

ADVANCE PROGRAM



**Third IEEE International
Vacuum Electronics
Conference**

IVEC 2002

April 23 - 25, 2002

**DoubleTree Hotel
Monterey, California, USA**

***Sponsored by the
IEEE Electron Devices Society***



<http://ivec2002.org>

WELCOME

The IVEC 2002 Program Committee, the EDS Technical Committee on Vacuum Devices, and I welcome you to the Third IEEE International Vacuum Electronics Conference. IVEC is dedicated to the field of vacuum electron devices and their application. The Meeting this year, sponsored by the IEEE Electron Devices Society, is being held at the DoubleTree Hotel in the beautiful and historic city of Monterey, California.

We have an interesting program in store for you. On the first morning of the Conference, Tuesday, April 23, there will be a Plenary Session with speakers covering subjects of special interest. On Tuesday afternoon, there will be parallel sessions of oral papers. On Wednesday, there will be a mix of both oral and poster presentations. The IVEC reception and banquet will be held on Wednesday night. At the banquet, awards including the first IVEC excellence award will be presented, followed by entertainment. On Thursday, there will be a series of oral sessions.

In general, we have attempted to configure IVEC to maximally disseminate useful information to manufacturers, device users, academics, and students. Throughout the meeting and social events, there will be time to renew friendships with colleagues and friends, interact with customers, meet students, and we hope that you will do so.

We plan to keep the IVEC 2002 website <http://ivec2002.org> active after the Conference for a while. It will continue to serve as a clearinghouse for news and other information about IVEC including links to past and future IVEC website areas.

Finally, I would like to take this time to thank all the Committee Members for their help and support, Ralph Nadell of Palisades Convention Management for doing such a fine job, and all the presenters and other contributors to the meeting for their participation. Our motto is "System Excellence through Vacuum Electronics," and I think everyone associated with IVEC has been helping to make this a continuing reality.

Richard True
General Chairman
IVEC 2002

IVEC 2002 CONFERENCE AND PROGRAM COMMITTEES

- General**
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*Northrop Grumman Electron Devices
San Carlos, CA*
- Technical**
Program Chair: Dan M. Goebel
*Boeing Electron Dynamic Devices
Torrance, CA*
- Entertainment:** Carol L. Kory
*Analex / NASA–Glenn Research Center
Cleveland, OH*
- Publicity and**
Webmaster: William L. Menninger
*Boeing Electron Dynamic Devices
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*Naval Research Laboratory
Washington, DC*
- Finance:** Robert K. Parker
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Washington, DC*
- Education:** John H. Booske
*University of Wisconsin
Madison, WI*
- Local**
Arrangements: Yehuda Goren
*Teledyne Electronic Technologies
Rancho Cordova, CA*
- Awards:** James A. Dayton, Jr.
*GENVAC Aerospace Corp.
Cleveland, OH*
- Conference**
Coordinator: Ralph Nadell
*Palisades Convention Management
New York, NY*

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Kwo Ray Chu

National Tsing Hua University, Hsinchu, Taiwan, ROC

Takao Kageyama

NEC Corp., Kawasaki, Japan

Guenter Kornfeld

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Analex / NASA–Glenn Research Center, Cleveland, OH

Shenggang Liu

*University of Electronic Science and Technology, Chengdu,
ROC*

Neville C. Luhmann, Jr.

University of California at Davis, Davis, CA

W. Devereux Palmer

Army Research Office, Research Triangle Park, NC

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Seoul National University, Seoul, Korea

Robert K. Parker

Naval Research Laboratory, Washington, DC

Armand Staprans

Communications and Power Industries, Palo Alto, CA

Philippe Thouvenin

Thales Electron Devices, Velizy, France

Richard True

Northrop Grumman Electron Devices, San Carlos, CA

Pierre Waller

European Space Agency, Noordwijk, The Netherlands

GENERAL INFORMATION

Registration

Advance Registration is not required, but it is strongly encouraged for quick pick-up of registration materials and for your own convenience. The registration fee includes admission to all technical sessions, a single ticket to the Wednesday evening banquet, all refreshment breaks, and a copy of the Book of Abstracts. On-line registration is also available through the IVEC 2002 website <http://IVEC2002.org>. Or, complete the enclosed registration form (see centerfold), include your payment, and mail or fax to the address below. Checks should be made payable to IVEC in U.S. currency drawn on a U.S. bank. Only credit card payment may be faxed.

Palisades Convention Management, Inc.
Attn: Ralph Nadell (IVEC 2002)
411 Lafayette Street, Suite 201
New York, NY 10003
fax (212) 460-5460

The deadline for receipt of Advance Registration is April 12, 2002. Requests for refunds must be made in writing and received no later than April 12, 2002. Confirmations will be mailed. However, confirmation of registration can also be made by calling (800) 350-0111 or (212) 460-9700.

	Before April 12	After April 12 or on Site
IEEE Member	\$400	\$425
Non-Member	\$450	\$475
Student/Retired/ Life Member	\$190	\$190

Registration will take place in the DeAnza Foyer of the DoubleTree Hotel during the hours listed below.

Registration Hours

Monday, April 22	4:00 pm – 9:00 pm
Tuesday, April 23	7:00 am – 5:00 pm
Wednesday, April 24	7:30 am – 5:00 pm
Thursday, April 25	7:30 am – 1:30 pm

Hotel Accommodations

The meeting will be held at the DoubleTree Hotel, located at Two Portola Plaza, Monterey, CA 93940, tel. (831) 649-4511. A block of sleeping rooms has been reserved for attendees of the Third IEEE International Vacuum Electronics Conference at the DoubleTree. The special meeting rates are listed below.

Single Occupancy	\$169
Double Occupancy	\$189

Complete and mail the enclosed hotel registration card (see centerfold) to the DoubleTree at Fisherman's Wharf or call (831) 649-4511 prior to April 1, 2002. Reservations received after this date will be processed at the conference rate on a space available basis only. When contacting the hotel, please be sure to mention that you are attending the International Vacuum Electronics Conference.

Airport/Hotel Transportation

The Monterey Peninsula Airport is served by major and regional carriers and offers more than 50 flights a day. There are connecting and direct flights to all major West Coast cities. The Peninsula is also convenient to all three San Francisco Bay airports. San Jose airport is just 1 hour away and both San Francisco and Oakland airports are less than 2 hours by car. Los Angeles is 5 hours away by car.

Climate

Moderate year-round temperatures and a typically dry California climate are two of Monterey's most attractive features. Daytime temperatures rarely exceed the 70s, and sweaters or light jackets are sufficient most evenings. The average temperature is 66 degrees.

Surrounding Attractions

Monterey, California is also home to historic Fisherman's Wharf on Cannery Row, the world-famous Monterey Bay Aquarium, and Pebble Beach. Monterey is a seaside community providing a variety of recreational activities including shopping, golf, local wineries, art galleries and museums.

Reception and Banquet

All conference attendees are invited to attend the Conference reception and banquet to be held on Wednesday evening, April 24th. The reception will start in the DeAnza Foyer at 6:00 pm, dinner will be served in the DeAnza Ballroom at 7:00 pm. The evening will conclude with the presentation of the IVEC Award for Excellence in Vacuum Electronics and a program of entertainment.

Employment Assistance Center

An employment assistance service will be offered at the conference. Individuals interested in employment opportunities in the vacuum electronics area and employers seeking applicants should contact IVEC 2002 publications chair, Monica Blank (click on "Contact Us" on the IVEC 2002 Web site). Interviews will be arranged at the conference.

Student Tutorial Software Projects

At the job center, an exhibit of computer-based tutorials on microwave vacuum electron devices is planned. This new educational software is being developed by creative students from the MURI consortium (six U.S. universities in the Multidisciplinary University Research Initiative in Innovative Microwave Vacuum Electronics). Describing the principles and applications of TWTs, klystrons, gyrotrons, gyroklystrons, and crossed-field devices, the tutorials will be incorporated into future educational initiatives and promotional materials.

IVEC 2002 Award for Excellence in Vacuum Electronics

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. Selection of the winner will be made by a vote of the members of the Technical Committee. The winner will receive a commemorative plaque and an award of \$1000. If a group nomination is selected for the award they will each receive a plaque and share the \$1000.

Messages

Messages will be posted in the Message Center, located adjacent to the IVEC registration desk. For incoming messages, please call the DoubleTree at Fisherman's Wharf at (831) 649-4511 and ask to be transferred to the IVEC registration desk.

Conference Contact

Anyone requiring additional information should contact the Conference Coordinator, Ralph Nadell, c/o Palisades Convention Management, 411 Lafayette Street, Suite 201, New York, NY 10003; (212) 460-8090 ext. 203, or Rnadell@pcm411.com. For registration verification, call (800) 350-0111 or (212) 460-9700.

Website

For additional information on Monterey and IVEC, individuals are encouraged to visit our website at <http://ivec2002.org>

PLENARY SESSION

Tuesday, April 23 / 8:00 am – 12:10 pm / Steinbeck Forum

Chair: Dan M. Goebel

Boeing Electron Dynamic Devices, Torrance, CA

• **Introductory Remarks** (8:00)

Richard True

Northrop Grumman Electron Devices, San Carlos, CA

PL.1: Applications of Microwave Vacuum Tube Amplifiers in Earth and Space Science (8:20)

W. L. Harvey, F. F. Chiha, M. S. Dennis

Jet Propulsion Laboratory, Pasadena, CA

PL.2: Design and Performance of Vacuum Electron Devices for Digital Communications (8:50)

D. M. Goebel, W. L. Menninger

Boeing Electron Dynamic Devices, Torrance, CA

PL.3: Powerful Vacuum Electron Tubes Used in European Particle Accelerators and Thermonuclear Fusion Systems (9:20)

M. Thumm

Forschungszentrum Karlsruhe and Universität Karlsruhe, Karlsruhe, Germany

BREAK (9:50–10:10)

PL.4: Training the Next Generation: The Consumer's Point of View (10:10)

J. A. Dayton, Jr.

GENVAC Aerospace Corp., Cleveland, OH

PL.5: Mass Production of Magnetrons for Microwave Ovens (10:40)

K-S. Chang, C-B. Lee, W-W. Eom, J-J. Cha, D-W. Kim, H-J. Ha

Samsung Electronics Co., Ltd., Suwon City, Korea

PL.6: Food-Irradiation Technology Using Electron Beams and X-Rays (11:10)

R. B. Miller

SureBeam Corp., Albuquerque, NM

PL.7: New Opportunities in Vacuum Electronics Using Microfabrication Technologies (11:40)

J. H. Booske

University of Wisconsin, Madison, WI

LUNCH (12:10–1:30)

CODE APPLICATIONS

Tues., April 23 / 1:30–3:10 pm / DoubleTree Hotel, De Anza I

Chair: Carol Kory
Analex Corp., Cleveland, OH

- 1.1: Session Keynote: *Application and Validation of the ONR/NRL/SAIC Helix TWT Design-Code Suite* (1:30)**

C. L. Chang, D. P. Chernin
SAIC, McLean, VA

K. Eppley, J. Petillo
SAIC, Beverly, MA

R. Begum, M. Cattelino, A. Jacquez, P. Kolda, J. Legarra
Communications & Power Industries, Inc., Palo Alto, CA

S. J. Cooke, J. McDonald, B. Levush, P. Safier
Naval Research Laboratory, Washington, DC

- 1.2: *A Comparison of Three-Dimensional Simulations of TWT Cold-Test Characteristics Using CST Microwave Studio (MWS) and MAFIA* (1:50)**

C. T. Chevalier, C. L. Kory
Analex Corp., Cleveland, OH

K. A. Herrmann, J. D. Wilson, A. W. Cross
NASA–Glenn Research Center, Cleveland, OH

- 1.3: *Optimization of a Dynamic Velocity Taper for a Wide-Band TWT Design Using Christine1D* (2:10)**

R. Harper, D. Holstein, F. Francisco
Triton Services, Easton, PA

D. Abe
Naval Research Laboratory, Washington, DC

- 1.4: *3-D Simulation of Hollow-Beam Helix TWTs* (2:30)**

D. Smithe
Mission Research Corp., Newington, VA

A. J. Theiss
Northrop Grumman Electron Devices, San Carlos, CA

- 1.5: *Simulation Study of Beam Loading in a Cavity* (2:50)**

C. B. Wilsen
Northrop Grumman Electronic Systems, San Carlos, CA

J. W. Luginsland, D. P. Chernin
SAIC, McLean, VA

Y. Y. Lau, P. M. Tchou, R. M. Gilgenbach
University of Michigan, Ann Arbor, MI

T. M. Antonsen, Jr.
University of Maryland, College Park, MD

L. D. Ludeking
Mission Research Corp., Newington, VA

BREAK

(3:10–3:30)

SOURCES I

Tues., April 23 / 1:30–3:10 pm / DoubleTree Hotel, De Anza II

Chair: R. Lawrence. Ives

Calabazas Creek Research, Inc., Saratoga, CA

- 2.1: Examination of the Performance of Backward-Wave CFAs in Simulation and Experiment (1:30)**

L. D. Ludeking, R. S. Smith III, W. R. Wortman
Mission Research Corp., Newington, VA

- 2.2: High-Power S-Band Magnetron (1:50)**

J. Robinson, M. Doherty, B. Davenport Jr., M. Lander, T. Treado
Communications & Power Industries, Inc., Beverly, MA

- 2.3: Comprehensive Simulations of Compact THz Radiation Sources Using Microfabricated Folded-Waveguide TWTs (2:10)**

S. Bhattacharjee, W.-J. Lee, S. Gallagher, D. W. van der Weide, J. H. Booske, S. Limbach
University of Wisconsin–Madison, Madison, WI

C. L. Kory

Analex Corp. and NASA–Glenn Research Center, Cleveland, OH

- 2.4: Fabrication and Emitter Measurements for a Nano-Klystron: A Novel THz Micro-Tube Source (2:30)**

H. M. Manohara, P. H. Siegel, C. Marrese
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

B. Chang, J. Xu

Brown University, Providence, RI

- 2.5: Relativistic Magnetron Experiments and Novel Theory on the Limiting Current in a Relativistic Magnetically Insulated Diode (2:50)**

M. R. Lopez, R. M. Gilgenbach, Y. Y. Lau, D. W. Jordan, S. Anderson, M. D. Johnston, M. W. Keyser, H. Miyake, M. C. Jones, V. B. Neculaes
University of Michigan, Ann Arbor, MI

C. W. Peters

Lockheed-Martin Corp.

T. A. Spencer, M. Haworth

Air Force Research Laboratory, Kirtland AFB, NM

J. W. Luginsland

SAIC, McLean, VA

R. W. Lemke

Sandia National Laboratories, Albuquerque, NM

D. Price

Titan Corp.

BREAK

(3:10–3:30)

MATERIALS I

Tues., April 23 / 1:30–3:10 pm / DoubleTree Hotel, De Anza III

Chair: David K. Abe

Naval Research Laboratory, Washington, DC

- 3.1: *AlN-Based Lossy Ceramics for High-Power Applications* (1:30)**

B. Mikijelj

Ceradyne, Inc., Costa Mesa, CA

D. K. Abe

Naval Research Laboratory, Washington, DC

- 3.2: *High-Thermal-Conductivity Aluminum Nitride Ceramics for High-Power Microwave Tubes* (1:50)**

E. Savrun, V. Nguyen

Sienna Technologies, Inc., Woodinville, WA

D. K. Abe

Naval Research Laboratory, Washington, DC

- 3.3: *Evaluation of Aluminum-Nitride-Based RF Lossy Dielectrics for Use in High-Power Microwave Devices* (2:10)**

M. F. Kirshner, L. Turek, E. Pekrul

Northrop Grumman Electronic Systems, San Carlos, CA

- 3.4: *Advanced High-Thermal-Conductivity Ceramics for Power Microwave Tubes* (2:30)**

**G. Xu, Y. Carmel, I. K. Lloyd, O. C. Wilson, Jr.,
T. Olorunyolemi**

University of Maryland, College Park, MD

- 3.5: *Developing Optimum Milling-Process Parameters for Samarium Cobalt Magnet Materials* (2:50)**

J. Willhite

*University of Kentucky and Semicon Associates,
Lexington, KY*

M. P. Effgen

Semicon Associates, Lexington, KY

T. Zhai

University of Kentucky, Lexington, KY

BREAK

(3:10–3:30)

TWT I

Tues., April 23 / 3:30–5:30 pm / DoubleTree Hotel, De Anza I

Chair: Yehuda Goren

*Teledyne Electronic Technologies,
Rancho Cordova, CA*

4.1: Low-Noise Low-Phase-Distortion 120-W K-Band TWT (3:30)

D. S. Komm, W. L. Menninger, N. R. Robbins

Boeing Electron Dynamic Devices, Inc., Torrance, CA

4.2: A High-Efficiency Miniaturized Ka-Band TWT Based on a Novel Finned-Ladder RF Circuit Design (3:50)

**E. G. Wintucky, J. D. Wilson, K. R. Vaden, D. A. Force,
J. C. Freeman, G. G. Lesny**

NASA–Glenn Research Center, Cleveland, OH

C. L. Kory, C. T. Chevalier

Analex Corp., Cleveland, OH

B. Ebihara

Ohio Aerospace Institute, Brook Point, OH

J. A. Dayton, Jr.

GENVAC Aerospace Corp., Cleveland, OH

4.3: Optimized Design of Folded-Waveguide TWTs (4:10)

D. A. Gallagher, J. Tucek, M. C. Converse,

K. E. Kreischer, V. O. Heinen, J. H. Booske

Northrop Grumman Corp., Rolling Meadows, IL

4.4: Parametric Modeling of Folded-Waveguide Circuits for Millimeter-Wave TWTs (4:30)

J. H. Booske, M. C. Converse, D. A. Gallagher,

K. E. Kreischer, V. O. Heinen

Northrop Grumman Corp., Rolling Meadows, IL

4.5: Heavily Loaded Wideband Helix TWT (4:50)

Y-D. Joo, S-S. Jung, J-I. Kim, S-T. Han, B. Jia,

H-S. Kim, G-S. Park

Seoul National University, Seoul, Korea

4.6: Design of W-Band Coupled-Cavity TWT by LIGA Fabrication (5:10)

Y. M. Shin, G-S. Park, S-T. Han, J-I. Kim

Seoul National University, Seoul, Korea

G. P. Scheitrum

Stanford Linear Accelerator Center, Menlo Park, CA

S. S. Chang

Pohang Accelerator Laboratory, POSTECH,

Kyung-buk, Korea

SOURCES II

Tues., April 23 / 3:30–5:10 pm / DoubleTree Hotel, De Anza II

Chair: Gregory Nusinovich

*Institute for Plasma Research, University of
Maryland, College Park, MD*

- 5.1: Session Keynote: Realization of High Efficiency in a Plasma-Assisted Microwave Source with Two-Dimensional Electron Motion (3:30)**

**A. G. Shkvarunets, Y. Carmel, G. S. Nusinovich,
T. M. Abu-elfadl, J. Rodgers, T. M. Antonsen, Jr.,
V. L. Granatstein**

University of Maryland, College Park, MD

D. M. Goebel

Boeing Electron Dynamic Devices, Inc., Torrance, CA

- 5.2: Studies of Relativistic Backward-Wave Oscillator with Low Magnetic Field (3:50)**

S. D. Korovin, V. V. Rostov, E. M. Totmeninov

Russian Academy of Science, Tomsk, Russia

- 5.3: Advanced THz Backward-Wave Oscillators (4:10)**

R. L. Ives, J. Neilson, D. Marsden, M. Caplan, C. Kory
Calabazas Creek Research, Inc., Saratoga, CA

S. Schwartzkopf

RWI, Inc.

A. Negirev

Istok Co., Fryazino, Russia

- 5.4: High-Power Nonrelativistic Inverted Coaxial Magnetrons (ICM) (4:30)**

E. Shlifer

Russian Electrotechnical Institute (VEI), Moscow, Russia

- 5.5: Orotron with Magnetic Nonuniformity: Advanced Millimeter-Wave Source (4:50)**

E. N. Odarenko, A. A. Shmat'ko

Kharkov National University, Kharkov, Ukraine

A. Tsvyk

*Institute of Radiophysics and Electronics of the NASU,
Kharkov, Ukraine*

VACUUM MICROELECTRONICS

Tues., April 23 / 3:30–5:30 pm / DoubleTree Hotel, De Anza III

Chair: W. Devereux Palmer
*U.S. Army Research Office,
Research Triangle Park, NC*

6.1: Invited Session Keynote: *Challenges and New Applications in Vacuum Microelectronics: A Look at IVMC-2001* (3:30)

**C. E. Hunt, A. G. Chakhovskoi, N. N. Chubun,
M. S. Hajra**
University of California at Davis, Davis, CA

6.2: Session Keynote: *Flat FEA Image Sensor with HARP Target* (4:10)

**Y. Takiguchi, K. Osada, K. Miyakawa, M. Nanba,
S. Okazaki, T. Yamagishi, N. Egami, K. Tanioka**
*NHK Science & Technical Research Laboratories, Tokyo,
Japan*

M. Tanaka, S. Itoh
Futaba Corp., Chiba, Japan

6.3: *High-Current Processing of Microfabricated Field Emitters for Enhanced Emission Uniformity and High-Current-Density Operation* (4:30)

P. R. Schwoebel, C. A. Spindt, C. E. Holland
SRI International, Menlo Park, CA

6.4: *X-Ray Tubes with Nanostructured Carbon Cold Cathodes* (4:50)

R. J. Espinosa
Microwave Power Technology, Campbell, CA

6.5: *Novel Concepts of Vacuum Microelectronic Microwave Devices with Field-Emitter Cathode Arrays* (5:10)

**A. G. Rozhnev, N. M. Ryskin, D. V. Sokolov,
D. I. Trubetskov**
Saratov State University, Saratov, Russia

S-T. Han, J-I. Kim, G-S. Park
Seoul National University, Seoul, Korea

CODE DEVELOPMENT I

Wed., April 24 / 8:00–9:40 am / DoubleTree Hotel, De Anza I

Chair: Richard Carter

Lancaster University, Lancaster, U.K.

- 7.1: Session Keynote: *Simulation-Based Design Methodology for Affordable Performance of Vacuum Electron Devices* (8:00)**

B. Levush

Naval Research Laboratory, Washington, DC

- 7.2: *Nonlinear Time-Domain Analysis of Coupled-Cavity TWTs* (8:20)**

H. P. Freund

SAIC, McLean, VA

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

E. G. Zaidman

FM Technologies, Fairfax, VA

B. Levush

Naval Research Laboratory, Washington, DC

J. Legarra

Communications & Power Industries, Inc., Palo Alto, CA

- 7.3: *Implementation of a 3-D Helix TWT Stability Model in the Large-Signal-Code CHRISTINE 3D* (8:40)**

D. P. Chernin

SAIC, McLean, VA

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

B. Levush

Naval Research Laboratory, Washington, DC

- 7.4: *A Complete Space-Charge Model for 3-D Structures in the CHRISTINE 3D Large-Signal Code* (9:00)**

S. J. Cooke, C-L. Chang, D. P. Chernin, A. A. Mondelli

SAIC, McLean, VA

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

B. Levush

Naval Research Laboratory, Washington, DC

- 7.5: *Simulation of Microwave Devices with External Cavities Using MAGY* (9:20)**

A. N. Vlasov, D. P. Chernin

SAIC, McLean, VA

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

B. Levush

Naval Research Laboratory, Washington, DC

E. L. Wright

Communications & Power Industries, Inc., Palo Alto, CA

BREAK

(9:40–10:10)

FAST-WAVE AMPLIFIERS I

Wed., April 24 / 8:00–10:00 am / DoubleTree Hotel, De Anza II

Chair: Kwo Ray Chu

National Tsing Hua University, Taiwan, ROC

- 8.1: Session Keynote: Development of Ku-Band Frequency Doubling Coaxial Gyroklystrons for Accelerator Applications (8:00)**

W. G. Lawson, B. Hogan, S. Gouveia, B. Huebschman, V. L. Granatstein

University of Maryland, College Park, MD

- 8.2: Initial Experimental Results from the MIT 140-GHz Quasioptical Gyro-TWT (8:20)**

J. R. Sirigiri, M. A. Shapiro, R. J. Temkin

MIT Plasma Science and Fusion Center, Cambridge, MA

- 8.3: Design of a 50-MW 30-GHz Gyroklystron Amplifier for Accelerator Applications (8:40)**

M. Blank, P. Borchard, S. Cauffman, K. Felch, Y. M. Mizuhara

Communications & Power Industries, Inc., Palo Alto, CA

W. Lawson

University of Maryland, College Park, MD

- 8.4: Comparison of Gyroklystron Concepts: Frequency Multiplication versus Operation at a Given Cyclotron Harmonic (9:00)**

G. S. Nusinovich, O. V. Sinitsyn, J. Rodgers, V. L. Granatstein

University of Maryland, College Park, MD

N. C. Luhmann, Jr.

University of California at Davis, Davis, CA

- 8.5: Development Update of a 10-MW 91-GHz Gyroklystron (9:20)**

J. M. Neilson, R. L. Ives, M. Read, M. Mizuhara, T. Robinson, D. Marsden

Calabazas Creek Research, Inc., Saratoga, CA

W. Lawson, B. Hogan

University of Maryland, College Park, MD

- 8.6: Free-Electron-Maser Amplifier Energy-Recovery Experiments (9:40)**

C. G. Whyte, A. W. Cross, D. A. Jaroszynski, W. He, K. Ronald, A. D. R. Phelps

University of Strathclyde, Glasgow, U.K.

BREAK

(10:00–10:10)

POSTER SESSION I

Wed., April 24 / 8:00–11:30 am / DoubleTree Hotel, De Anza III

Chair: Thomas A. Hargreaves

Northrop Grumman Electron Devices, San Carlos, CA

P1.1: *Linear TWT Development*

**T. A. Hargreaves, C. M. Armstrong, R. True,
R. Watkins, M. L. Barsanti, A. Schram**

Northrop Grumman Electron Devices, San Carlos, CA

P1.2: *Synthesis of Folded Waveguide TWT*

S-T. Han, J-I. Kim, W-K. Han, G-S. Park

Seoul National University, Seoul, Korea

P1.3: *A High-Power Wideband TWT Using Coaxial Inverted Helical-Groove Slow-Wave Structure*

Y. Y. Wei, B. F. Jia, Y. D. Joo, G-S. Park

Seoul National University, Seoul, Korea

H. S. Uhm

Ajou University, Korea

G. F. Yu, W. X. Wang, S. G. Liu

*University of Electronics Science and Technology of
China, Chengdu, China*

P1.4: *The Synthesis of Slow-Wave Structure for Irregular Coupled-Cavity TWT with High Efficiency*

A. V. Aksenchyk, A. A. Kurayev, A. K. Sinitsyn

*Belarus State University of Informatics and
Radioelectronics, Minsk, Republic of Belarus*

P1.5: *Design of a Q-Band TWT Amplifier*

Y. H. Na, S. W. Jung, J. J. Choi, J. J. Choi, R. Kim

Kwangwoon University, Seoul, Korea

P1.6: *The Design of the Transition Region in Coupled-Cavity TWTs*

T. Kageyama

NEC Corp., Kawasaki, Japan

P1.7: *Discrete-State Simulated Annealing for TWT Slow-Wave Circuit Optimization*

J. D. Wilson

NASA–Glenn Research Center, Cleveland, OH

B. A. Bulson, C. L. Kory

Analex Corp., Cleveland, OH

- P1.8: *Artificial Neural Networks for the Representation of Axisymmetric Magnetic Fields in TWT Collectors***
G. Capizzi, S. Coco, A. Laudani
Università di Catania, Catania, Italy
- P1.9: *Beam-Focusing for MM-Wave TWTs***
A. J. Theiss, R. True
Northrop Grumman Electron Devices, San Carlos, CA
- P1.10: *Quick Estimation and Sensitivity Analysis of Pierce Electron-Gun Parameters***
R. K. Sharma, A. K. Sinha, S. N. Joshi
CTG, CEERI, Pilani, India
S. Sancheti
MREC, Jaipur, India
- P1.11: *Quasi-Stationary States of Relativistic Field-Emission Limited Diodes***
M.-C. Lin
National Chiao Tung University and Chung-Shan Institute of Science and Technology, Taiwan, ROC
D-S. Chuu
National Chiao Tung University, Taiwan, ROC
- P1.12: *Improved Magnetron Injection Guns***
R. L. Ives, M. Mizuhara
Calabazas Creek Research, Inc., Saratoga, CA
K. Gunther
Heatwave Laboratories, Watsonville, CA
P. Borchard
Consultant
K. Felch
Communications & Power Industries, Inc., Palo Alto, CA
- P1.13: *Traveling-Wave Gyrotron with Double-Mode Operation***
S.V. Kolosov, A. A. Kurayev, A. A. Lavrenov
Belarus State University of Informatics and Radioelectronics, Minsk, Belarus
- P1.14: *Amplification Mechanism in the Output Section of an Harmonic Multiplying Gyrotron Traveling-Wave Amplifier***
A. T. Lin, C-C. Lin
University of California, Los Angeles, CA

- P1.15: A New Triplet Gyrotron Amplifier: The Gyrotriotron**
H. Guo, Y. Y. Miao, J. Rodgers, V. L. Granatstein
University of Maryland, College Park, MD
R. S. Wu, J. R. Luo, D. S. Wu, Y. L. Yin, Y. H. Miao, Y. S. Zhang, Z. P. Cai, L. Zheng, Y. N. Su, W. Guo, Y. T. Luan, Y. G. Ding
Institute of Electronics, Chinese Academy of Science, Beijing, China
- P1.16: TE_{21} Second-Harmonic Gyro-TWT Amplifier with an Axis-Encircling Beam**
S. B. Harriet
University of California at Davis, Davis, CA and Naval Surface Warfare Center, Crane, IN
D. B. McDermott, N. C. Luhmann, Jr.
University of California at Davis, Davis, CA
- P1.17: Study of Axial Modes in the Gyrotron Backward-Wave Oscillator**
T. H. Chang, K. F. Pao, C. T. Fan, K. R. Chu
National Tsing Hua University, Taiwan, ROC
S. H. Chen
National Center for High-Performance Computing, Taiwan, ROC
- P1.18: Large-Orbit Gyrodevice with Crossed Fields**
O. P. Kulagin, V. D. Yeryomka
Usikov Institute of Radiophysics and Electronics, National Academy of Sciences of the Ukraine, Kharkiv, Ukraine
- P1.19: TWT with Combined Gyroresonance-Gyrotrons Type of Interaction of the Wave Modes E_{11} and H_{11} with the Helical Electron Beam in a Goffered Waveguide**
S. V. Kolosov
Belarus State University of Computer Science and Radio Electronics, Minsk, Belarus
- P1.20: Analysis of Gain and Bandwidth for a Dielectric Chernkov Maser with a Plasma Layer Operating in a Hybrid Mode**
A.S. Shlapakovski
Tomsk Polytechnic University, Tomsk, Russia
- P1.21: Space-Charge-Limited Emission above the 1-D Child-Langmuir Limit**
R. J. Umstattd
Naval Postgraduate School, Monterey, CA
J. W. Luginsland
SAIC, Albuquerque, NM
J. J. Watrous
NumerEx Corp., Albuquerque, NM
Y. Y. Lau
University of Michigan, Ann Arbor, MI

- P1.22: *Correlation of Emission of Electrons with Surface and Nonlocal Transfer***
O. G. Bakunin
Kurchatov Institute of Atomic Energy, Moscow, Russia
- P1.23: *A New Computer Code for Modeling Reflected Electrons from Surfaces***
D. Kapraun, H. Tran
North Carolina State University, Raleigh, NC
R. L. Ives, T. Bui
Calabazas Creek Research, Inc., Saratoga, CA
- P1.24: *Analysis of Resonance Frequencies and Inherent Q-Factors of a Spatially Developed Partially Filled Cylindrical Resonator***
V. Naidenko, H. Borsch
National Technical University of Ukraine, Kiev, Ukraine
- P1.25: *Millimeter-Wave Hybrid Devices: Theory & Simulation***
E. N. Odarenko, A. Shmat'ko
Kharkov National University, Kharkov, Ukraine
- P1.26: *The Relativistic TWT on the Irregular Waveguides with the Rectangular Cross Section***
A. A. Kurayev, A. K. Sinitsyn
Belarus State University of Informatics and Electronic Engineering, Minsk, Belarus
- P1.27: *The Helical Slow-Wave Structures with a Varying Law of the Winding for Application in Satellite TWT***
A. A. Kurayev, A. K. Sinitsyn
Belarus State University of Informatics and Electronic Engineering, Minsk, Belarus
- P1.28: *Evaluation of Vortex Fields in a Non-Linear Slow-Wave Structure: I. The Method of Instantaneous Values***
A. V. Gritsunov
Kharkiv National University of Radio Electronics, Kharkiv, Ukraine
- P1.29: *Evaluation of Vortex Fields in a Non-Linear Slow-Wave Structure: II. The Method of Complex Amplitudes***
A. V. Gritsunov
Kharkiv National University of Radio Electronics. Kharkiv, Ukraine
- P1.30: *Chaotic Oscillations in a Relativistic Backward-Wave Oscillator***
N. M. Ryskin, V. N. Titov
Saratov State University, Saratov, Russia

P1.31: TWT and BWT on Mode $H_{1,1}$ in Goffered Waveguide

S. V. Kolosov

*Belarus State University of Informatics and
Radioelectronics, Minsk, Belarus*

P1.32: A Coaxially Loaded Helical Slow-Wave Structure for TWTs

M. V. Kartikeyan

Forschungszentrum Karlsruhe, Karlsruhe, Germany

A. K. Sinha, S. N. Joshi

*Central Electronics Engineering Research Institute,
Pilani, India*

M. Thumm

*Forschungszentrum Karlsruhe and Universität Karlsruhe,
Karlsruhe, Germany*

P1.33: Chaotic Oscillations in a Delayed Feedback TWT Oscillator

N. M. Ryskin, A. G. Zaitseva

Saratov State University, Saratov, Russia

S. T. Han, J. I. Kim, G. S. Park

Seoul National University, Seoul, Korea

P1.34: The Influence of the Magnetic Field on the Stability Problem

P. A. Lindsay, W. Tob, X. Chen

Queen Mary College, University of London, London, U.K.

CODE DEVELOPMENT II

Wed., April 24 / 10:10 am – 12:10 pm / DoubleTree Hotel, De Anza II

Chair: William Menninger

Boeing Electron Dynamics Devices, Torrance, CA

9.1: *The 3-D Electron Gun and Collector Modeling Tool: MICHELLE* (10:10)

J. J. Petillo, K. Eppley, D. Panagos

SAIC, Burlington, MA

P. Blanchard, T. McClure, A. Mondelli

SAIC, McLean, VA

E. Nelson

Los Alamos National Laboratories, Los Alamos, NM

N. Dionne

Raytheon Systems Co., Sudbury, MA

J. DeFord, B. Held, L. Chernyakova

STAR, Inc.

S. Humphries

Field Precision

J. Burdette

Boeing Electron Dynamic Devices, Torrance, CA

M. Cattelino

Communications & Power Industries, Inc., Beverly, MA

R. True

Northrop Grumman Electron Devices, San Carlos, CA

K. Nguyen

KN Research, Silver Spring, MD

B. Levush

Naval Research Laboratory, Washington, DC

9.2: *The Design Optimization of Multistage Depressed Collectors for High-Efficiency TWTs Using Genetic Algorithm* (10:30)

T.K. Ghosh, R. G. Carter

Lancaster University, Lancaster, U.K.

9.3: *Beam-Optics Analysis: A 3-D Finite-Element Charged-Particle Code with Adaptive Meshing* (10:50)

T. Bui, B. Volger, R. L. Ives

Calabazas Creek Research, Inc., Saratoga, CA

M. Shephard, O. Klaas, J.-F. Remacle

Rensselaer Polytechnic Institute, Troy, NY

D. Kapraun, H. Tran

North Carolina State University, Raleigh, NC

9.4: Refinements to the MICHELLE Secondary-Electron-Emission Model for Simulating Multistage-Depressed-Collector Operation (11:10)

N. J. Dionne

Raytheon Co., Sudbury, MA

J. J. Petillo

SAIC, Burlington, MA

9.5: A Simulated Annealing Algorithm for the Optimization of Multistage-Depressed-Collector Efficiency (11:30)

K. R. Vaden, J. D. Wilson

NASA–Glenn Research Center, Cleveland, OH

B. A. Bulson

Analex Corp., Cleveland, OH

9.6: Verification of the 3-D Finite-Element Gun-Code MICHELLE on a Gridded Gun (11:50)

E. M. Nelson

Los Alamos National Laboratory, Los Alamos, NM

M. Cattelino

Communications & Power Industries, Inc., Beverly, MA

J. J. Petillo

SAIC, Burlington, MA

B. Levush

Naval Research Laboratory, Washington, DC

LUNCH

(12:10–1:30)

GUNS I

Wed., April 24 / 1:30–3:10 pm / DoubleTree Hotel, De Anza I

Chair: Baruch Levush

Naval Research Laboratory, Washington, DC

10.1: Multiple-Beam Electron-Gun Development for High-Power Amplifiers (1:30)

K. T. Nguyen

KN Research, Silver Spring, MD

D. E. Pershing, J. Pasour

Mission Research Corp., Newington, VA

B. Levush, D. Abe

Naval Research Laboratory, Washington, DC

J. Petillo

SAIC, Beverly, MA

10.2: Confined-Flow Multiple-Beam Guns for High-Power RF Applications (1:50)

R. L. Ives, G. Miram, M. Mizuhara, D. Marsden

Calabazas Creek Research, Inc., Saratoga, CA

A. Krasnykh, V. Ivanov

Consultants, Stanford, CA

10.3: Electron-Optical System for O-Type Devices of Millimeter-Wavelength Range (2:10)

I. V. Lopatin, A. S. Tishchenko

Institute of Radio Physics & Electronics, Kharkiv, Ukraine

10.4: X-Band High-Current Micro-Pulse Electron Gun for Accelerators (2:30)

S. K. Guharay, L. K. Len, F. Mako

FM Technologies, Inc., Fairfax, VA

10.5: Dispenser Cathode Units of Electron Guns with Low-Voltage Control Rod for High-Power O-Type Electron Vacuum Devices (2:50)

S. S. Drozdov, O. Yu. Maslennikov, A. A. Luchin,

A. B. Ushakov, O. V. Ivanov

SSPE (TORIY), Moscow, Russia

BREAK

(3:10–3:30)

TWT II

Wed., April 24 / 1:30–3:30 pm / DoubleTree Hotel, De Anza II

Chair: Carter Armstrong
*Northrop Grumman Electron Devices,
San Carlos, CA*

11.1: Invited Session Keynote: Characterization of Field-Emitter Arrays Operating in a TWT Amplifier (1:30)

D. R. Whaley, B. Gannon, K. E. Kreischer, V. O. Heinen
*Northrop Grumman Advanced Defensive Systems
Technology Center, Rolling Meadows, IL*

C. M. Armstrong
Northrop Grumman Electron Devices, San Carlos, CA

C. A. Spindt, C. E. Holland
SRI International, Menlo Park, CA

11.2: Wideband High-Efficiency Compact TWTs (1:50)

A. Laurent, P. Nugues, T. Beck, D. Henry
Thales Electron Devices, Vélizy, France

11.3: A Low-Cost Electrostatically Focused TWT (2:10)

B. K. Vancil
FDE, Inc., Beaverton, OR

E. G. Wintucky
NASA–Glenn Research Center, Cleveland, OH

11.4: Hot-Phase Velocity Measurements and Modeling for a Broad-Band TWT (2:30)

**M. Converse, A. Singh, J. Scharer, M. Wirth,
S. Bhattacharjee, J. Booske**
University of Wisconsin–Madison, Madison, WI

C. Strong
Northrop Grumman Corp., Rolling Meadows, IL

11.5: High-Efficiency S- and C-Band TWTs for Satellite Communications (2:50)

**R. T. Benton, U. R. Hallsten, J. A. Hill, K. P. Mallon,
W. L. Mellinger**
Boeing Electron Dynamic Devices, Inc., Torrance, CA

11.6: High-Efficiency Low-Power TWTs for C- and Ku-Bands (3:10)

E. Bosch, H. P. Rothacker, A. Jäger
Thales Electron Devices Ulm, Ulm, Germany

POSTER SESSION II

Wed., April 24 / 1:30–5:00 pm / DoubleTree Hotel, De Anza III

Chair: Peter Kolda

Communications & Power Industries, Inc., Palo Alto, CA

P2.1: *Development of a Tunable Air-Cooled All-Gun PM-Focused Ku-Band Klystron*

T. Habermann, R. Begum, B. Stockwell, L. Zitelli

Communications & Power Industries, Inc., Palo Alto, CA

P2.2: *Multiple Beam Vacuum Electron Device Technology*

E. L. Wright, R. Beckwith

Communications & Power Industries, Inc., Palo Alto, CA

P2.3: *Development of an Advanced Electron Gun for High-Power Radar Applications*

T. Bui, R. L. Ives, G. Miram, M. Mizuhara

Calabazas Creek Research, Inc., Saratoga, CA

S. Lenci, M. Davis, K. Lande

Communications & Power Industries, Inc., Palo Alto, CA

P2.4: *An Electron Gun for a Sheet Beam Klystron*

M. E. Read, G. Miram, R. L. Ives

Calabazas Creek Research, Saratoga, CA

A. Krasnykh, V. Ivanov

Stanford Linear Accelerator Center, Menlo Park, CA

P2.5: *Ka-Band Fundamental-Mode Peniotron with High Device Efficiency*

L. J. Dressman, D. B. McDermott, N. C. Luhmann, Jr.

University of California at Davis, Davis, CA

D. A. Gallagher

Nothrop Grumman Corp., Rolling Meadows, IL

T. A. Spencer

Air Force Research Laboratory, Albuquerque, NM

P2.6: *Non-Traditional Microwave Electronics Based on Electron-Beam Transverse Waves*

V. A. Vanke

Moscow State University, Moscow, Russia

P2.7: *Electron-Beam Collector with a Low Back Flow*

A. Shemyakin

Fermi National Accelerator Laboratory, Batavia, IL

P2.8: *Development of a Dual-Output Mini-TWT Power Module*

F. Yang, L. Roeder

Communications & Power Industries, Inc., Palo Alto, CA

P2.9: High-Efficiency Frequency-Multiplier Grid Arrays for Watt-Level Millimeter-Wave Sources

S. A. Rosenau

Agilent Technologies, Inc., Palo Alto, CA

Y. Liang, W-K. Zhang, C. W. Domier, N. C. Luhmann, Jr.

University of California at Davis, Davis, CA

C. Liang

Fodus Communications, Inc.

P2.10: CFA Noise Modeling Using MASK

W. C. Guss, M. L. Tracy

Communications & Power Industries, Inc., Beverly, MA

P2.11: Design of Slow-Wave Structure with Double Rings for Microwave Devices

O. M. Nikitenko

Kharkiv National University of Radioelectronics, Kharkiv, Ukraine

P2.12: Mode-Interaction Effects in Spatial-Harmonic Magnetrons

D. M. Vavriv, S. V. Sosnytskiy

National Academy of Sciences of Ukraine, Kharkov, Ukraine

K. Schünemann

Technical University of Hamburg-Harburg, Germany

P2.13: Particle-in-Cell Code Simulations and Experiments of a Rising-Sun Magnetron Oscillator

H. J. Kim, J. U. Shin, J. J. Choi

Kwangwoon University, Seoul, Korea

P2.14: Breakdown Properties of High-Pressure Discharge in the Plasma-Display Panels

H. S. Uhm

Ajou University, Suwon, Korea

K. W. Whang

Seoul National University, Seoul, Korea

E. H. Choi

Kwangwoon University, Seoul, Korea

P2.15: Simulation of Diamond-Film Field-Emission Arrays with Parallel Emitter, Gates, and In-Plane Lens

B. Zeng

University of Electronic Science and Technology of China and Southwest Institute of Physics, Chengdu, P.R. China

Y. Liu, Z. Yang

University of Electronic Science and Technology of China, Chengdu, P.R. China

S. Qian

Southwest Institute of Physics, Chengdu, P.R. China

P2.16: *The Negative Grid Gun*

B. Stockwell, G. Miram, B. James, F. Yang

Communications & Power Industries, Inc., Palo Alto, CA

P2.17: *A Novel Wide-Band High-Transmission Window for High-Frequency Microwave Tubes*

M-C. Lin

National Chiao Tung University and Chung-Shan Institute of Science and Technology, Taiwan, ROC

D-S. Chuu

National Chiao Tung University, Taiwan, ROC

P2.18: *Design and Test of a 100-MW X-Band TE₀₁ Window*

J. Neilson, R. L. Ives

Calabazas Creek Research, Inc., Saratoga, CA

S. G. Tantawi

Stanford Linear Accelerator Center, Stanford, CA

P2.19: *A Wide-Bandwidth Coupler for a Free-Electron Maser Amplifier*

D. Gamble

Defense Science & Technology Laboratory, Portsmouth, U.K.

P. R. Foster

Microwave and Antenna Systems, Malvern, U.K.

P2.20: *Broadband Pillbox-Type Windows for Microwave Tubes*

B. V. Prokofiev

Federal State Unitary Enterprise Scientific and Production Corp. (TORIY), Moscow, Russia

P2.21: *Pillbox-Type Windows Transmitting Power in the TM₀₁-Mode of the Circular Waveguide*

B. V. Prokofiev

Federal State Unitary Enterprise Scientific and Production Corp. (TORIY), Moscow, Russia

P2.22: *Performance Characteristics and Measurements Used to Predict Life Expectancy of Barium Oxide Cathodes*

L. Falce, G. Miram

Communications & Power Industries, Inc., Palo Alto, CA

P2.23: *Development of Multi-Megawatt Circulator for X-Band*

J. Neilson, R. L. Ives

Calabazas Creek Research, Inc., Saratoga, CA

S. G. Tantawi

Stanford Linear Accelerator Center, Stanford, CA

- P2.24: *Coining Manufacturing Process for High-Power TWTs and TWT Amplifiers***
R. Pyles, R. S. Kim
DynamicWave Telecom, Inc., Anaheim, CA
- P2.25: *Thermal Analysis of Output Connector for TWT***
S. W. Baek, J. H. Lee, S. H. Kim, K. H. Cho, H. S. Kim
KMW, Inc., Kyungki-do, Korea
- P2.26: *Surface Flashover Phenomena at Vacuum/Oil Interface***
A. Sharma, K. V. Nagesh
Bhabha Atomic Research Centre, Mumbai, India
U. Kumar, G. R. Nagabhushana
IISc, Bangalore, India
- P2.27: *Acceptance Criteria and Workmanship Standards at Semicon Associates***
M. P. Effgen
Semicon Associates, Lexington, KY
- P2.28: *Moving Forward: Technical Advances in Resistance Welding – Closed-Loop Welding Systems and Process Controls***
M. P. Effgen
Semicon Associates, Lexington, KY
- P2.29: *EMP Mitigation Technique Based on Low-Pressure SF₆ Gas-Filled Surge Suppressor***
A. Sharma, K. C. Mittal
Bhabha Atomic Research Centre, Mumbai, India
- P2.30: *High-Voltage Commutator on the Base of an Electron-Beam Valve (EBV) for Powerful Modulators***
S. Gusev, N. Matveev, V. Perevodchikov, V. Stuchenkov, V. Shapenko
Russian Electrotechnical Institute (VEI), Moscow, Russia
- P2.31: *Recent Progress in the Development of Compact Solid-State High-Voltage Radar Modulators***
M. P. J. Gaudreau, J. A. Casey, P. Brown, T. Hawkey, M. Mulvaney, M. A. Kempkes
Diversified Technologies, Inc., Bedford, MA
- P2.32: *Solid-State Pulsed Power Systems for the Next Linear Collider***
M. P. J. Gaudreau, J. A. Casey, I. Roth, T. Hawkey, M. Mulvaney, M. A. Kempkes
Diversified Technologies, Inc., Bedford, MA
- P2.33: *Computer Modeling of the Possible Multipactor Effect in the Output System of an S-Band Linac Magnetron***
L. Ma, X. Chen, M. Esterson, P. A. Lindsay
Queen Mary College, University of London, London, U.K.

COLLECTORS

Wed., April 24 / 3:30–5:30 pm / DoubleTree Hotel, De Anza I

Chair: David Whaley

Northrop Grumman Corp., Rolling Meadows, IL

12.1: 3-D Code COLLECT3D for Accurate Multistage Collector Simulation (3:30)

A. Le Clair, D. Lamy, Y. Thaler, J. F. David, Ph. Thouvenin

Thales Electron Devices, Velizy, France

12.2: Practical 3-D Collector Design Using MICHELLE (3:50)

X. Zhai, J. T. Burdette, D. S. Komm

Boeing Electron Dynamic Devices, Inc., Torrance, CA

12.3: 3-D Finite-Element Analysis of TWT Multistage Depressed Collectors (4:10)

S. Coco, A. Laudani

Università di Catania, Catania, Italy

12.4: Improved Modeling of Backscattered Electron Effects in a Code for Depressed Collector Design (4:30)

A. Valfells, A. Singh, M. Kolander, V. L. Granatstein

University of Maryland, College Park, MD

12.5: Electron Backscatter in X-Ray Tubes: Experiment and Analysis (4:50)

L. Salasoo, L. Inzinna, A. Linsebigler, K. Truszkowska

GE Corporate R&D, Niskayuna, NY

M. R. Sridhar

GE Corporate R&D, Bangalore, India

12.6: Design of Four-Stage Depressed Collector for a High-Efficiency Helix TWT (5:10)

V. Srivastava, A. K. Sinha, S. N. Joshi

Central Electronics Engineering Research Institute, Pilani, India

P. V. Bhaskar, V. Kiran

BEL, Bangalore, India

P. R. Rao, L. Kumar

MTRDC, BEL Complex, Bangalore, India

KLYSTRONS I

Thurs., April 25 / 8:00–9:40 am / DoubleTree Hotel, De Anza I

Chair: Glenn Scheitrum

*Stanford Linear Accelerator Center,
Menlo Park, CA*

13.1: *The RF System Design for the Spallation Neutron Source* (8:00)

D. Rees, P. J. Tallerico, W. Reass

Los Alamos National Laboratory, Los Alamos, NM

13.2: *Development of an 805-MHz 550-kW Pulsed Klystron for the Spallation Neutron Source Project* (8:20)

S. J. Lenci, E. Eisen, B. Stockwell

Communications & Power Industries, Inc., Palo Alto, CA

D. Rees, P. J. Tallerico

Los Alamos National Laboratory, Los Alamos, NM

13.3: *Klystrons with Ring Resonators for Accelerators* (8:40)

**M. Yu Vorobiyev, N. A. Kokorev, S. N. Nazarov,
V. I. Pasmannik**

Research and Production Corp. (TORIY), Moscow, Russia

13.4: *An 805-MHz High-Power Klystron* (9:00)

T. A. Hargreaves, M. F. Kirshner, R. True

Northrop Grumman Electron Devices, San Carlos, CA

13.5: *Multiple Cavity Klystron: A Source of Chaotic Microwave Radiation* (9:20)

**B. S. Dmitriev, D. V. Klokov, N. M. Ryskin,
A. M. Shigaev, Yu. D. Zharkov**

Saratov State University, Saratov, Russia

BREAK (9:40–10:10)

GUNS II

Thurs., April 25 / 8:00–9:40 am / DoubleTree Hotel, De Anza II

Chair: Gun-Sik Park

Seoul National University, Seoul, Korea

14.1: *An Experimental Study on the Low-Velocity-Spread Axis-Encircling Electron Gun for Harmonic Gyrotrons* (8:00)

S. G. Jeon, C. W. Baik, D. H. Kim, B. Jia, G. S. Park

Seoul National University, Seoul, Korea

14.2: *High-Power Cusp Guns* (8:20)

D. Gallagher, P. Frawley, K. Kreischer, V. Heinen

Northrop Grumman Corp., Rolling Meadows, IL

14.3: *Emission Uniformity Studies of Gyrotron MIG Cathodes* (8:40)

J. P. Anderson, M. A. Shapiro, R. J. Temkin

MIT Plasma Science and Fusion Center, Cambridge, MA

K. L. Felch

Communications and Power Industries, Inc., Palo Alto, CA

14.4: *Beam Characteristics of Mechanically Tunable Magnetron Injection Guns* (9:00)

Y. S. Yeh

Southern Taiwan University of Technology, Taiwan, ROC

T-H. Chang, C-T. Fan

National Tsing Hua University, Taiwan, ROC

14.5: *Characteristics and Scanning Circuit of Camel CRTs* (9:20)

H. Zhu, M. Wang, B. Huang

HDTV Institute of Shanghai, Jiao Tong University, Shanghai, P.R. China

BREAK (9:40–10:10)

IMD I

Thurs., April 25 / 8:00–9:40 am / DoubleTree Hotel, De Anza III

Chair: Philippe Thouvenin

Thales Electron Devices, Villacoublay, France

15.1: Session Keynote: A Novel Technology for Linearizing TWT Amplifiers (8:00)

Y. Goren, C. Jensen, T. Chen, P. M. Lally, D. Gagne

Teledyne Electronic Technologies, Rancho Cordova, CA

15.2: The Physics of Harmonic Injection in a TWT (8:20)

J. G. Wöhlbier, J. H. Boose, I. Dobson

University of Wisconsin–Madison, Madison, WI

15.3: Intermodulation Products in a Klystron (8:40)

M. W. Keyser, Y-Y. Lau, R. M. Gilgenbach

University of Michigan, Ann Arbor, MI

C. B. Wilson

Northrop Grumman, San Carlos, CA

M. J. Newman

University of Wisconsin–Madison, Madison, WI

D. Chernin

SAIC, McLean, VA

15.4: Intermodulation Suppression in a Broadband TWT (9:00)

A. Singh, J. Scharer, M. Wirth, S. Bhattacharjee, J. Booske

University of Wisconsin-Madison, Madison, WI

15.5: Effect of the Beam Parameters on the Non-Linear Performance in Broadband Helix TWTs (9:20)

R. O. Jenkins, R. G. Carter

Lancaster University, Lancaster, U.K.

BREAK (9:40–10:10)

KLYSTRONS II

Thurs., April 25 / 10:10–11:50 am / DoubleTree Hotel, De Anza I

Chair: Heinz Bohlen

*Communications and Power Industries, Inc.,
Palo Alto, CA*

16.1: An L-Band 100-kW CW Klystron for Free-Electron-Laser Driver Accelerator (10:10)

A. Mizuhara

CPI Wireless Solutions, Palo Alto, CA

16.2: Product Improvement Efforts for the 75-MW Pulsed PPM-Focused X-Band Klystron Proposed for Use in the Next Linear Collider (10:30)

E. L. Eisen, B. Stockwell

Communications & Power Industries, Inc., Palo Alto, CA

E. Jongewaard, D. Sprehn

Stanford Linear Accelerator Center, Menlo Park, CA

16.3: Development of a 10-MW L-Band Multiple-Beam Klystron for TESLA (10:50)

**A. J. Balkcum, E. Wright, H. Bohlen, F. Friedlander,
M. Cattellino, L. Cox, E. Eisen, S. Lenci, B. Stockwell,
L. Zitelli**

Communications & Power Industries, Inc., Palo Alto, CA

R. L. Ives, G. Miram

Calabazas Creek Research, Saratoga, CA

16.4: Development of an X-Band PPM Klystron for the JLC Project (11:10)

**Y. H. Chin, S. Matsumoto, Y. Morozumi, K. Ohya,
K. Takata, S. Tokumoto**

KEK, Ibaraki, Japan

M. Kanno, S. Miyake, H. Urakata

Toshiba Corp., Japan

16.5: Recent Progress on L-Band Broadband MBK (11:30)

D. Yaogen

Chinese Academy of Sciences, Beijing, P. R. China

LUNCH

(12:00–1:30)

CATHODES

Thurs., April 25 / 10:10 am –12:10 pm / DoubleTree Hotel, De Anza II

Chair: Edwin Wintucky

NASA–Glenn Research Center, Cleveland, OH

17.1: *Measuring Current Emission and Work Functions of Large Thermionic Cathodes* (10:10)

C. M. Fortgang

Los Alamos National Laboratory, Los Alamos, NM

17.2: *Life-Prediction Model for Vacuum Electron Devices Using Barium Calcium Aluminate Impregnated Tungsten Cathodes as Electron Sources* (10:30)

T. J. Grant, L. R. Falce

Communications & Power Industries, Inc., Palo Alto, CA

17.3: *Integrated Cathode Testing* (10:50)

W. Tighe, R. Longo, C. Harrison

Boeing Electron Dynamic Devices, Inc., Torrance, CA

17.4: *Assessing Cathode Quality in Pulse and CW Tubes* (11:10)

S. L. Gold

Stanford Linear Accelerator Center, Menlo Park, CA

G. V. Miram

Calabazas Creek Research, Inc., Saratoga, CA

17.5: *A Generalized Current-Density Model for Field, Thermal, and Photo-Emission* (11:30)

K. L. Jensen, P. G. O'Shea, D. Feldman

University of Maryland, College Park, MD

17.6: *Fast Warm Dispenser Cathodes: Modified Standard Designs* (11:50)

J. O. Tarter, J. J. Farrell

Semicon Associates, Inc., Lexington, KY

LUNCH (12:10–1:30)

IMD II

Thurs., April 25 / 10:10 am –12:10 pm / DoubleTree Hotel, De Anza III

Chair: John Booske

University of Wisconsin–Madison, Madison, WI

- 18.1: Session Keynote: TWT Amplifier Model to Predict High-Order Modulation Intersymbol Interference (10:10)**

C. L. Kory

Analex Corp., Cleveland, OH

M. Andro

NASA–Glenn Research Center, Cleveland, OH

- 18.2: TWT Amplifier Performance Evaluation and Design Optimization for Applications in Multi-Level Digital Communications (10:30)**

J. X. Qiu, D. K. Abe, B. G. Danly, B. Levush

Naval Research Laboratory, Washington, DC

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

- 18.3: Design and Evaluation of a Linearized C-Band Helix TWT for Digital Communications Experiments (10:50)**

D. K. Abe, B. Levush, B. G. Danly

Naval Research Laboratory, Washington, DC

T. M. Antonsen, Jr.

University of Maryland, College Park, MD

D. R. Whaley

Northrop Grumman Corp., Rolling Meadows, IL

- 18.4: Polyspectral Techniques for Nonlinear System Modeling and Distortion Compensation (11:10)**

C. P. Silva, A. A. Moulthrop, M. S. Muha

The Aerospace Corp., El Segundo, CA

- 18.5: From Frequency-Domain Physics-Based Modeling to Time-Domain Simulation of High-Data-Rate Performance. II: Non-Linear Gain with Memory (11:30)**

P. N. Safier

SAIC, McLean, VA

T. M. Antonsen, Jr.

SAIC, McLean, VA and University of Maryland, College Park, MD

J. Qiu, B. G. Danly, B. Levush

Naval Research Laboratory, Washington, DC

- 18.6: Origins of Saturation in a TWT (11:50)**

J. Plouin

Ecolè Polytechnique, Palaiseau, France

LUNCH (12:10–1:30)

KLYSTRONS III

Thurs., April 25 / 1:30–3:10 pm / DoubleTree Hotel, De Anza I

Chair: Pierre Waller

ESA/Estec, Noordwijk, The Netherlands

19.1: *Ka-Band Extended Interaction Klystrons (EKs) for Satellite Communications Equipment* (1:30)

M. Hyttinen, P. Horoyski, A. Roitman

*Communications & Power Industries Canada, Inc.,
Ontario, Canada*

19.2: *Design and Performance of a Ka-Band Extended Interaction Amplifier* (1:50)

L. Chen, F. H. Cheng, K. R. Chu

National Tsing Hua University, Taiwan, ROC

J. D. Wang

*Chung-Shan Institute of Science and Technology,
Taiwan, ROC*

19.3: *Initial RF Testing of 95-GHz Klystrino* (2:10)

**G. P. Scheitrum, A. Burke, G. Caryotakis, A. Haase,
D. Martin**

Stanford Linear Accelerator Center, Menlo Park, CA

B. Arfin

Arfin Associates, San Carlos, CA

19.4: *Development and Production of a High-Power S-Band MSDC Klystron for Satellite Digital Radio* (2:30)

**A. Shabazian, E. L. Wright, R. Batra, E. McCune,
R. Begum, L. Zitelli**

Communications & Power Industries, Inc., Palo Alto, CA

19.5: *Reliability of TV Klystron with Multi-Stage Depressed Collector* (2:50)

R. C. Batra, E. L. Wright, E. McCune

Communications & Power Industries, Inc., Palo Alto, CA

BREAK (3:10–3:30)

GYROTRON OSCILLATORS

Thurs., April 25 / 1:30–3:10 pm / DoubleTree Hotel, De Anza II

Chair: Gregory G. Denisov

Institute of Applied Physics, Novgorod, Russia

20.1: Session Keynote: A 140-GHz 1-MW CW Gyrotron for Fusion Plasma Heating (1:30)

**G. Dammertz, E. Borie, S. Illy, K. Koppenburg,
M. Kuntze, W. Leonhardt, G. Neffe, B. Piosczyk,
M. Schmid, R. Heidinger**

Forschungszentrum Karlsruhe, Karlsruhe, Germany

S. Alberti, J. P. Hogge, M. Q. Tran

*Centre de Recherche en Physique des Plasmas,
Lausanne, Switzerland*

A. Arnold, M. Thumm

*Forschungszentrum Karlsruhe and Universität Karlsruhe,
Karlsruhe, Germany*

V. Erckmann, H. Laqua, G. Michel

*Max-Planck Institut fuer Plasmaphysik, Greifswald,
Germany*

G. Gantenbein, W. Kasperek, G. Mueller

*Institute fuer Plasmaforschung, Universität Stuttgart,
Stuttgart, Germany*

**E. Giguët, G. Le Cloarec, F. Legrand, Y. Le Goff,
C. Lievin**

Thales Electron Devices, Velizy-Villacoublay, France

R. Magne

CEA/Cadarache, Saint Paul-lez Durance, France

20.2: Progress Update on CPI 500-kW and 1-MW Multi-Second-Pulsed Gyrotrons (1:50)

**K. Felch, M. Blank, P. Borchard, P. Cahalan,
S. Cauffman, T. S. Chu, H. Jory**

Communications & Power Industries, Inc., Palo Alto, CA

20.3: Development of 170-GHz Gyrotron for ITER (2:10)

**V. E. Myasnikov, A. G. Litvak, S. V. Usachev,
L. G. Popov, M. V. Agapova, V. V. Alikaev, G. G. Denisov,
A. Ph. Gnedenkov, V. I. Ilyin, V. N. Ilyin, D. V. Khmara,
A. N. Kostyna, V. O. Nichiporenko, V. E. Zapevalov**
GYCOM, Ltd., Moscow, Russia

20.4: Development of 170- and 110-GHz Gyrotrons for Fusion Applications (2:30)

**K. Sakamoto, A. Kasugai, Y. Ikeda, K. Hayashi,
K. Takahashi, M. Tsuneoka, T. Imai**

Japan Atomic Energy Research Institute, Ibaraki, Japan

T. Kariya, Y. Mitsunaka

Toshiba Corp., Tochigi, Japan

20.5: *Effect of the Radial Thickness of Electron Beams on Mode Coupling and Stability in Gyrotrons* (2:50)

**G. S. Nusinovich, O. V. Sinitsyn, M. Yedulla,
L. Velikovich**
University of Maryland, College Park, MD

BREAK

(3:10–3:30)

NOISE

Thurs., April 25 / 1:30–3:10 pm / DoubleTree Hotel, De Anza III

Chair: Yue-Ying Lau

University of Michigan, Ann Arbor, MI

21.1: *A Novel Phase Noise Suppression Technique for High-Power Microwave Amplifiers* (1:30)

Y. Goren, C. Jensen, D. Gagne, P. M. Lally, D. Zavadil

Teledyne Electronic Technologies, Rancho Cordova, CA

21.2: *Pulsed Phase Measurement Techniques for Vacuum Electronic Amplifiers* (1:50)

K. B. Mitsdarffer

Naval Surface Warfare Center, Crane, IN

L. R. Hoover, D. Thelen

Technology Service Corp., Bloomington, IN

21.3: *Effects of Modulator Misalignment on LINC Transmission with TWT Amplifiers* (2:10)

A. Choffrut, B. D. Van Veen, J. H. Booske

University of Wisconsin–Madison, Madison, WI

21.4: *Investigation to Reduce Ion Noise and Body Current Behavior in Continuous-Wave TWTs* (2:30)

D. Thelen

Technology Service Corp., Bloomington, IN

R. Emerson

Naval Surface Warfare Center, crane, IN

21.5: *Periodic Jitter Investigations* (2:50)

D. M. Goebel, W. Tighe

Boeing Electron Dynamic Devices, Inc., Torrance, CA

BREAK (3:10–3:30)

TWT III

Thurs., April 25 / 3:30–5:30 pm / DoubleTree Hotel, De Anza I

Chair: Guenter Kornfeld

Thales Electron Devices, Ulm, Germany

22.1: Higher-Power Low-Cost Mini TWTs (3:30)

R. F. Watkins

Northrop Grumman Electron Devices, San Carlos, CA

22.2: Millimeter-Wave Vacuum Power-Booster Development (3:50)

J. Tucek, G. Groshart

*Northrop Grumman Defensive Systems,
Rolling Meadows, IL*

22.3: Low-Voltage Power-Booster TWT (4:10)

J. G. Kennedy, C. Colombo, R. Watkins

Northrop Grumman Electron Devices, San Carlos, CA

22.4: High-Perveance TWT Modeling and Experimental Verification (4:30)

D. R. Whaley

*Northrop Grumman Advanced Defensive Systems
Technology Center, Rolling Meadows, IL*

**C. M. Armstrong, M. L. Barsanti, T. A. Hargreaves,
J. A. McKay, A. J. Theiss, R. True**

Northrop Grumman Electron Devices

D. N. Smithe

Mission Research Corp., Newington, VA

D. Chernin, T. M. Antonsen, Jr.

SAIC, McLean, VA

B. Levush

Naval Research Laboratory, Washington, DC

22.5: Development of Ka-Band 250-W Peak Power Helix TWT (4:50)

T. Machida, T. Kanamoto, H. Fukui, K. Tsutaki

NEC Electron Devices, Kanagawa, Japan

22.6: High-Power X-Band Helix TWT for Airborne Radar Applications (5:10)

R. Dionisio, G. Andriolo

Altelco S.p.A., Palermo, Italy

FAST-WAVE AMPLIFIERS II

Thurs., April 25 / 3:30–5:30 pm / DoubleTree Hotel, De Anza II

Chair: Monica Blank

*Communications & Power Industries, Inc.,
Palo Alto, CA*

23.1: Session Keynote: A Broadband Efficient Low-Relativistic Gyro-TWT with a Helically Grooved Waveguide (3:30)

**V. Bratman, G. Denisov, G. Kalynova, V. Manuilov,
M. Ofitserov, S. Samsonov, A. Volkov**
Russian Academy of Sciences, Novgorod, Russia

23.2: Gyro-Amplifiers for High-Power Millimeter-Wave Radar (3:50)

B. G. Danly
Naval Research Laboratory, Washington, DC

23.3: High-Power Millimeter-Wave Transmitter for the NRL WARLOC Radar (4:10)

M. Ngo, B. G. Danly, R. Myers, D. E. Pershing
Naval Research Laboratory, Washington, DC

23.4: Experimental Study on Ka-Band Harmonic-Multiplying Two-Stage Tapered Gyro-TWT (4:30)

C. W. Baik, S. Jeon, D. H. Kim, A. K. Ganguly, G-S. Park
Seoul National University, Seoul, Korea

J. J. Choi
Kwangwoon University, Seoul, Korea

N. Sato, K. Yokoo
Tohoku University, Sendai, Japan

23.5: Initial Hot Tests on a 28-GHz Five-Cavity Gyroklystron Amplifier (4:50)

J. J. Choi, H. J. Kim, Y. H. Na
Kwangwoon University, Seoul, Korea

W. C. Kim, M. Kwon
Korea Basic Science Institute, Taejeon, Korea

R. Temkin
MIT Plasma Science and Fusion Center, Lexington, MA

23.6: High-Power W-Band Heavily Loaded TE_{01} Gyro-TWT (5:10)

**D. B. McDermott, H. H. Song, Y. Hirata, H. L. Hsu,
P. S. Marandos, J. S. Lee, N. C. Luhmann, Jr.**
University of California at Davis, Davis, CA

A. T. Lin
UCLA, Los Angeles, CA

T. H. Chang, K. R. Chu
NTHU, Taiwan, ROC

MATERIALS II

Thurs., April 25 / 3:30–5:10 pm / DoubleTree Hotel, De Anza III

Chair: Elissa Pekrul

*Northrop Grumman Electron Devices,
San Carlos, CA*

24.1: K-Band Vacuum Electron Tubes for Materials Processing: Present and Future (3:30)

M. Thumm

*Forschungszentrum Karlsruhe and Universität Karlsruhe,
Karlsruhe, Germany*

L. Feher

Forschungszentrum Karlsruhe, Karlsruhe, Germany

24.2: Dielectric Measurements Using Fabry-Perot Open Resonators at Millimeter-Wave Frequencies (3:50) (26–110 GHz)

W. B. Seo, J. J. Choi

Kwangwoon University, Seoul, Korea

24.3: The Use of CVD Diamond as a High-Power Wide-Bandwidth Waveguide Window in the Free-Electron-Maser Amplifier (4:10)

D. Gamble

Defense Science & Technology Lab, Portsmouth, U.K.

P. R. Foster

Microwave and Antenna Systems, Malvern, U.K.

C. Wort

DeBeers Industrial Diamonds, Ltd., U.K.

24.4: Design and Development of High-Power Window for the Linear Accelerator at 2.856 GHz (4:30)

T. Tiwari, C. Nainwad, A. B. Shah

SAMEER, Mumbai, India

24.5: Investigation of a Diamond Window Failure Mechanism (4:50)

H. L. Bosman, Y-Y. Lau, R. M. Gilgenbach

University of Michigan, Ann Arbor, MI

ADJOURN