Zhang, Honghai Zhang, Shiji Yu and Pukun Liu
(Research and Development of Center for Space TWT, Institute of Electronics, Chinese Academy of Sciences, China)

P3-11: Thermal Management: Use of Aluminum-Nitride Multilayer Heaters in Dispenser Cathodes
Daniel Busbaher (Semicon Associates, USA)
Peter C. Smith and Robert W. LeClair (Oasis Materials Corporation, USA)

P3-12: Emission Characteristics of Nanosized-Scandia Doped Dispenser Cathodes at Different Operating Modes
Yiman Wang, Wei Liu, Jinshu Wang and Xizhu Zhang (School of Materials Science and Engineering, Beijing University of Technology, China)

P3-13: Neutral Pressure Effects on Ionization Characteristics of Electron Cyclotron Resonance Discharge
XiaoLin Jin, ZhongHai Yang, Tao Huang, XiaoFang Zhu, JianQing Li and Bin Li (School of Physical Electronics, University of Electronic Science and Technology of China)

P3-14: Microfabrication of W-Band Folded Waveguide Slow Wave Structure Using DRIE and UV-LIGA Technology
Hanyan Li, Jinjun Feng and Guodong Bai (Beijing Vacuum Electronic Research Institute, China)

P3-15: Study on Chemical State of Oxygen on Surface of Cathodes Coated with Os or W Film
Shengyi Yin, Jingxin Yang, and Honghai Zhang (Institute of Electronics, Chinese Academy of Sciences, China)

P3-16: Efficiency Improvement of TWTs by Surface Modification of Multistage Depressed Collectors
Ming Q. Ding, Bo Qu, Guodong Bai, Junyi Xing, Xiaofeng Liang, Shaolun Cai and Jinjun Feng (Beijing Vacuum Electronics Research Institute, China)

xxii
P3-17: Design and Development of Pseudospark Based Hollow Cathode Plasma Electron Gun
U.N. Pal, M.K. Barik, V. Lamba, D.K. Verma, N. Kumar, M. Kumar, B.L. Meena, M.S. Tyagi, A.K. Sharma (Central Electronics Engineering Research Institute, India)
V.P. Dubey (Ch. Beevi Singh College of Engineering & Management, Agra, India)

P3-18: A Study of Free Standing Diamond Films for mm TWTs
Ming Q. Ding, Lili Li, Guodong Bai, Yangfu Hu and Jinjun Feng (Beijing Vacuum Electronics Research Institute, China)

P3-19: Dielectric and Ferroelectric Properties of Lanthanum Doped SrBi4Ti4O15 Ferroelectric Ceramics
K. Ashok, P. Sarah (Vardhaman College of Engg., Shamshabad, India)
V.S. Raju (CCCM, BARC, ECIL post, Hyderabad, India)
S. Chandralingam (Department of Physics, JNTUH College of Engineering, Hyderabad, India)

P3-20: Cathode Manufacturing Relational Data Collection and Process Control System
Michael P. Ejfgen (Semicon Associates, USA)

P3-21: Compensation of Wave $E_0$ Reflection from a Dielectric Window on to the Horn Aperture
Oksana I. Naranovich and Anatoly K. Sinitsyn (Belarusian State University of Informatics and Radioelectronic, Belarus)

P3-22: Micro Fabrication by Low Energy Ion Beam from Plasma Based Ion Sources
P.Y. Nabhiraj, Ranjini Menon, R.K. Bhandari (Variable Energy Cyclotron Centre, Kolkata, India)
G. Mohan Rao, S. Mohan (Department of Instrumentation, Indian Institute of Science, India)

P3-23: Moving Toward Sustainability in Cathode Manufacturing Process
Scott Roberts and Mike Ejfgen (Semicon Associates, USA)

P3-24: Alternative Ceramic Potting Materials for Dispenser Cathodes
T.J. Balk, P. Rottmann, D. Bowling, E. Fadde, A. Floyd, R. Wilson (Department of Chemical and Materials Engineering, University of Kentucky, USA)
S. Roberts (Semicon Associates, USA)

P3-25: Influence of Os-Ru Coating on Closed-Space Diode Tests of M-Type Dispenser Cathodes
P. Swartzentruber, T.J. Balk (Department of Chemical and Materials Engineering, University of Kentucky, USA), S. Roberts (Semicon Associates, USA)

P3-26: 2 MW CW RF Load for Gyrotrons
R. Lawrence Ives, David Marsden, Max Mizuhara, George Collins, Jeff Neilson and Philipp Borchard (Calabazas Creek Research, USA)

P3-27: Design Study of a 0.4 THz 100 kW Pulsed Gyrotron
E.M. Choi (Ulsan National Institute of Science and Technology, South Korea)

P3-28: XRD Analysis of Scandate Cathodes
Wei Liu, Jinshu Wang, Yiman Wang, Yuntao Cui, Xizhu Zhang and Meiling Zhou (Beijing University of Technology, China)

P3-29: Experimental Setup for Optimization of Electro-Explosive Fuse
N. Nalini, M. Kale, T.C. Kaushik and S.C. Gupta (Applied Physics Division, Bhabha Atomic Research Center, India)

P3-30: High Power Microwave Coupling with a Buried Twisted Pair Cable
K. Sunita and M. Joy Thomas (Pulsed Power and EMC Laboratory, Department of Electrical Engineering, Indian Institute of Science, India)
P3-31: Thermal Emission Property of Solid Solution Gd\textsubscript{1-x}Nd\textsubscript{x}O\textsubscript{2} (x=0, 0.6, 0.8) ................. 413
Jiu Xing Zhang, Li Hong Boo and Shen Lin Zhou (Key Laboratory of Advanced Functional Materials, Beijing University of Technology, China)

P3-32: Pulsed Magnetic Field Measurement Outside Finite Long ......................... 415
Solenoid Implementing Novel Calibration Technique
Shibaji Basu, S.V. Desai, Archana Sharma, S. Mitra, K.V. Nagesh, M.R. Kuikarni and D.P. Chakravarty (Bhaba Atomic Research Centre, India)

P3-33: Cathode Life Evaluation Based on the Evolution of Heater Power and Perveance ...... 417
Fan Hehong, Xu Yushu, Bai Ningfeng, Xiao Jinbiao, Sun Xiaohan (Research Center for Electronic Device and System Reliability, Southeast University, Nanjing China)
Li Ji (Beijing Vacuum Electronics Research Institute, China)

P3-34: Two-Dimensional Electromagnetic Child-Langmuir Law ......................... 419
of a Short-Pulse Electron Flow
Yao Li Liu, Ling Chieh Tai, Shih Hung Chen (Department of Physics, National Central University, Zhongli, Taiwan), Lay Kee Ang (School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore)
Woo Shing Koh (Institute of High Performance Computing, Singapore)

P3-35: Preparation of High Field Emission Current Carbon Nanotubes .................. 421
by Chemical-Vapor Deposition
Feng Gao, Mei Xiao, Xiaobing Zhang and Wei Lei (School of Electronic Science & Engineering, Southeast University, Nanjing, China)

P3-36: The Investigation of Interaction between Low-Temperature ................. 423
Solders and Emission Body of Dispenser Cathodes
B.Ch. Dyubua and O.V. Polivnikova (SRPC, ISTOK, Russia)

P3-37: Design of an Ka-Band Mode Converter .............................................. 425
Xu Shouxi, Pu-Kun Liu, Zhang Shi-Chang, Du Chao-Hai and Gu Wei
(Key Laboratory of High Power Microwave Sources and Technologies, Institute of Electronics, Chinese Academy of Sciences, China)

P3-38: Vacuum Processing of 42 GHz, 200 kW CW/Long-Pulse Gyrotron .................. 427
(Central Electronics Engineering Research Institute, India)

Session-19: Vacuum Electronic Device Applications

19.1: Design of High Performance TWT Based C-Band Transmitter .................. 429
for High Altitude Operation
Dharmendra Kumar, B.R. Sushma, Venkatesh Prabhu, Meera Das and
N.C. Saha (Electronics and Radar Development Establishment, India)

19.2: Design and Realization Challenges of Power Supplies for Space TWT ............ 431
N.V. Bijeev, Anju Malhotra, Virender Kumar, Surinder Singh, K.S. Dasgupta
(Space Application Centre, ISRO, Ahmedabad, India)
Rajesh N. Motta, B. Venugopal, Sandhyarani, O.K. Jinan, B.K. Jayakumar
(Bharat Electronics Limited, Bangalore, India)

19.3: Development of a Fast Switching Modulator for an MPM .......................... 433
P. Sidharthan, K. Mirjith, A.J. Zabiulla and Sudhir Kamath
(Microwave Tube R&D Centre, Bangalore, India)

19.4: Integration and Evaluation of a MPM Based Transmitter on Fighter Aircraft .......... 435
Ch. Durga Prasad, G. Baranidharan, K.B. Venkataraman and U.K. Revankar
(Defence Avionics Research Establishment, Bangalore, India)
Session–20: Magnetron

20.1: The Development of Vacuum Microwave Devices in Istok ........................................437
A.A. Borisov, U.A. Budzinsky, S.Y. Bykovsky, A.V. Galdetskiy, A.N. Korolev,
M.I. Lopin, A.A. Negirev, V.I. Pugnin, G.Y. Ruvinsky and B.V. Sazonov
(FSU E Istok, Russia)

20.2: X-Band RF Power Sources for Accelerator Applications ........................................439
Mark F. Kirshner, Richard D. Kowalczyk, Craig B. Wilson,
Richard B. True, Ian T. Simpson and John T. Wray
(L-3 Communications Electronic Devices, USA)

20.3: Electromagnetic Design and Analysis of a High Power Tunable Pulsed Magnetron........ 441
S. Maurya, V.V.P. Singh (Central Electronics Engineering Research Institute, India)
S. Prasad, M. Kumar, P. Chaudhary, N. Shekhawat

20.4: 3D Magnetron Simulation with CST STUDIO SUITE™ .............................................443
Monika C. Balk (Computer Simulation Technology, Germany)

20.5: Recirculating Planar Magnetrons: Simulations and Experiment ....................................445
Matthew Frantz, Ronald Gilgenbach, David French, Y.Y. Lau, David Simon
(Nuclear Engineering and Radiological Sciences Dept., University of Michigan, USA)
Brad Hoff (Air Force Research Lab, USA)
John W. Luginsland (Air Force Office of Scientific Research, USA)

POSTER SESSION–4

P4-1: The Problem of Diagnostics of Electronics and Plasma Units ......................................447
Yu. A. Kovalenko and D.S. Korolev (Federal State Unitary Enterprise,
All-Russia Electronic Technical Institute, Russia)

P4-2: Multiplication of Frequency in a Gyrocon with a Longitudinal Magnetic Field ............449
V.Y. Matveenko and A.K. Sinitsyn
(Belarusian State University of Informatics and Radioelectronics, Belarus)

P4-3: Beam-Wave Synchronization and Coupling in a Multi-Gap Coupled Cavity ...............451
Cui Jian, Luo Ji-Run, Zhu Min and Guo Wei
(Institute of Electronics, Chinese Academy of Sciences, China)

P4-4: The Results of a Numerical Modeling of Two-Gap Cavity for Powerful Multibeam IOT Working as the Frequency Multiplier ...........................................453
Alexey I. Korchagin, Alexey Yu. Miroshnichenko and Vladimir A. Tsarev
(Saratov State Technical University, Russian Federation)

P4-5: Plane Gyroklinotron at First and Third Harmonics of Cyclotron Frequency ...............455
A.A. Kurayev, D.V. Lukashonok and A.K. Sinitsyn
(Belarusian State University of Informatics and Radioelectronics, Belarus)

P4-6: Development of Two Ka-Band High Efficiency Helix-TWTs at IECAS .........................457
Ming-Guang Huang, Bao-Liang Hao, Pu-Kun Liu,
Wei Liu and Zi-Cheng Wang
(Institute of Electronics, Chinese Academy of Sciences, China)

P4-7: Design and Performance Verification of Space Grade Multi-output Medium Power, Electronic Power Conditioner under Thermo-Vacuum Environment ........................................459
Bhoopendrakumar Singh, Santosh Joteppa, Satyanarayana Prasad,
Vinod S. Chippalkatti (Centum Electronics Limited, Yelahanka, Bangalore, India)
R.N. Garvalia, K.G. Domadia, R.M. Parmar, R.K. Dave, D.R.M. Samudraiah
(Space Applications Centre, Indian Space Research Organisation, Ahmedabad, India)
P4-8: Suppression of High Order Mode Oscillation and Parasitic RF Output in Multi-Beam Klystrons

Yaogen Ding, Zhaochuan Zhang, Bin Shen, Haibin Ding and Xiaoxin Sun (Institute of Electronics, Chinese Academy of Sciences, China)

P4-9: ICEPIC Simulation of a Strapped Non-Relativistic High-Power CW UHF Magnetron with a Helical Cathode Operating in the Explosive Electron Emission Mode

Andrey D. Andreev and Kyle J. Hendricks (Air Force Research Laboratory, Directed Energy Directorate, Kirtland, USA)

P4-10: Multiple Electron Beam Helix TWT for the Active Phased Array Radar System

Ming Hui Liu, Fu Jiang Liao (Beijing Vacuum Electronics Research Institute, China)

P4-11: Pulsed Power Supply for Magnetic Field to Generate HPM from Slow Wave Structures

Nidhi Parmar, P. Deshpande, Y. Choyal, K.P. Maheshwari (School of Physics, D.A. University, Indore, India)

P4-12: Thermal Management of GEO Satellite Communication Payload

H.S. Vasudeva Murthy, Amit Kumar Sharma, K. Badarinarayana and P. Lakshminarasimhan (ISRO Satellite Centre, Bangalore, India)

P4-13: Development and Calibration of Rogowski Coils for Pulsed Power Systems


P4-14: Development of Solid-State Based Triggering Arrangement of KALI-5000 MARX Generator

T.S. Kolge, S. Mitra, Ritu Agarwal, P.C. Saroj, Ankur Patel, K. Senthil, Archana Sharma, K.V. Nagesh and D.P. Chakravarthy (Bhabha Atomic Research Centre, Mumbai, India)

P4-15: Experimental Results for Induction Voltage Adder of LIA-200


P4-16: Study and Observation of Multipacting in New RF Cavity of INDUS-1 SRS

Pritam Singh Bagdual, Nitesh Tiwari, M. Prasad, Ashish Bohrey, M. Lad, S.J. Buhari and P.R. Hannurkar (Raja Ramanna Centre for Advanced Technology, Indore, India)

P4-17: Experimental Results of Inductive Energy Storage Pulsed Power System Using Exploding Wire as an Opening Switch

K. Senthil, S. Mitra, Archana Sharma, K.V. Nagesh and D.P. Chakravarthy (Bhabha Atomic Research Centre, Mumbai, India)

P4-18: Interaction of High Power Microwave with Plasma

V.P. Anitha, Amita Das, Y.C. Saxena, Anurag Shyam and P.K. Kaw (Institute for Plasma Research, Gandhinagar, India)

P4-19: Design and Testing of a PFN for the Washer-gun in SYMPEL

Priyavandna J. Rathod, V.P. Anitha, Jayesh Raval, Renu Bahl, Y.C. Saxena (Institute for Plasma Research, Gandhinagar, India)

Z.H. Sholapurwala (Zeonics Systech, Maruthinagar, Bangalore, India)
P4-20: Development of 352.2 MHz High Power RF Test Setup .......................... 485
Manmath K. Badapanda, Abhilesh Tripathi, Rinki Upadhyay and
Pundlik R. Hamurkar
(Raja Ramanna Centre for Advanced Technology, Indore, India)

P4-21: Feedback Design in High Voltage Power Supplies .............................. 487
T. V. Prakash Rao, R.S.N. Moorthy and Sowbhagya
(Electronics & Radar Development Establishment, India)

P4-22: A Compact Generator Based on Tesla Transformer and Water Pulsed Forming Line for POS Application
Rajesh Kumar, Jignesh Patel, V.P. Anitha and Anurag Shyam
(Institute for Plasma Research, Gandhinagar, India)

P4-23: Short Pulse High Power Microwave Generation from an Axially Extracted Virtual Cathode Oscillator
Rishi Verma, Tushar Patel, Y.C. Saxena
(Institute for Plasma Research, Bhat, Gandhinagar, India)
Anurag Shyam (Bhabha Atomic Research Centre, Mumbai, India)

P4-24: Radar Transmitter-HV Engineering, Crowbar Design and Environmental Qualification—A Case Study
(DRDO, Bangalore, India)

P4-25: Experimental Analysis on Advantage of Hot Stuffing over Cold Stuffing for Space TWTS
J. Koner, P. V. Bhaskar, K. S. Prasad, S. Prasad and R. P. Rajagopalan
(Bharat Electronics, Bangalore, India)

P4-26: Experiments on Use of Electrically Exploding Opening Switches to Direct Driving of HPM Load
S.P. Nayak, N. Nalini, Mahesh Kale, T.C. Kaushik, S.C. Gupta
(Applied Physics Division, Bhabha Atomic Research Centre, Mumbai, India)
Archana Sharma, K. Senthik, Rakhee Menon, Amitava Roy, K.V. Nagesh,
D.P. Chakravarthy (Accelerator and Pulse Power Division, Bhabha Atomic Research Centre, Mumbai, India)

P4-27: Heat Treatment Effects on Dielectric Properties of SrFe₁₂O₁₉ Hexaferrite Prepared by an SHS Route
Nital R. Panchal and Rajshree B. Jotania (Department of Physics, University School of Sciences, Gujarat University, India)

P4-28: Methodological Approach in Development of System Design Layout for Alignment of a MSD Collector for TWT Application
A.J. Banerjee, B. Sampath Kumar, P. Saha
(Central Mechanical Engineering Research Institute, India)
R.K. Sharma (Central Electronics Engineering Research Institute, India)
A. Ghosh (Department of Applied Optics and Photonics, University of Calcutta, India)

P4-29: 3D Analysis of Fabrication Misalignments in Electron Gun
Vemula Bhanu Naidu, Subrata Kumar Datta and Sudhir Kamath
(Microwave Tube Research and Development Centre, Bangalore, India)

P4-30: Embedded Cooling Scheme to Increase the Electronics Packing Density for MPM
P. Srikrisna, P.V. Siva Rao, S. Subramanian and Lalit Kumar
(Microwave Tube Research and Development Centre, Bangalore, India)

P4-31: Simulation of a Collector for a Gyro-Device Using PIERCE
P. Raja Ramanna Rao, Subrata Kumar Datta and Lalit Kumar
(Microwave Tube Research and Development Centre, Bangalore, India)
P4-32: Simulation of Collectors for TWT Including the Effects of SEE Using PIERCE
P. Raja Ramana Rao, S.K. Datta, Lalit Kumar
(Microwave Tube Research and Development Centre, Bangalore, India)
V.A. Deshmukh (Defence Institute of Advanced Technology, Pune, India)

P4-33: Hot Stuffing of Helical SWS by Induction Heating
(Microwave Tube Research and Development Centre, Bangalore, India)
V.A. Deshmukh (Defence Institute of Advanced Technology, Pune, India)

P4-34: Ka-Band Waveguide Component Simulations for a Gyro-Travelling Wave Amplifier
C.W. Robertson, A.D.R. Phelps, C.G. Whyte, A.R. Young, K. Ronald and A.W. Cross
(Department of Physics, University of Strathclyde, Glasgow, UK)

P4-35: Reversed Cherenkov Radiation in a Half Space
Chen Guo, Zhaoyun Duan, Jucheng Lu (Institute of High Energy Electronics, School of Physical Electronics, University of Electronic Science and technology, China)
Min Chen (Department of Physics, Massachusetts Institute of Technology, USA)

P4-36: A High Voltage Test Stand for Electron Gun Qualification for LINACs
Yashwant D. Wanmode, J. Mulchandani, M. Acharya, A. Bhisikar, H.G. Singh and Purushottam Shrivastava (Raja Ramanna Centre for Advanced Technology, India)

P4-37: Planar Helix with Straight-Edge Connections and a Sheet Electron Beam for Traveling-Wave Tube Applications
Ciersiang Chua, Sheel Aditya (School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore)
Zhongxiang Shen, Min Tang, Julius Tsai (Institute of Microelectronics, Agency for Science, Technology and Research, Singapore)

Valedictory Session
PL-5: Gyro-Devices and their Applications
Manfred Thumm (Karlsruhe Institute of Technology, Germany)

PL-6: An Overview of Advances in Vacuum Electronics in China
Yaogen Ding, Pukun Liu, Zhaochuan Zhang and Yong Wang
(Institute of Electronics, Chinese Academy of Sciences, China)

PL-7: Microwave Tubes for Space Applications
PL-8: High Power Microwave & Applications

AUTHOR INDEX