

AD-A190 552

WORKSHOP ON FUTURE OPPORTUNITIES THROUGH GAAS ON
SILICON HELD IN MARINA D (U) ILLINOIS UNIV AT URBANA
COORDINATED SCIENCE LAB H MARKOC DEC 87
AFOSR-TR-87-1922 AFOSR-87-0198

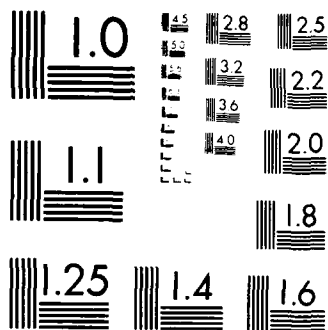
1/1

UNCLASSIFIED

F/G 7/2

ML





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

REPORT DOCUMENTATION PAGE

AD-A190 552

1b. RESTRICTIVE MARKINGS **DTIC FILE COPY**
None

3. DISTRIBUTION / AVAILABILITY OF REPORT
Approved for public release;
distribution unlimited

4. PERFORMING ORGANIZATION REPORT NUMBER(S)
Report

5. MONITORING ORGANIZATION REPORT NUMBER(S)
AFOSR-TR-87-1922

6a. NAME OF PERFORMING ORGANIZATION
Coordinated Science Lab
University of Illinois

6b. OFFICE SYMBOL
(if applicable)
N/A

7a. NAME OF MONITORING ORGANIZATION
Air Force Office of Scientific Research

6c. ADDRESS (City, State, and ZIP Code)
1101 W. Springfield Avenue
Urbana, IL 61801

7b. ADDRESS (City, State, and ZIP Code)
Bldg 410, Bolling AFB
Washington, DC 20332

8a. NAME OF FUNDING / SPONSORING ORGANIZATION
Air Force Office of Scientific Research

8b. OFFICE SYMBOL
(if applicable)
NE

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
AFOSR 87-0198

8c. ADDRESS (City, State, and ZIP Code)
Bldg 410
Bolling AFB
Washington, DC 20332

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
61102F	2305	C1	

11. TITLE (Include Security Classification)
Final Report Workshop on Future Opportunities Through GaAs on Silicon
June 18-19, 1987, Marinal del Rey, CA

12. PERSONAL AUTHOR(S)
H. Morkoc

13a. TYPE OF REPORT
Fund
Technical

13b. TIME COVERED
FROM 15-19 June 87

14. DATE OF REPORT (Year, Month, Day)
1987 December

15. PAGE COUNT
14

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Meeting, agenda, attendees, discussion topics

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
The workshop was attended by about 110 researchers who are actively involved, in one phase or another, with GaAs on Si and related problems. The format of the workshop was such that there was ample opportunity for spontaneous discussions in subjects ranging from materials growth to potential systems that may be possible. The enclosed program details and the list of attendees should provide a sufficient account of what went on at the workshop.

DTIC ELECTED
S JAN 15 1988

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT
 UNCLASSIFIED/UNLIMITED SAME AS RPT. DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION
Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL
DR. CHARLES C. H.

22b. TELEPHONE (Include Area Code)
(202) 767-4932

22c. OFFICE SYMBOL
NE

The workshop was attended by about 110 researchers who are actively involved, in one phase or another, with GaAs on Si and related problems. The format of the workshop was such that there was ample opportunity for spontaneous discussions in subjects ranging from materials growth to potential systems that may be possible. The enclosed program details and the list of attendees should provide a sufficient account of what went on at the workshop.

10 June 1987

Final Detailed Program

TECHNICAL PROGRAM
WORKSHOP ON FUTURE OPPORTUNITIES THROUGH GaAs ON SILICON

18-19 June 1987

Marina del Rey, California

Thursday morning: 18 June 1987

- 7:30-8:30 Continental Breakfast, Dining Room, Marina del Rey
Marriott Hotel
- 8:30-9:00 Registration (Lobby, Marriott Hotel)
- 9:00-9:05 Welcoming Remarks: Prof. Hadis Morkoc
- 9:05-9:50 Plenary Session:
- A. Asch, "Why GaAs/Si"
 - D. Shaw, "What We Have Really Accomplished"

Note: Plenary speakers will tell us what GaAs/Si technology is all about, where we are now, where we are going and what the technology is likely to lead to if successful in application to integrated circuits and systems. They should also recount briefly the history of GaAs/Si, with reference to other lattice mismatched semiconductor materials systems, development of hetero-epitaxial materials and devices, in general, and particularly of III-V heterostructures on silicon.

SESSION I: GROWTH ISSUES:

- 9:50-10:10 I(a): **Moderator:** D. Shaw (T.I.)
- "What Questions Have We Answered in GaAs/Si Epitaxy and Where are We Headed?"
- (i) Fundamental Physics of Hetero-epitaxy
 - (ii) Basic Limitations
- Speaker:** S. Wang (U.C. Berkeley)

Audience Participation

G. Turner (Lincoln)
T. Lee (Kopin)
C. Itoh (FMI)
P. Norris (GTE)

10:10-10:40 I(b): Moderator: L. Schowalter (RPI)

"Are the Present Surface Preparation Methods Adequate?"

Speaker: Paula Grunthner (JPL)

(i) Planar Growth

(ii) For patterned growth or selective epitaxy. Thermally grown oxides (thermal desorption and chemical desorption, pseudo-in-situ removal).

(iii) Speaker: Paula Grunthner
How clean the surfaces are, potential contamination of epi-layer during growth.

DISCUSSION PERIOD: 20 minutes of total time for I(b). (Directed by Moderator, assisted by speakers seated at table facing audience, next to podium.)

NOTE: In each major session, the speakers together with the moderator will serve as focus of a panel discussion with audience.

Panel

D. Biegelsen (Xerox)
P. Grunthner (JPL)
F. Allen (UCLA)
F. Grunthner (JPL)
D. Streit (TRW)
L. Schowalter (RPI)

10:40-11:10 I(c): Moderator: L. Schowalter (RPI)

"Epitaxial Wafer Properties and Their Relation to Processing/Production Issues"

Speaker: G. Turner (Lincoln Labs): (10 minutes)

MBE/MOCVD Growth as pertains to:

- (i) wafer size
- (ii) throughput, wafer cost
- (iii) compatibility with potential processing techniques
- (iv) wafer bowing, cracking, residual strain, dislocations, oval and large structural defects.

DISCUSSION PERIOD: 20 minutes of total time for I(c)

Audience

A. Y. Cho (AT&T Bell Labs)
C. Tu (AT&T Bell Labs)
G. Turner (Lincoln)
J. Lee (Kopin)
M. Scott (Kopin)
J. Salerno (Kopin)
J. Posa (Crystal Spec)
J. Fan (Kopin)
S. Severin (UET)
R. Lum (AT&T Holmdel)

"Growth on Patterned Wafers Selective Area Growth
CaF₂/GaAs Issues"

Speaker: To be chosen by Moderator
(possibly S. Wang).

11:10-11:40 Moderator: L. Schowalter (RPI)

Speakers: R. Matyi (T.I.)
J. Pinter (Ford Aerospace)
C. Tu (At&T Bell)

Issues:

- (i) Special cleaning procedures
- (ii) Special growth requirements
- (iii) Effect on hydrogen
- (iv) Effect of Ga, Al, etc. on underlying Si devices (threshold voltage shifts, etc.)
- (v) Growth over poly, SiO₂ and Si₃N₄.
- (vi) Selective etching vs. selective epitaxy.

OPEN DISCUSSION: Time allowed by Moderator

12:00-1:00 Luncheon

Thursday Afternoon

SESSION II: CHARACTERIZATION ISSUES:

1:10-1:30 II(a) Moderator: A. Jordon (AT&T)

"Overview: Characterization Techniques Presently Employed in GaAs/Si Materials" (What are the relevant techniques and their strengths and limitations; possible new approaches needed for GaAs/Si materials.)

Speaker: Ross Briegelsen or D. Beige Isen (Xerox, PARC)

1:30-1:50 II(b) Moderator: A. Jordan (AT&T Bell)

"Structural Analysis by Transmission Electron Microscopy"

Speaker: E. Weber and Z. Liliental-Weber (UC Berkeley): 10 minutes

DISCUSSION PERIOD: 10 minutes of total time for II(b)

NOTE: E. Weber (Berkeley), Z. Liliental-Weber (Berkeley) and F. Ponce (Xeros) should be on panel or in the audience. Also J. H. Mazur (USC), J. Brown (AT&T), and A. E. Blackeslee (SERI).

1:50-2:00 II(c) Moderator: A. Jordan (AT&T Bell)

"Structural Analysis by X-Ray Diffraction"

Speaker: H. Zabel (University of Illinois) 10 minutes

2:00-2:30 II(d): Moderator: A. Jordan (AT&T Bell)

"Interfacial Analysis, What Can the Following Methods do for GaAs/Si Towards Devices and Curcuits?"

STEM: "Scanning Tunneling Electron Microscopy of GaAs/Si"

Speaker: W. Kaiser (JPL): 5 minutes

RHEED: "Reflection Electron Difrraction at GaAs/Si"

Speaker: S. Batra & P. Cohen (Univ. of Minn.): 10 minutes

2:30-2:40 DISCUSSION PERIOD: 10 minutes of total time for II(c)

NOTE: R. Bean (Ford Aerospace), A. Macrander (AT&T), D. Neumann (NBS), and C. Sparks (Oak Ridge) should be on the panel and speak if they wish. Also J. Ahearn (Martin Marietta and C. Litton (Avionics Lab).

DISCUSSION PERIOD: During Coffee Break

2:30-3:00 Coffee Break (Coffee and Refreshments served in Classroom).

SESSION III: UNIQUE PROCESSING AND DEVICE APPROACHES:

3:00-3:20 Moderator: B. Murphy (AT&T Bell)

"Can Si Processing Lithography be Used for GaAs Devices on Si?"

Speaker: A. Saxena (RPI): 20 minutes

"Special Requirements for GaAs/Si Processing" and "Characterization of Confined Area GaAs/Si Growth"

Speakers: T. Kamins/J. Adkisson, H-P Stanford
20 minutes

"Ion Implantation"

Speaker: S. Pearton (AT&T): 10 minutes

"Annealing, In-situ, Ex-situ"

Speaker: N. Chand, (AT&T): 10 minutes

OPEN DISCUSSION: Time allowed by Moderator (approx. 20 minutes)

Panel Members:

W. Oldham (Berkeley)

J. Salerno (Kopin)

M. Feng (FMI)

J. Amano (H-P)

S. Shichijo (TI)

DISCUSSION PERIOD: Time allowed by Moderator (approx. 20 minutes)

(i) Accomplishments to date

(ii) Major problems

(iii) Potential Solutions

(iv) Eventual Limitations

(v) Effects of defects

(vi) Applications & reliability (Nomardi, G.E.)

Panel

A. Y. Cho (AT&T)
H. T. Yuan (TI)
M. Feng (IMI)
H. K. Choi
H. L. Hung (COMSAT)
M. Namordi (GTE)

5:25 Break for Supper, End of Day

(Continuation of Session IV, HBT's & Optical Devices, Friday, morning)

Friday morning: 19 June 1987: 8:45 a.m.

SESSION IV: DISCRETE DEVICE ISSUES (continued)

IV(c): Moderator: G. Witt (AFOSR)

8:45-8:55

"HBT-type Devices"

Speaker: H. T. Yuan (TI): 10 minutes

DISCUSSION PERIOD: Time allowed by moderator (approx. 15 minutes)

"Same Issues for HBT's as for FET devices and in addition consider:

Speaker: T. Smith/H. Huang (COMSAT): 10 min.

"Substrate Requirements"

Speaker: A. Jordan (AT&T): 10 min.

DISCUSSION PERIOD: 20 minutes of total time for V(a)

Issues:

- (i) Microwave losses
- (ii) Low substrate resistivity
- (iii) Wafer supply
- (iv) Wafer warpage
- (v) Wafer fracture strength, GaAs vs. Si.
- (vi) Substrate wafer breakage & yield consideration
- (vii) Cracking of epitaxy on Si
- (viii) Cracking of epitaxy on Si
- (ix) Possible solutions through selective epitaxy and separation of device areas
- (x) Questions of thermal expansion differences

Audience/Panel

T. Smith (COMSAT)
H. Kim/M. Feng (FMI)
N. Cirillo (Honeywell)
S. Shichijo (TI)
A. Jordan (AT&T)
W. Tseng (NRL)
J. King (AFWAL)

10:45-11:00 Coffee Break

SESSION VI: FOCUSING ON THE APPLICATIONS OF GaAs/Si IC's:

VI(a): Moderator: J. N. Cast (Ford Aerospace)

11:00-11:20 "Overview of Functional Integration for Both
Electronic and Optoelectronic IC's"
Speaker: L. Chall (Ford Aerospace): 20 minutes

HOLD DISCUSSION FOR LATER

11:20-11:30 "Integration for VLSI"
Speaker: C. Hu* (Berkeley): 10 minutes
*Will not attend

DISCUSSION PERIOD: Time allowed by Moderator (approx. 15 min.)

Experts

L. Chall (Ford Aerospace)
B. Murphy (AT&T)
H. T. Yuan (T.I.)
T. Kamins/J. Adkisson (H-P)
A. Asch (Ford Aerospace)
P. Ko (Berkeley)
E. Gertner (Rockwell)
A. Saxena (RPI)
G. Rabanus (AFWAL)

11:45-1:00 BREAK FOR LUNCH (Luncheon arranged for continued
discussion in hotel dining room.)

Friday Afternoon

SESSION VI: FOCUSING ON APPLICATIONS OF GaAs/Si IC's (continued):

VI(a) Moderator: J. N. Cast (Ford Aerospace)

1:00-1:15 "Impact of GaAs/Si on Si VLSI"
Speaker: A. Saxena (RPI): 15 minutes

1:15-1:35 "VLSI Design with GaAs and Si"
Speaker: B. Murphy (AT&T): 20 minutes

DISCUSSION PERIOD: Time allowed by Moderator (approx. 30 min)

VI(b) Moderator: J. N. Cast (Ford Aerospace)

1:35-1:45 "Integration for Detectors/Focal Plane Arrays"
Speaker: K. Zanio (Ford Aerospace): 10 min.

1:45-1:55 "Integration for Detectors/Focal Plane Arrays"
Speaker: E. Gertner (Rockwell): 10 min.

DISCUSSION PERIOD: Time allowed by Moderator (approx. 20 min.)

Expert Panel

Same members as for VI(a) above

2:00-2:20 COFFEE BREAK

SESSION VII: OPTOELECTRONIC IC's AND OPTICAL INTERCONNECTS:

Moderator: J. C. Fan (Kopin)

2:00-2:30 VII(a) "Overview of IC's and Optical Interconnects"
Speaker: F. Leonberger (UTRC) and/or
J. Goodman (Stanford): 10 min.

2:30-2:40 VII(b) "Monolithic GaAs/Si Integration for Optical
Interconnects"
Speaker: H. K. Choi (Lincoln Labs): 10 min.

OPEN DISCUSSION: Time allowed by Moderator (approx. 20 min)

Panel Members

J. Goodman (Stanford)
H. Choi (Lincoln)
J. Ballantyne (Cornell)
K. Lau (ORTEL)
A. Yariv (Caltech)

SESSION VIII: REFLECTIONS AND CLOSING REMARKS

3:00-3:30 Moderators: H. Morkoc or C. Litton

Commentary

B. Murphy
A. Saxena
T. Kamins/J. Adkisson
L. Chall
D. Shaw

3:30- FINAL ANNOUNCEMENTS, WORKSHOP CONCLUDES

GaAs/Si WORKSHOP

18-19 June 1987, Marinas del Rey, California

SESSION MODERATORS

Session No.

I(a), (c-d)	Leo Schowalter Physics Dept., R.P.I. Troy, N.Y.	Tel: (518) 266-6435
I(b)	Don Shaw Texas Instruments Inc. P.O. Box 655936 Dallas, TX	Tel: (214) 995-4788
II	Andrew Jordan AT&T Bell Labs Murray Hill, N.J.	Tel: (201) 582-3714
III	Bernard Murphy AT&T Bell Labs Reading, PA	Tel: (215) 939-6779
IV	Gerald Witt AFOSR/NE Bolling AFB Washington, D.C.	Tel: (202) 767-4931
V	H. K. Choi/B. Y. Tsaur MIT Lincoln Lab Lexington, MA	Tel: (617) 863-5500 X-4457, 7838
VI	J. N. Cast Ford Aerospace Newport Beach, CA	Tel: (714) 720-7525
VII	John Fan Kopin Corp. Taunton, MA	Tel: (617) 824-6696
VIII	Hadis Morkoc University of Illinois Urbana, Ill. (Caltech, Pasadena, CA) and Cole Litton Avionics Lab AFWAL Wright Patterson Ohio	Tel: (818) 356-4828 Tel: (513) 255-3457

№	Last Name	First Name	Affiliation	Address	City	State	Zip	Telephone
1	Adkisson	Ann	Stanford Univ	McClough 2-6	Stanford	CA	94305	(415) 723 4166
2	Ahearn	Jack	Marion Marcella Labs	1450 S. Holling Rd	Baltimore	MD	21227	(301) 247 0700
3	Amano	Ken	Hewlett Packard	3140 Deer Creek Road	Palo Alto	CA	94304	(415) 857 4386
4	Anderson	Greg	Stanford Univ	Alt 2311	Stanford	CA	94305	(415) 723 1482
5	Asch	Ailyn	Ford Aerospace	Ford Rd Bldg 2	Newport Beach	CA	92260	(714) 720 6270
6	Awal	M. Abdul	A1&T Engg. Research Center	P O Box 900	Princeton	NJ	08540	(609) 639 2495
7	Bajaj	Krishnan	USAF	AIWAL/AADR	Wright Patterson AFB	OH	45433	(513) 255 8668
8	Barnett	Allen M	Univ of Delaware	EE Dept	Newark	DE	19716	(302) 451 8784
9	Batra	Sharat	Univ of Minnesota	123 Church St. S.E.	Minneapolis	MN	55455	(612) 625 7341
10	Bean	Hoss C	Ford Aerospace	Ford Rd	Newport Beach	CA	92660	(714) 720 5167
11	Blegelsen	David K	Xerox Parc	3333 Coyote Hill Rd	Palo Alto	CA	94304	(415) 494 4137
12	Blakeslee	A Eugene	Solar Energy Research Inst	1617 Cole Blvd	Golden	CO	80401	(303) 231 7298
13	Braunstein	Morris	MIR Instrument Co	4746 La Villa Marina	Manna del Rey	CA	90219	(213) 823 3815
14	Buchanan	Bobby	Spire Corp	Painot Park	Bedford	MA	01730	(617) 275 6000
15	Calawa	Arthur R	MIT Lincoln Labs	Group 87, Rm 118	Lexington	MA	02173	(617) 865 5500
16	Carr	Paul H	USAF/RADC	RADC/EEA	Hanscom AFB	MA	01730	(617) 377 3686
17	Cast	James N	Ford Aerospace	Ford Rd	Newport Beach	CA	92660	(714) 720 6525
18	Chall	Lou	Ford Aerospace	Ford Rd	Newport Beach	CA	92660	(714) 720 6350
19	Chand	Naresh	A1&T Bell Labs	600 Mountain Ave. - Rm 7C 308	Murray Hill	NJ	07974	(201) 582 7158
20	Chen	Howard	Caltech - 128-95		Pasadena	CA	91125	(818) 795 1574
21	Chen	James	Univ of Illinois	1101 W. Springfield Ave.	Urbana	IL	61801	(217) 333 3297
22	Cho	A. Y.	A1&T Bell Labs	600 Mountain Ave. - Rm 1C-326	Murray Hill	NJ	07974-2070	(201) 582 2093
23	Chol	Hong K.	MIT - Lincoln Lab	244 Wood St.	Lexington	MA	02173 0073	(617) 863 5500
24	Chong	Tow C.	MIT	77 Mass. Ave., Rm 13-3070	Cambridge	MA	02139	(617) 253 4620
25	Christie	Phillip	Univ of Delaware	Evans Hall - EE Dept.	Newark	DE	19716	(302) 451 8199
26	Collins	Dean	Texas Instruments	P O Box 655936-MS134	Dallas	TX	75265	(214) 995 3974
27	D'Haenens	Irnee	Hughes Research Labs	3011 Malibu Canyon Rd.	Malibu	CA	90265	(213) 317 5771
28	Dahlhauser	Karl	USAF	AFWL/ARBF	Kirtland AFB	NM	87117-6008	(505) 844 0166
29	Delaney	Michael	Hughes Research Labs	3011 Malibu Canyon Rd.	Malibu	CA	90265	(213) 317 5771
30	Dickson	Edward M.	Advantage Quest	1110 Sunnyvale-Saratoga Road, Suite C2	Sunnyvale	CA	94087-2515	(408) 733 0818
31	Erickson	L. Peter	Perkin-Elmer	6509 Flying Cloud Drive	Eden Prairie	MN	55344	(612) 828 5975
32	Fan	John C.C.	Kopin Corporation	695 Myles Standish Blvd.	Teunon	MA	02780	(617) 824 6696
33	Feng	Milton	Ford Microelectronics, Inc.	10340 State Highway 83 North	Colorado Springs	CO	80908	(303) 528 7647
34	Gaskill	D. Kurt	Naval Research Lab		Washington	DC	20375	(202) 767 3098
35	Gertner	Edward R.	Rockwell Intl Science Center	P O Box 1085	Thousand Oaks	CA	91360	(805) 373 4175
36	Ghaflart	Alireza	Caltech - 125/95		Pasadena	CA	91125	(818) 356 3984
37	Grunthaler	Paula J	Jet Propulsion Laboratory	4800 Oak Grove Dr. - M/S 189/100	Pasadena	CA	91109	(818) 354 2114
38	Harris	J.S.	Stanford Univ.	McCullough 226	Stanford	CA	94305	(415) 723 9775
39	Hung	Hing Loi A.	COMSAT Labs	22300 Comsat Drive	Clarksburg	MD	20871	(301) 428 4414
40	Jordan	Andrew S.	A1&T Bell Labs	MH 7B-426	Murray Hill	NJ	07974	(201) 582 3714
41	Kaiser	William J.	JPL/Caltech		Pasadena	CA	91125	(818) 354 8238
42	Kanber	Hilda	Hughes Aircraft Co.	3100 W. Lomita Blvd.	Torrance	CA	90509	(213) 517 6408
43	Kim	He Bong	Ford Microelectronics, Inc.	10340 State Highway 83 North	Colorado Springs	CO	80908	(303) 528 7615
44	Kling	John M.	USAF	AFWAL/AADM	Wright-Patterson AFB	OH	45433	(513) 255 7659
45	Koch	Stephanie	Stanford Univ.	McCullough 226	Stanford	CA	94305	(415) 723 4766
46	Krumm	Charles	Hughes Research Labs	3011 Malibu Canyon Rd.	Malibu	CA	90265	(213) 317 5349
47	Kuech	Thomas	IBM	P O Box 218	Yorktown Heights	NY	10598	(914) 945 1644

WORKSHOP on GaAs on Si ATTENDANCE LIST

N#	Last Name	First Name	Affiliation	Address	City	State	Zip	Telephone
48	Lau	Kam	Oriel Corporation	2015 W. Chestnut St	Alhambra	CA	91801	(818) 281-3636
49	Lee	Jiang W	Kopin Corporation	695 Myles Standish Blvd	Taunton	MA	02780	(617) 824-6696
50	Lee	Henry	Univ of Ca	2431 Ellsworth St #108	Berkeley	CA	94704	(415) 841-7989
51	Leonberger	Fred	UIHC	Silver Lane	Hartford	CT	06108	(203) 727-7472
52	Lillental-Weber	Zuzanna	Lawrence Berkeley Lab	1 Cyclotron Rd - B2-203	Berkeley	CA	94120	(415) 486-6276
53	Litton	Cole W	Air Force Avionics Lab	AF WAI/AADR, Bldg 620	Wright Patterson AFB	OH	45433	(513) 255-3457
54	Lou	Jen Chung	Univ of Ca	205 Wilson St. #73	Albany	CA	94710	(415) 526-2882
55	Lum	Richard	AT&T Bell Labs		Holmdel	NJ	07733	(201) 949-5299
56	Madhukar	Anupam	USC Materials Science Dept	Vivian Hall	Los Angeles	CA	90089 0241	(213) 743-6929
57	Malik	Roger J	AT&T Bell Labs	600 Mountain Ave - Rm 1C-318	Murray Hill	NJ	07974	(201) 582-6580
58	Matyi	Richard	Texas Instruments	P.O. Box 655936 M/S 147	Dallas	TX	75265	(214) 995-4204
59	Mazur	Jerome JH	USC Materials Science Dept		Los Angeles	CA	90089 0241	(213) 743-0994
60	Messham	R	Westinghouse R & D	1310 Beulah Road	Pittsburgh	PA	15235	(412) 256-2041
61	Mitchel	William	Air Force Materials Lab	AF WAI/M PO	Wright-Patterson AFB	OH	45433 6533	(513) 255-6671
62	Mittelstein	Michael	Callech	Mail Code 128 95	Pasadena	CA	91125	(818) 356-4829
63	Morkoc	Hadis	Univ of Illinois	1101 W. Springfield Ave	Urbana	IL	61801	(217) 333-2000
64	Morse	Jeffrey	Lawrence Livermore Lab	P.O. Box 808 L-156	Livermore	CA	94550	(415) 423-4864
65	Murphy	Bernard T	AT&T Bell Labs	2525 N. 12th St. Rm 20E-301A	Reading	PA	19612 3566	(215) 939-6779
66	Nasserbakhti	Gifty	Stanford Univ	1943 Mt. Vernon Ct #308	Mountain View	CA	94040	(415) 725-1775
67	Norris	Peter E	GTE Laboratories	40 Sylvan Road	Walham	MA	02254	(617) 466-2318
68	Nozaki	Shinji	Intel Corporation	SC9 40 - 3601 Juliette Ln	Santa Clara	CA	95051	(408) 496-2554
69	Oldham	William	Univ of California	Electronics Research Lab-253 Cory Hall	Berkeley	CA	94720	(415) 642-7200
70	Pearton	S J	AT&T Bell Labs	600 Mountain Ave	Murray Hill	NJ	07974	(201) 582-4757
71	Pinter	Jeff	Ford Aerospace	Ford Rd - P.O. Box A - MS/2489	Newport Beach	CA	92660	(714) 720-6161
72	Ponce	Fernando A	XEROX PARC	3333 Coyote Hill Rd	Palo Alto	CA	94304	(415) 494-4199
73	Posa	John G	Crystal Specialties	16535 S W 72nd St	Portland	OR	97224	(503) 684-0470
74	Rabanus	Gordon G	AFWAL	AF WAI/AADE-2	Wright Patterson AFB	OH	45433 6543	(513) 255-3802
75	Radhakrishnan	Gouri	Jet Propulsion Laboratory	4800 Oak Grove Drive, MS 512-103	Pasadena	CA	91109	(818) 397-9324
76	Russell	Kenneth J	JPL - MS 122 123	4800 Oak Grove Dr	Pasadena	CA	91109	(818) 354-6080
77	Sahal	Shiro	Univ of Florida	EE Dept	Gainesville	FL	32611	(904) 392-4960
78	Salerno	Jack P	Kopin Corporation	695 Myles Standish Blvd	Taunton	MA	02780	(617) 824-6696
79	Saxena	Arjun N	RPI	Center for Integrated Electronics	Troy	NY	12186-3590	(518) 270-6032
80	Schaus	Christian	AFWL/JUNM	EECE L215 D - Univ of NM	Albuquerque	NM	87131	(505) 277-1358
81	Schowaller	Leo J	RPI		Troy	NY	12181	(518) 276-6435
82	Shaw	Don W	Texas Instruments	P.O. Box 655936, MS 147, 08/070	Dallas	TX	75265	(214) 995-4788
83	Shichijo	Sam	Texas Instruments	Cirral Research Lab P.O. Box 655936/MS134	Dallas	TX	75265	(214) 995-5510
84	Shin	Soo H	Rockwell Science Center	1049 Camino dos Rios	Thousand Oaks	CA	91360	(805) 373-4133
85	Smith	Thane	COMSAT Labs	22300 Comsat Drive	Clarksburg	MD	20671	(301) 428-4501
86	Speckman	Dorina	Aerospace Corporation	M2-244 P.O. Box 92957	Los Angeles	CA	90009	(213) 326-9399
87	Springthorpe	A J	BNR	P.O. Box 3511 Station C	Ottawa, Ontario	CANADA		(613) 726-4417
88	Streit	Dwight	TRW	One Space Park	Redondo Beach	CA	90278	(213) 536-8696
89	Tu	Charles W	AT&T Bell Labs	600 Mountain Ave - Rm MH 7B 410	Murray Hill	NJ	07974-2070	(201) 582-3416
90	Turner	George	MIT Lincoln Lab	244 Wood St. C-130	Lexington	MA	02173 0073	(617) 863-5500
91	Van der Ziel	Jan P	AT&T Bell Labs	600 Mountain Ave - Rm 7A-221	Murray Hill	NJ	07974	(201) 582-6935
92	Vasudev	Prahalad	Hughes Research Labs	3011 Malibu Canyon Rd.	Malibu	CA	90265	(213) 317-5134
93	Wang	S	Univ of Ca	EE Dept	Berkeley	CA	94720	(415) 642-4134
94	Weber	F R	Univ of Ca - Berkeley	Hearst Mining Building	Berkeley	CA	94720	(415) 642-0205

Signature
726-6
4040

WORKSHOP on GaAs on Si - ATTENDANCE LIST

No	Last Name	First Name	Affiliation	Address	City	State	Zip	Telephone
95	Westergren	Mark	USAF	AFWL/ARBF	Kirtland AFB	NM	87117-6008	(505) 844-0166
96	Wilt	Gerald	U.S. Air Force	AFOSR/AE	Bolling AFB	DC	20332-6448	(202) 767-4931
97	Wolfson	Robert G.	Spire Corp.	Patriots Park	Bedford	MA	01730	(617) 369-6132
98	Wong	Simon	Cornell Univ.	408 Phillips Hall	Ithaca	NY	14853	(607) 257-7752
99	Wood	Colin	GEC		Wembley	ENGLAND		01-9089552
100	Yanof	Arnold W.	AT&T Bell Labs	600 Mountain Ave - Rm 2A 330	Murray Hill	NJ	07974	(201) 582-6755
101	Yu	Anthony	Cornell Univ.	Bard Hall, Dept. of Materials Science	Ithaca	NY	14853	(607) 277-2897
102	Yuan	James	Texas Instruments	7131 Birchwood Dr.	Dallas	TX	75240	(214) 995-4339
103	Zabel	Hartmut	Univ. of Illinois	Dept. of Physics-1110 W. Green St.	Urbana	IL	61801	(217) 333-2514
104	Zanlo	Ken	Ford Aerospace	Ford Rd.	Newport Beach	CA	92260	(714) 720-7707

END

DATE

FILM

4-88

DTIC