

1993 IEEE 6th International Vacuum Microelectronics Conference



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IVMC '93

Sixth International Vacuum Microelectronics Conference

Newport, Rhode Island

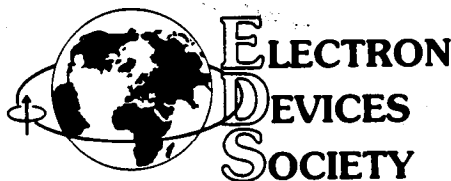
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General Welcome from the Chairman

Welcome to Newport! The Sixth International Vacuum Microelectronics Conference is very fortunate to be held this year in the historic coastal town of Newport, Rhode Island. Newport was a very important early shipping center for the American colonies, and it is generally acknowledged that the finest American colonial furniture was made by Quaker craftsmen just a few streets away from the Hotel Viking. In the later nineteenth and early twentieth centuries, Newport became the summer home of some of America's wealthiest families, and many of their mansions can be toured by the public today. Our major social event, an evening clambake, will be held on the grounds of Hammersmith Farm, Jacqueline Bouvier Kennedy's childhood home and the Summer White House for President John F. Kennedy.

The technical program for this year's conference promises to continue the outstanding tradition established by past conferences. An internationally recognized set of plenary speakers will report on the latest developments in fields ranging from RF power devices to flat-panel displays to micromachining, and two panel sessions will allow the conference to examine and discuss these and other important and timely issues in detail.

The Steering Committee and I would like to extend our deepest thanks to the sponsors listed below for their financial support of IVMC '93. Without their critical assistance, IVMC '93 could not have been held in its present form. I would also like to thank all of the authors who have submitted contributions to the conference; it is the technical quality of their work that will make this conference memorable. I also express my deepest gratitude to our two Vice-Chairmen, Henry Gray and Capp Spindt, for their continuing advice and encouragement; to the Program Committee for its assistance and suggestions; and to the Steering Committee for its general support. Finally, I would like to gratefully acknowledge all of the help with conference arrangements rendered by Nick McGruer and by the management and staff of Professional Association Management, Newport Hospitality, and the Hotel Viking.

Mark A. Hollis
Chairman

IVMC '93 Sponsors

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American Vacuum Society**

IVMC '93 Conference-at-a-Glance

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY
	7:30-8:30 am Continental Breakfast	7:30-8:30 am Continental Breakfast	8-8:55 am Continental Breakfast	7:30-8:30 am Continental Breakfast
	8:30-9:55 am Plenary Session	8:30 am-10:10 am FEA Surface Science & Reliability Issues	8:55-10:10 am Theory & Simulation II	8:30-10:10 am RF Power Devices
	9:55-10:15 am Break	10:10-10:25 am Break	10:10-10:25 am Break	10:10-10:25 am Break
	10:15 am-12 noon Plenary Session con't	10:25 am-12:05 pm FEA Surface Science & Reliability Issues con't	10:25 am-12:30 pm Technology for Field Emission Displays	10:25 am-12:05 pm RF Power Devices con't
	12:00-1:30 pm Lunch on Patio (Plus Committee Lunch)	12:05-2:00 pm Lunch on Patio	12:30-5:30 pm Free Time (2-5 pm Optional Tour of Newport, \$17.50/person)	12:05-1:30 pm Box Lunch with Panel Session
	1:30-3:10 pm FEA Fabrication & Characterization	2:00-3:30 pm Poster Session I		1:30-3:10 pm Novel Electron Sources and Devices
	3:10-3:25 pm Break			3:10-3:25 pm Break
	3:25-5:05 pm FEA Fabrication & Characterization con't	3:45-5:25 pm Theory & Simulation I		3:25-5:30 pm Novel Electron Sources and Devices con't
5:00-9:00 pm Registration	6:00-10:00 pm Clambake at Hammersmith Farm (Bus departures begin at 6 pm)		5:30-7:00 pm Cocktails and Hors d'oeuvres Buffet	6:00-9:00 pm Committee Dinner
7:00-9:00 pm Welcome Reception		7:30-9:00 pm Poster Session II	7:00-9:00 pm Panel Session	Adjourn

IVMC '93

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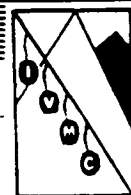
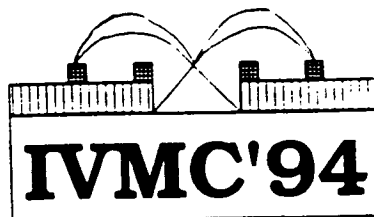
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Preliminary
Announcement



GRENOBLE

7th INTERNATIONAL VACUUM MICROELECTRONICS CONFERENCE
Grenoble, France, July 4-7, 1994

TOPICS

FUNDAMENTAL AND APPLIED ISSUES OF ALL ASPECTS OF VACUUM MICROELECTRONICS

- Development of Vacuum Microelectronic devices and structures
- Theory of Electron Emission and Electron Transport
- Theory, experiment, and development of Field Emitter Displays (FEDs)
- Theory and experimental Research in generating Microwaves and Millimeter Waves from Vacuum Microelectronic structures
- Theory and Experiments of Hybrid Devices consisting of both solid-state and Vacuum Microelectronic structures (lasers pumped by electrons)
- Electron sources including Field Emission, Field Emitter Arrays (FEAs), Solid-State and Ferroelectric Emitters, Photo-Emitters, etc.
- Microminiature ion sources, electron microguns
- 3-D Vacuum Nanostructures such as Scanning Tunneling Microscope (STM) and Atomic Force Microscope (AFM) type devices
- Electron Holography
- Micromachining science
- Nanostructure fabrication science
- Processing and fabrication science including Lithography, Chemistry and Physics
- Packaging of Vacuum Microelectronic devices

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Sponsored by : International Union of Vacuum Science, Technique and Applications (IUVSTA) --





GENERAL INFORMATION

LOCATION :

Grenoble is a beautiful city situated on the edge of the French Alps, approximately one hundred kilometers South-East of Lyon. Not only is Grenoble known for its University and fundamental research Laboratories, but it also hosted the 1968 Winter Olympics. Indeed, Grenoble and its surrounding area has a long and illustrious history which spans thousands of years. Scientists find that Grenoble is a most scenic and comfortable location, quite attractive for scientific and technical discussions as well as relaxation.

Among other International meetings closely related to the 7th IVMC, are :

the 41th International Field Emission Symposium to be held in Rouen, France, 11-15 July 1994 ;

contact : Prof. D. Blavette / IFES - Fax : (33) 14 66 51

and the 13th International Congress on Electron Microscopy to be held in Paris, France, 17-22 July 1994

contact : Secretariat ICEM 13 - Tel (33) 1 46 70 28 44 - Fax : (33) 1 46 70 88 46

CONFERENCE REGISTRATION :

You will be informed of the IVMC'94 registration fees in the first Call for Papers, to be mailed by November 93.

CALL FOR PAPERS :

With the first Call for Papers (November 93), you will be invited to submit contributed scientific and technical abstracts describing your research results in Vacuum Microelectronics and related fields. We would require your abstracts at SFV (French Vacuum Society) by 4 February 1994, at the latest.

Please note now, important Deadlines :

Receipt of Abstracts : February 4, 1994

Receipt of full length papers : April 30, 1994

ADDITIONAL INFORMATION :

Call or write Dr D. CELIER - SFV - Tel (33) 1 42 78 15 82 - Fax (33) 1 42 78 63 20
or Dr. R. BAPTIST at E-mail : BAPTIST @ CHARTREUSE. CEA. FR

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Please answer all questions, complete name and address sections

- ☐ I plan to attend the conference
☐ I expect to present an oral and/or a poster communication
☐ I cannot attend the meeting, but I wish to purchase a copy of the Proceedings book
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TUESDAY, 13 JULY 1993**FEA Surface Science and Reliability Issues, 8:30 am - 12:05 pm****Session Chairmen: D. Norman Hill and Nicol McGruer**

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WEDNESDAY, 14 JULY 1993

Theory and Simulation II, 8:55 - 10:10 am

Session Chairmen: Paul H. Cutler and Raouf Bakhtizin

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Session Chairmen: Jim Browning and Gerard van Veen

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11:15 am	Phosphor Selection Constraints in Application of Gated Field-Emission Micro-Cathodes to Flat-Panel Displays ; Chakhovskoi, A. G., Kesling, W. D., *Hunt, C. E. ; University of California, Davis, CA	141
11:40 am	New Electron-Excited Light-Emitting Materials; Vecht, A., Smith, D. W., Chadha, S. S.; University of Greenwich, London, England	143
12:05 pm	Some Ways to Increase Brightness Stability of Flat Displays Based on Field Emission; Karpov, L. D., Drach, V. A., Zasemkov, V. S., Mirgorodsky, Y. V., Genelyov, A. P., Proskurnin, S. B., Polytechnical Institute, Krasnoyarsk, Russia	145

Free Time, 12:30 - 5:30 pm (Optional Tour of Newport, buses depart at 2 pm)

Cocktails and Hors d'oeuvres Buffet, 5:30-7 pm

Panel Session, 7 - 9 pm

Chairman: Takao Utsumi

Will Field-Emitter Displays Successfully Challenge Active-Matrix Liquid-Crystal Displays?

THURSDAY, 15 JULY 1993

RF Power Devices, 8:30 am - 12:05 pm**Session Chairmen: Robert K. Parker and Tayo Akinwande**

<i>Time</i>		<i>Abstract Page Number</i>
8:30 am	Field Emitter Array Microwave Amplifiers (Invited); *Calame, J. P., Gray, H. F., Shaw, J. L. ; Naval Research Laboratory, Washington, DC	146
8:55 am	Progress in Field-Emitter Development for Gigahertz Operation ; *Holland, C. E., Rosengreen, A., Spindt, C. A., Brodie, I. ; SRI International, Menlo Park, CA	148
9:20 am	Analysis of Electrically Tuned Distributed Field Emitter Array Amplifier ; Gulyaev, Y. V., Nefyodov, I. S., *Sinit syn, N. I., Torgashov, G. V., Zakharchenko, Y. F., Zhbanov, A. I. ; Russian Academy of Sciences, Saratov, Russia	150
9:45 am	Silicon Field Emission Arrays - A Novel Gyrotron Cathode Design ; *Garven, M., Spark, S. N., Phelps, A. D. R. ; Univ. of Strathclyde, Glasgow, UK	151
10:10 am	Break	
10:25 am	Proposal of A High Efficiency Microwave Power Source using A Field Emission Array ; *Yokoo, K., Shimawaki, H., Ono, S. ; Tohoku Univ., Sendai, Japan	153
10:50 am	Design Projection for F. E. Triode using Low Capacitance Spindt Structures ; *Phillips, P. M., Neidert, R. E., Hor, C., Spindt, C. A. ; Naval Research Laboratory, Washington, DC	155
11:15 am	Electron Guns with Carbon Materials-Based Field Emission Multitip Cathodes for Microwave O-Type Devices ; *Grigoriev, Y. A., Rehen, G. A., Semyonov, V. C., Shestyorkin, V. I. ; Saratov University, Saratov, Russia	156
11:40 am	A Design for a Resonant Vacuum Microelectronic Microstrip Amplifier at 10 and 60 GHz ; *McKnight, S. W., Treado, T., Sahin, A., McGruer, N. E. ; Northeastern Univ., Boston, MA	158

Panel Session with Box Lunch, 12:05-1:30 pm

Topic to be selected by ballot.

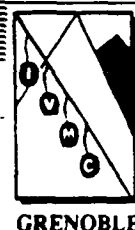
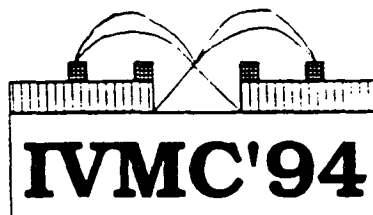
THURSDAY, continued

Novel Electron Sources and Devices, 1:30 - 5:30 pm

Session Chairmen: Bill Goodhue and Steve Bandy

<i>Time</i>		<i>Abstract Page Number</i>
1:30 pm	Diamond Field-Emission Cathodes ; Geis, M. W., *Twichell, J. C., Bozler, C. O., Rathman, D. D., Efremow, N. N., Krohn, K. E., Hollis, M. A., Uttaro, R., Lyszcza, T. M. ; MIT, Lincoln Laboratory, Lexington, MA	160
1:55 pm	Electron Field Emission from Amorphous Diamond Thin Films ; *Xie, C., Kumar, N., Collins, C. B., Lee, T. J., Schmidt, H., Wagal, S. ; MCC, Austin, TX	162
2:20 pm	Negative Electron Affinity Based Vacuum Microelectronics Devices ; *Santos, E. J. P., MacDonald, N. E. ; Cornell Univ., Ithaca, NY	164
2:45 pm	Cesium of Field Emission Microcathode Arrays ; Macaulay, J. M. ; Silicon Video Corp., Cupertino, CA	166
3:10 pm	Break	
3:25 pm	Properties of GaAs Field Emitter Array Structures for ESD-Protection of MMIC ; Bock, K., Hartnagel, H. L. ; Technical Univ. of Darmstadt, Darmstadt, Germany	167
3:50 pm	Energy Distribution of Tunneling Emission from Si-gate MOS Cathode ; *Yokoo, K., Sato, S., Koshita, G., Murota, J., Ono, S. ; Tohoku Univ., Sendai, Japan	169
4:15 pm	Study on the I-V Characteristics of Planar-Doped-Barrier Electron Emitters ; *Jiang, W.-N., Mishra, U. K. ; Univ. of California, Santa Barbara, CA	171
4:40 pm	Geometrically Asymmetric Nanotunnel Structures (GANT); *Schweitzer, D. C., Sullivan, T. E., Marcus, R. B., Cutler, P. H., Miskovsky, N. M. ; Temple Univ., Philadelphia, PA	173
5:05 pm	Large-Area Microstructured Liquid-Metal Ion Sources (MILMIS); Mitterauer, J., Snitko, A. O.; Tech. Universitat Wien, Vienna, Austria.	

Preliminary
Announcement



7th INTERNATIONAL VACUUM MICROELECTRONICS CONFERENCE
Grenoble, France, July 4-7, 1994

TOPICS

FUNDAMENTAL AND APPLIED ISSUES OF ALL ASPECTS OF VACUUM MICROELECTRONICS

- Development of Vacuum Microelectronic devices and structures
- Theory of Electron Emission and Electron Transport
- Theory, experiment, and development of Field Emitter Displays (FEDs)
- Theory and experimental Research in generating Microwaves and Millimeter Waves from Vacuum Microelectronic structures
- Theory and Experiments of Hybrid Devices consisting of both solid-state and Vacuum Microelectronic structures (lasers pumped by electrons)
- Electron sources including Field Emission, Field Emitter Arrays (FEAs), Solid-State and Ferroelectric Emitters, Photo-Emitters, etc.
- Microminiature ion sources, electron microguns
- 3-D Vacuum Nanostructures such as Scanning Tunneling Microscope (STM) and Atomic Force Microscope (AFM) type devices
- Electron Holography
- Micromachining science
- Nanostructure fabrication science
- Processing and fabrication science including Lithography, Chemistry and Physics
- Packaging of Vacuum Microelectronic devices

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GENERAL INFORMATION

LOCATION :

Grenoble is a beautiful city situated on the edge of the French Alps, approximately one hundred kilometers South-East of Lyon. Not only is Grenoble known for its University and fundamental research Laboratories, but it also hosted the 1968 Winter Olympics. Indeed, Grenoble and its surrounding area has a long and illustrious history which spans thousands of years. Scientists find that Grenoble is a most scenic and comfortable location, quite attractive for scientific and technical discussions as well as relaxation.

Among other International meetings closely related to the 7th IVMC, are :

the 41th International Field Emission Symposium to be held in Rouen, France, 11-15 July 1994 ;

contact : Prof. D. Blavette / IFES - Fax : (33) 1 46 66 51

and the 13th International Congress on Electron Microscopy to be held in Paris, France, 17-22 July 1994

contact : Secretariat ICEM 13 - Tel (33) 1 46 70 28 44 - Fax : (33) 1 46 70 88 46.

CONFERENCE REGISTRATION :

You will be informed of the IVMC'94 registration fees in the first Call for Papers, to be mailed by November 93.

CALL FOR PAPERS :

With the first Call for Papers (November 93), you will be invited to submit contributed scientific and technical abstracts describing your research results in Vacuum Microelectronics and related fields. We would require your abstracts at SFV (French Vacuum Society) by 4 February 1994, at the latest.

Please note now, important Deadlines :

Receipt of Abstracts : February 4, 1994

Receipt of full length papers : April 30, 1994

ADDITIONAL INFORMATION :

Call or write Dr D. CELIER - SFV - Tel (33) 1 42 78 15 82 - Fax (33) 1 42 78 63 20

or Dr. R. BAPTIST at E-mail : BAPTIST @ CHARTREUSE. CEA. FR

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