

1997 IMS-DENVER STEERING COMMITTEE REPORT

APPENDIX IV.A

ACTIVITIES SUMMARY FOR PAST 3 MONTHS,
(June - September 1997)

- Held very successful Microwave Week in Denver, CO, S-13 June 1997; Details to Follow.
- Helen Frey processing Settlement of all Accounts, Issuing Refunds, Distributing Left-over Digests and CD-ROMs, Preparing for IEEE Audit of IMS'97 Account.
- Claude Weil wrote-up detailed Reports on 1997 Microwave Week for Introduction to Special Transactions on MTT, to be published in December 1997, and for Lead Story in the Fall 1997 issue of MTT-S Newsletter.
- Bob & Sharon Seeley organized most enjoyable Party for IMS'97 Steering Committee over Labor Day weekend at Beaver Run Resort, Breckenridge, CO (25 Members came, many with their Families)
- Dick Booton, Special Transactions on MTT Editor, completed Review Process for Total of 159 submissions and sent Package to IEEE.
- All Members working on IMS'97 Final Report; anticipate Completion in mid-October

SPECIAL TRANSACTIONS ON MTT REVIEW PROCESS STATISTICS

	IMS	RFICS	ARFTG	TOTAL
NUMBER PAPERS SUBMITTED	147	7	5	159
NUMBER PAPERS ACCEPTED FOR PUBLICATION	44	4	1	49

IMS'97 PRELIMINARY BUDGET SUMMARY (in \$k)

	BUDGETED	ACTUAL
Total Income	1,045	1,350.2
Total Expenses	908	759.7
Surplus	174	590.5

Note: The Allocations to RFICS & ARFTG not yet completed

IMS'97 EXPENSES TO DATE, 9/19/97

CATEGORY	BUDGETED	ACTUAL
I. Publicity	82.1	21.5
II. Publications	167.8	153.6
III. Social Functions	235.4	182.4
IV. Administration	386	402.2
GRAND TOTALS	871.2	759.7

INCOME (\$k) TO DATE, 9/19/97

CATEGORY	BUDGETED	ACTUAL
Advance (since repaid)		40
Registration		
IMS	479	
RFICS	63	
ARFTG	17	
Publications	54	
Social Functions	26	
TOTAL	639	693.3
Exhibition Royalties (HH)	444	576.2
Interest, Grants & Misc.	6	40.7
TOTALS	1089	1350.2

REGISTRATION COUNTS (past 4 Years)

CATEGORY	1997, Denver FINAL	1997, Denver ADVANCED	1996, SF FINAL	1995, Orlando FINAL	1994, San Diego, FINAL
IMS (MTT-S)	2174	1584	2293	1767	1848
RFICS/MMWMC	727	602	579	546	583
ARFTG	205	125	157	96	108
Workshops	2775	1919	2340/1322	1505/	1390/
Exhibitors	5781	4015	6985	4078	4976
TOTAL REGISTRATION	8585	4261	9957	6671	7315

REGISTRATION STATISTICS FOR THE 1997 MICROWAVE WEEK ACTIVITIES

IEEE MTT-S International Microwave Symposium	2174
RFIC Symposium	727
ARFTG Conference	205
TOTAL Conference Registration	2518
Panel Sessions (IMS & RFICS)	1453
Rump Session	180
Workshop Registrations	
Sunday	635
Monday	1230
Friday	910
	TOTAL: 2775
Exhibition Only	5781
TOTAL REGISTRATION (All Events)	8585

TECHNICAL PROGRAM STATISTICS FOR PAST 5 YEARS

	Denver, 1997	San Francisco, 1996	Orlando, 1995	San Diego, 1994	Atlanta, 1993
Papers Submitted	752	839	636	725	614
Papers Accepted, Platform Open Forum	413 (55%) 281 132	461 (55%) 326 135	400 (63%) 296 104	426 (59%) 294 132	356 (58%) 257 99
No. IMS Sessions	55 5 Focussed 3 joint RFICS 1 joint ARFTG 3 Student	55	56	56	51
No. Workshops, Total Wkshp Registration	24 2775	26 2364	1505	1390	1010
No. Panels, Total Panel Registration	6 1453	7 1269	949	652	724
Rump Attendance	180	287	111	96	

1997 IMS Workshop Attendance

Workshop	Registration	Notebooks	Head Count	Breakfasts	Lunches	pm Break	Actual
WSA	153	234	220				
WSB	209	303	250				
wsc	114	162	157				
Sunday Totals	476	699	627	568	613	535	635
WMA	192	214	173				
WMB	117	129	96				
WMC	223	254	180				
WMD	91	95	86				
WME	60	62	54				
WMF	27	25	23				
WMG	179	197	172				
WMH	59	67	49				
WMI	65	65	59				
WMJ	52	66	50				
WMK	107	114	89				
WML	58	71	57				
Monday Totals	1230	1359	1088	1145	1100	N/A	1235
WFA	177	200					
WFB	290	299					
WFC	136	153					
WFD	101	110					
WFE	45	48					
WFF	47	65					
WFG	40	50					
WFH	39	42					
WFI	26	26					
Friday Totals	901	993		900	800	N/A	905
TOTAL	2607	3051					27751 17-Sep-97

7.1 Program Survey Questions

General Workshop Program Questions	Strongly Agree	Mildly Agree	Mildly Disagree	Strongly Disagree
There are too many workshops offered during the Symposium.	32	107	181	78
Different workshop topics should be offered every year.	115	163	54	2
There are too many workshops offered during the Symposium.	47	141	55	4
The entire 1997 IMS workshop program was well executed.	104	183	37	8
Different workshop topics should be offered every year.	31.3%	55.1%	11.1%	2.4%

PANEL AND RUMP SESSIONS

PANEL NO.	TITLE	DAY	ATTENDANCE
PA (RFICS)	Device Tech. Choices for Commer. Portable Power Amplifiers	Monday	286
PB (IMS)	Transceiver Technology for Multi-Mode Wireless Personal Nets	Tuesday	318
PC (IMS)	IC Reliability Needs for Commer. Applications	Tuesday	110
PD (IMS)	Packaging Techniques for Optical/Microwave Modules	Wednesday	281
PE (IMS)	Balancing Tradeoffs between Thermal Management & Electrical Performance	Thursday	280
PF (IMS)	Radio Frequency ID Tags & Data Cards	Thursday	178
Rump (IMS)	HF to UHF Designs & Applications	Tuesday Evening	180

TABLE 3
THE 1997 IEEE MTT-S INTERNATIONAL
MICROWAVE SYMPOSIUM STEERING COMMITTEE

Chair

Claude M. Weil, NIST

Vice Chair,

Plenary Session & ARFTG Chair

Roger B. Marks, NIST

Vice Chair,

special Sessions

Motohisa Kanda, NIST

Technical Program Co-Chairs

K.C. Gupta & Zoya Popovic,
University of Colorado, Boulder

Workshop Coordinators

Donald DeGroot, NIST
Ajay Sreenivas, Ball Corp.
John Meredith, HP

Interactive Forum

John Norgard, UCCS

Student Paper Contest

Stoyan Ganchev, CSU

Digest Editor

Gerhard Koepf, SCT

CD-ROM Editor

Chris Jelks,
Lockheed Martin

Digest & CD-ROM Support

Joseph Donovan
Donald Huebner,
Lockheed Martin
Charlie Jackson, TRW

**Transactions Guest Editor
& Gifts**

Richard Booton

TPC/Publications Support

Larry R. & Margaret Whicker,
LRW Associates

Finance

John Dunn, CU
Helen Frey, CU
John Tary

Registration

George Jankovic,
RF Globalnet Website

Publicity

Ronald DeLyser, DU
George Rinard, DU
Jeffrey Jargon, NIST

Secretary

Michael Janezic, NIST

RFICS Liaison

Dylan Williams, NIST

Chief of Protocol

David Wait, NIST

AdCom Liaison

Karl Varian, TI

Local Arrangements Chair

TPC Meeting Arrangements

HQ Hotel Coordinator

Bob Seeley, Monitor Labs

Events Coordinator,

Catering & AV

Sharon Seeley

Convention Center Coordinator

Ray Kagiya, HP

**Guest Program &
Transportation**

Robbie Marks

Signs

Christie Whitehead, HP

Awards Banquet

Carol & Andy Repjar, NIST

**Chairman's Dinner &
Chairman's Reception**

Carole Coates, CU

**Industry Relations /
Microwave Application
& Product Seminars**

Robert O'Rourke
Boulder Microwave Technologies
Dick Loewecke, Odyssey I
Gerome Reeve, NIST

Exhibition Managers

Harlan Howe, Jr. &
Howard Ellowitz,
Horizon House Publications

Historical Exhibit

David Russell

University Booths

Dick Ehret, H. Bass Assoc.

Student Help

Attila Weiscr, Jr. &
Jonathan Scupin, SCT

The 1997 IEEE MTT-S International Microwave Symposium/Microwave Week: “High Frequencies in High Places”

Claude M. Weil, *Senior Member, IEEE*, Roger B. Marks, *Senior Member, IEEE*
and Motohisa Kanda, *Fellow, IEEE*

I. INTRODUCTION

The 41st annual IEEE MTT-Society International Microwave Symposium (**IMS**), the primary event of the 1997 “Microwave Week”, took place in Denver, Colorado during the week of 8-13 June 1997. The historic return of **this** event to Colorado occurred **after** a 24 year hiatus. It had been held twice before in Colorado: in 1962 at the laboratories of the then National Bureau of Standards in Boulder [1] and again in 1973 on the campus of the University of Colorado in Boulder [2]. Many extraordinary changes have taken place in the MTT Symposium during the intervening years; details are given in Table 1, which demonstrates well the dramatic growth of this conference. Where once the **IMS** could be adequately accommodated in a small college town such as Boulder, this was no longer true by the 1980s and 1990s. The very large exhibition, which has become a major and very important adjunct to the conference, now dictates that the IMS can only be held in medium-to-large sized cities having major convention center facilities. The completion of the new Colorado Convention Center in Denver in the early Nineties finally made it possible to bring the **IMS** back to Colorado in 1997.



The Colorado Convention Center in Denver. Site of the 1997 Microwave Week events.

TABLE 1
STATISTICS FOR RECENT AND PAST SYMPOSIA HELD IN COLORADO

EVENT	1962 IRE PG-MTT National Symposium	1973 IEEE PG-MTT International Microwave Symposium	1997 IEEE MTT-S International Microwave Symposium
Location, Dates	NBS Labs Boulder, CO 22-24 May 1962	University Colorado, Boulder, CO 4-6 June 1973	Colo. Convention Center, Denver, CO 8-13 June 1997
IMS Attendance	465	586	2174
No. Papers given	36 in 10 sessions, 1 -track	119 in 15 sessions, 2-track	4 13 in 55 sessions, 5-track
Digest	1 Volume	1 Vol., 343 pages	3 Vols, 1830 pages
No. Panels & Workshops	None	3 1	6 24
TPC Members TPC Chair/Co-chairs	8 R. Beatty, NBS	50 R. Beatty & E. Komarek, NBS	240 K.C. Gupta & Z. Popovic, cu
No. Exhibitors	None	15	375; 521 booths
Steering Committee Members	18	20	42
Steering Committee Chair	G.E. Schafer, NBS	D.F. Wait, NBS	H. Haddad , Ball; C.M. Weil, NIST
Local Arrangements Chair	J.F. Brockman, NBS	R. L. Gallawa, ITS	R. Seeley

Today's IMS is only one component of what has now come to be known as "Microwave Week ", **including** two other conferences that are formerly sponsored by or **affiliated** with the MTT- Society: the Radio Frequency Integrated Circuits Symposium (RFICS, formerly the MMWMC Conference) and the Automatic RF Techniques Group (ARFTG) Conference. These take place at the beginning and end of Microwave Week respectively. There exists considerable overlap in the registration for these three conferences. Another major component is the Exhibition, organized by Horizon House Publications, and its associated Microwave Application & Product Seminars. The social events have always been a traditional part of Microwave Week and include the **IMS** Awards Banquet, the RFICS

Reception, the *Microwave Journal*/MTT-S Reception and the Industry-hosted Cocktail Reception which precedes the Banquet. Lastly, a comprehensive Guest Program is always organized for accompanying spouses, including a Hospitality Suite and various tours/outings.

II. REGISTRATION STATISTICS

The registration statistics are given below in Table 2:

TABLE 2
REGISTRATION STATISTICS FOR THE 1997 MICROWAVE WEEK ACTIVITIES

IEEE MTT-S International Microwave Symposium	2174
RFIC Symposium	727
ARFTG Conference	182 205
TOTAL Conference Registration	2518
Panel Sessions (IMS & RFICS)	1453
Rump Session	180
Workshop Registrations Sunday Monday Friday	635 1230 910 TOTAL: 2775
Exhibition Only	5781
TOTAL REGISTRATION (All Events)	8585

In general, we consider these registration statistics to be most impressive and far in excess of our most optimistic projections. They truly reflect the outstanding success achieved in Denver during Microwave Week. By comparing these statistics with those published last year for the 1996 IMS [3, Table 1], some very interesting trends are readily apparent. Although the registration for IMS was down slightly from last year (2174 versus **2299**), both the RFICS and ARFTG saw ~~very significant~~

increases ^{of approximately 25%} ~~(24% for RFICS)~~. It is clear that the RFICS is attracting a sizable and increasing proportion of the total conference registration, reflecting increased interest amongst attendees in the technical areas of interest to RFICS. Registration for the lunchtime Panel Sessions also increased 13% from 1289 at IMS'96 to 1453. An increase that is equally significant is in the number of workshops registered for (2775 versus **2496**), further confirming a major growth trend that has now been evident for several years. The inescapable conclusion emerging **from** both our experiences and those of other organizers is that the workshop format is becoming very popular to many Microwave Week attendees. This is undoubtedly due to the more informal and slower pace of the workshop setting, which frequently allows for relaxed one-on-one interactions between the presenters and the audience and obviously **frees** the presenters from the kind of time constraints that they are subject to in the regular conference sessions. The ever-increasing popularity of the workshops is a factor that needs to be paid attention to by all future conference organizers.

III. THE TECHNICAL PROGRAM

IMS Technical Sessions

The majority of technical presentations during the 1997 Microwave Week strongly confirmed the important shift that the microwave industry has recently undergone **from** the earlier high-cost, low-volume environment of military applications to the present low-cost, high-volume environment of the commercial marketplace. Many papers reported on state-of-the-art advances covering a very broad frequency spectrum in many of the booming fields of commercial telecommunication applications, such as wireless, PCS, fiber optics, MMDS, LMDS, etc. (For further details, see K.C. Gupta and Z. Popvic', "1997 IMS Technical Program", this edition)

The IMS is renowned for the very thorough review process that all potential technical contributions are subjected to, which always results in a very high-quality technical program. Out of a total of 752 submissions, the IMS'97 Technical Program Committee (TPC) accepted a total of 413 papers for presentation at 55 technical sessions in a **5-track** format. This represents a 55% acceptance rate. 5 of these 55 sessions were organized **Focussed** Sessions; most dealt with very specific technical areas, but one was devoted to the history of microwave metrology at **NBS/NIST** in Boulder. Another regular session, dealing with developments in millimeter and submillimeter waves, was devoted to the memory of Sir J.C. Bose, an Indian physicist who performed some extraordinary pioneering experiments at 60 **GHz** over a century ago (see also Section IV below). 3 of the regular sessions were jointly sponsored by both IMS and RFICS and one jointly by IMS and ARFTG. 132 of the 413 accepted papers were presented at two Interactive Forum (poster) sessions, in which the audience could discuss some of the issues presented by authors over snacks, fruit, wine and beer!

Student Paper Competition

In addition, 32 of the platform presentations authored or co-authored by students were entered in the

IMS Student Paper Competition, which this year involved three separate sessions. As a novel innovation in 1997, all student competition participants were awarded travel grants, intended to provide partial reimbursement for travel expenses incurred by them. We believe that such grants encourage greater student participation in the IMS and we hope that this precedent will be repeated in future years.

Panel Sessions and Workshops

6 lunchtime panel sessions, 5 sponsored by IMS and the 6th by RFICS, and the evening “**rump**” session all featured presentations by invited panelists as well as lively interactive discussions between the audience and panelists. A total of 24 workshops, 10 full-day and 14 **half-day**, were featured as part of the IMS Program. These featured a tutorial or short-course setting for professional development in which attendees can closely interact with invited specialists. They covered important areas of emerging technologies, as well as business aspects, government regulations and web site design.



Leaders of the 1997 JMS **Steering** Committee: (from left) **Bob Seeley**, Local Arrangements Chair, **K.C. Gupta**, Technical Program Cochair, **Roger Marks**, Vice Chair. Plenary Session & ARFTG Chair, **John Dunn**, Treasurer, **Motohisa Kanda**, Vice Chair & Special Sessions; **Claude M. Weil**, General Chair

The Plenary Session

In order to further highlight the important commercial telecommunication themes of this year's IMS, this year's Plenary Session was devoted to two new telecommunication infrastructures. Bernard Bossard, chief technical ~~officer and~~ co-founder of **CellularVision** USA, discussed his company's pioneering work in ~~local 28 GHz~~ multi point distribution systems (**LMDS**), which can potentially provide customers with wide-band wireless links for telephone, high-speed data and multi-channel TV applications at much reduced capital investment. The other plenary speaker, Robert Dixon, chief scientist of Omnipoint Corporation of Colorado Springs, questioned whether the real promise of PCS wireless communications, including high-speed data service, have been met. He concluded that, due to various factors, primarily economic, PCS is currently little more than digital cellular telephony operating on upper frequency bands. At the conclusion of the Plenary Session, awards were presented by the MTT-S President, R.E. (Skip) Bryan, to the leaders of the 1996 **IMS** Steering Committee, led by Chairman E. J. **Crescenzi**, Jr., as well as three of this year's MTT-S graduate fellowship winners.

Publications

The work of the Technical Program cannot be considered complete until the **IMS** Digest is published. As evident in Table 1, this has now grown to a 3-volume, 12 pound monster! Additional copies of the Digest can be obtained from the IEEE, Publication Order Department, 445 Hoes Lane, Piscataway, NJ 08855-1331; please quote IEEE Catalog No. **97CH36037** and ISSN: 0149-645X. Because of the many advantages inherent in the use of CD-ROMs as a storage medium, the organizers of this year's **IMS** followed the lead of the **IMS'96** organizers in again preparing a **CD-ROM** that contains all of the **IMS** and RFICS technical papers. New this year were titles and abstracts of MTT-S publications since 1989. All **IMS** and RFICS registrants again received this at no extra cost. This year, considerable effort went into creating a much improved system that is more **user-friendly** and which is capable of retrieving title and abstracts in considerably less time.

IV. EXHIBITION AND MICROWAVE APPLICATION & PRODUCT SEMINARS

For many years now, the Microwave Week events have included the largest and most comprehensive Exhibition of its kind in the microwave industry, organized by Horizon House Publications under contract to the **MTT** Society. This year's event, which posted a total of 521 revenue booths and 375 participating companies, even exceeded last year's record participation! This undoubtedly reflects the renewed economic growth and sense of optimism which the microwave industry is currently enjoying. The early concerns of those who feared that Denver would not attract a very sizable exhibition audience were answered by the extraordinarily large and steady exhibition **traffic**, which astonished even the Exhibition organizers. This year's Exhibition included 16 University Booths, five of which occupied, for the first time, a full booth.

The Exhibition has also traditionally included the Microwave Historical Exhibit. Besides the historical artifacts that are normally loaned to IMS by the Historical Electronics Museum, Inc. of Baltimore, MD, there were some significant additions to this year's Historical Exhibit. These included some early microwave standards and instruments provided by the National Institute of Standards and Technology in Boulder, as well as a special display and live demonstration of the 60 GHz instrumentation used by the Indian physicist, Sir J.C. Bose, who performed many pioneering investigations into the quasi-optical properties of millimeter waves over a century ago. Those who visited the display were astonished to learn that such sophisticated technology, including spark generators, waveguide filters, dielectric lenses, absorbers, semiconductor detectors, etc. were already



Part of the 1997IMS Exhibition, Colorado Convention Center, Denver

in use at that time. By special arrangements, these artifacts had been brought to Denver by Prof. A.K. Sen of the University of Calcutta and Mr. D. Sen, the curator of the J.C. Bose Museum in Calcutta, for whose IMS participation and collaboration we are most grateful.

Following the precedent set last year, the Microwave Application and Product Seminars (μ APS) were again presented on the exhibition floor. A program totaling 38 papers ran continuously during regular exhibition hours, including lunch, in a 1-track format. These seminars, which were **free** to all technical registrants as well as the exhibition-only attendees, were intended to provide useful and up-to-date information on new microwave products and techniques for design, manufacturing, marketing and managerial professionals. This year, we sought to better publicize the μ APS and it appeared that these efforts did pay off through much improved attendance.

V. THE SOCIAL FUNCTIONS

Microwave Week would not be complete without the traditional social functions that are held throughout the week. The first event was the RFICS Reception, which took place at the Denver Marriott Hotel on Sunday evening. This was followed by the traditional *Microwave Journal*-MTT Reception, held at the Denver Museum of Natural History on Monday evening. For this function, the Museum was reserved exclusively for our use and included free access to **all of** the museum exhibits as well as an **IMAX** film. As an innovation to this year's IMS, we hosted a complimentary breakfast for all **MTT** members on both Tuesday and Wednesday mornings. This provided members with an opportunity to interact with **MTT AdCom** and TPC members as well as renew old friendships and chat with colleagues. Tuesday evening found many **IMS** participants and their guests at Coors Field in lower downtown Denver to watch the Rockies-Braves baseball game. But the premier social event continues to be the **IMS** Awards Banquet. Some 600 people attended this event in the Grand **Ballroom** of the Headquarters Hotel, the Adam's Mark, on Wednesday evening. At this function, the 1997 MTT-S awards were presented by the MTT Society President, R.E. "Skip" Bryan, and Honorary Life Fellow Ted S. Saad. In addition to recognizing the major microwave awardees and presenting the new IEEE Fellows (for further details, see D.N. **McQuiddy, Jr.**, "1997 MTT-S Awards", this edition), certificates of recognition were also presented to the outgoing MTT-S President, J. W. **Wassel**, and three retiring **AdCom** members, J.M. Golio, D.C. Webb and R.E. Lehmann. Presentations were also made by Stoyan Ganchev to the winners of the IMS Student Paper Contest. "Four Hands, Two Grands" Piano entertainment by Larry Wagoner and John Rite of Denver followed the awards ceremony.

Due to its close proximity to Colorado's magnificent Rocky Mountains, Denver is always a very popular tourist attraction. Consequently, many attendees were accompanied by their spouses and families, who enjoyed a varied and well-balanced Guest Program . We provided a Hospitality Suite at the historic Brown Palace Hotel for the exclusive use of accompanying guests and we also organized a program of in-town tours, featuring some of Denver's cultural attractions, as well as two out-of-town tours to the Rocky Mountain National Park and to Colorado Springs.

ACKNOWLEDGMENTS

To repeat an old cliché, the secret of success (and the 1997 Microwave Week was an enormous success by any standards) is a team of dedicated, committed and hard-working individuals. Without any doubt, such a description fits the 1997 IMS Steering Committee (see Table 3). As we all know, the IEEE relies almost entirely on unpaid volunteers to organize its conferences and other functions. There is very little reward in this hard work, much of which is done on the volunteers' own time, other than the satisfaction of working together toward a common and worthy goal and of knowing that everyone did a truly outstanding job. Nor is there ever enough recognition given to these dedicated people, many of whom toil unrecognized and in anonymity. To all of our outstanding Committee members, we want to say a big "thank **you**" and hope that this short tribute will help recognize their dedication, hard work and accomplishments.

An undertaking of this magnitude cannot possibly succeed without the professional support and encouragement given to Committee members by its various employers (see Table 3). We wish to acknowledge this generous support, particularly that given by the National Institute of Standards and Technology, which was an official technical sponsor of the Symposium, as well as the **Hewlett-Packard Co.**, which contributed prizes for the Student Paper Contest, plus a grant to assist in **defraying** expenses associated with the Historical Exhibit. We also acknowledge the support of the National Science Foundation which provided a grant to help **defray** student travel expenses.



The 1997 IMS Steering Committee. First Row, Left to Right: D. Williams, C. Repjar, S. Seeley, R Booton, Robbie Marks, Roger Marks, S. Ganchev, C. Weil (Chair), M. Kanda, R. DeLyser, K.C. Gupta, J. Tary, R DeGroot, C. Whitehead. Second Row: J. Dunn, K. Varian, R Ehret, R O'Rourke, R Loewecke, J. Norgard, D. Wait, J. Meredith, A Repjar, G. Jankovic, R Seeley. Missing: Z. Popovic, H. Frey, A Sreenivas, G. Koepf, C. Jelks, D. Huebner, J. Donovan, R Kagiya, C. Coates, J. Jargon, M. Janezic, D. Russell, A. Weiser, J. Scupin

REFERENCES

- [1] "The 1962 PGMTT National Symposium", *IRE Trans. Microwave Theory Tech.*, vol. MTT-10, No. 6, pp. 410-412, November 1962
- [2] D.F. Wait and R. W. Beatty, "The 1973 International Microwave Symposium", *IEEE Trans. Microwave Theory Tech.*, vol. MTT-21, No. 12, pp. 747-751, December 1973
- [3] E.J. Crescenzi, Jr. and J. Barrera, "The 1996 IEEE MTT-S International Microwave Symposium/Exhibition: 'Bridging the Spectrum', " *IEEE Trans. Microwave Theory Tech.*, Vol. 44, No. 12, pp. 2311-2317, December 1996.