

FINAL PROGRAM

*The 2009 U.S. WORKSHOP on the PHYSICS
and CHEMISTRY of II-VI MATERIALS*

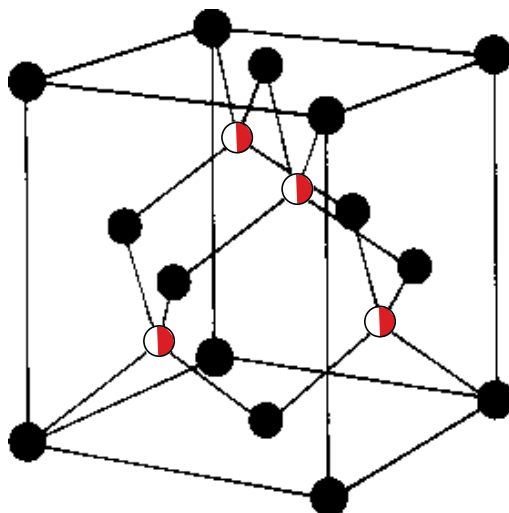
Embassy Suites Chicago Downtown–Lakefront
October 6–8, 2009
Chicago, Illinois

II-VI Detector Materials

- IR
- UV
- Gamma-Ray
- X-Ray
- HgCdTe
- CdZnTe
- ZnO

Special Sessions

- ZnO Materials and Devices
 - Surfaces and Interfaces
- Alternative CdTe Substrates
 - HgCdTe Avalanche Photodiodes
- Superlattices: Strained & Unstrained
 - X-Ray & Gamma-Ray Detectors
- II-VI Based Solar Cells
 - Defects and Doping



Participating Agencies

*U.S. Army RDECOM CERDEC, Night Vision & Electronic
Sensors Directorate*

U.S. Army Research Laboratory

U.S. Army SMDC

U.S. Navy Electro-Optics Center

Penn State University

Office of Naval Research

Air Force Research Laboratory

The Minerals, Metals & Materials Society

Endorsed by

The American Physical Society

<http://www.ii-viworkshop.org>

2009 II-VI WORKSHOP

In the twenty-eight years since the first MCT Workshop was held back in 1981, the technology of HgCdTe and related devices has significantly matured and broadened.

The Workshop plays a vital role in this technological evolution. It provides the principal open forum for the exchange of information relative to theory and experiment, synthesis, and analysis. It brings together university, governmental, and industrial research in a highly interactive manner.

- To encourage in-depth discussion and audience participation, the Workshop combines conventional oral presentations with sufficient time allocated for questions and answers.
- To broaden exposure without sacrificing depth, invited speakers offer insight into areas relevant to II-VI materials.
- To ensure dissemination of results, submitted full-length papers will appear in the *Journal of Electronic Materials*.

The Workshop will focus on fundamental research on the major scientific problems in II-VI materials. Its primary goal is to promote an understanding of the relationship among the physical and chemical properties and leverage this understanding into manufacturing and performance improvements.

Informal discussions among participants are strongly encouraged and ample time for paper discussion and individual interactions has been scheduled. To foster these interactions, lunch will be provided on all three days of the Workshop, while a Wine and Cheese Reception has been scheduled for Tuesday evening.

CO-CHAIRS

- M. B. Reine
BAE Systems
S. Sivananthan, *Proceedings Co-Editor*
University of Illinois at Chicago

PROGRAM COMMITTEE

- T. Almelda
U.S. Army RDECOM CERDEC, NVESD
J. M. Arias, emeritus
Teledyne Imaging Systems
I. B. Bhat
Rensselaer Polytechnic Institute
L. E. Brown
Air Force Research Laboratory, WPAB
A. Burger
Fisk University
T. N. Casselman
Consultant
W. W. Clark
U.S. Army Research Office
R. E. De Wames
U.S. Army RDECOM CERDEC, NVESD
N. K. Dhar, *Proceedings Co-Editor & Web-Site Manager*
U.S. Army Research Laboratory
J. P. Faurie
University of Illinois at Chicago
C. A. Hoffman
Naval Research Laboratory
R. B. James
Brookhaven National Laboratory
S. M. Johnson
Raytheon Vision Systems
T. M. Myers
Texas State University
J. G. Pellegrino
U.S. Army RDECOM CERDEC, NVESD
E. C. Piquette
Teledyne Imaging Sensors
H. K. Pollehn, emeritus
U.S. Army Research Laboratory
H. G. Robinson
SRI International
H. F. Schaake
DRS RSTA
C. Szeles
eV Products
H. R. Vydyanath
Avyd Devices
P. Wijewarnasuriya
Army Research Office

WORKSHOP COORDINATOR

Ralph Nadell
Palisades Convention Management, Inc.
212/460-8090 x203, fax -5460
e-mail: Rnadell@pcm411.com

WORKSHOP PARTICIPATING AGENCIES

U.S. Army RDECOM CERDEC, Night Vision &
Electronic Sensors Directorate
U.S. Army Research Laboratory
U.S. Army SMDC
U.S. Navy Electro-Optics Center,
Penn State Applied Research Laboratory
Office of Naval Research
Air Force Research Laboratory, WPAB
The Minerals, Metals & Materials Society

WORKSHOP ENDORSER

The American Physical Society

WORKSHOP PARTICULARS

LOCATION AND DATE

The 2009 II-VI Workshop will be held October 6–8, 2009 at the Embassy Suites Downtown–Lakefront, located at 511 North Columbus Dr., Chicago, IL 60611.

REGISTRATION

Registration for the 2009 II-VI Workshop can be accomplished in two ways: (1) By downloading the Registration Form located on the II-VI Workshop Web site (www.ii-viworkshop.org) and completing and mailing it to:

The 2009 II-VI Workshop
Attn.: Ralph Nadell
411 Lafayette St., Ste. 201
New York, NY 10003

or (2) by using the secure direct on-line link provided on the Workshop Web site.

The deadline for registration is September 18, 2009. The registration fee for all attendees, except full-time university students with proper identification, is \$695. The special student registration fee is \$150. Refunds will not be issued after September 18, 2009. The fees include a continental breakfast on each morning, lunches, refreshments, a copy of the *Extended Abstracts*, and a softbound copy of the Workshop Proceedings. A hardbound copy of the Proceedings can be purchased for an additional \$20. All checks must be payable in U.S. currency and be drawn from a U.S. bank to THE II-VI WORKSHOP. For registration confirmation, please contact Palisades Convention Management, Inc., at 1-800-350-0111 or 212/460-8090 x203, or Rnadell@pcm411.com.

HOTEL ACCOMMODATIONS

A block of rooms has been reserved at the Embassy Suites Downtown – Lakefront at the special Workshop rates of \$239 single or double for industry attendees. Direct on-line reservations at the group rate can be made using the link provided on the Workshop Web site).

U.S. Government employees and University attendees are eligible for a further reduced room rate (\$218 single or double). However, to receive the University/Government rate, qualified individuals should download the University/Government hotel reservation form from the Workshop Web site and mail or fax the form to Ralph Nadell, Palisades Convention Management, 411 Lafayette Street, New York, NY 10003, fax (212) 460-5460. Copies of the University/Government hotel forms may also be requested electronically by e-mailing to Rnadell@pcm411.com. Since a limited number of these reduced-rate rooms have been reserved, please make your hotel reservations as soon as possible. A rooming list of Government/University-rate reservations will be sent to the hotel on September 11, 2009.

For individuals who prefer to call in their reservations (industry rate only), please call:

Toll-Free: 1-888-903-8884

Non-Toll-Free: 312/836-5900

The deadline for room reservations at these special Workshop rates is September 11, 2009. Reservations received after the deadline will be subject to availability.

TRAVEL ARRANGEMENTS

The Emassy Suites Downtown - Lakefront is located about 40 minutes from O'Hare International Airport.

Getting to and from the Airport:

Taxi – typical minimum charge \$45 (one person)

Subway – minimum charge \$1.75 one way

Rental Car – The distance from hotel is 17 miles and the average drive time is 40 minutes

Directions from airport: I-90/94 East. Exit @ Ohio Street. Turn right onto Orleans Street and proceed 2 blocks. Turn left onto Illinois Street and proceed 10 blocks to Columbus Drive. Hotel is at intersection of Illinois and Columbus.

Continental Air Transport (Airport Express) call 1-800-654-7871 for schedule and current price

WORKSHOP CHECK-IN

Attendees arriving on Monday, October 5, will be able to pick up their Workshop material at the II-VI Registration Desk located in the Chicago River Ballroom Pre-Function Area between 5:00 and 9:00 pm.

Attendees will also be able to pick up their Workshop material on Tuesday morning, October 6, at the II-VI Registration Desk beginning at 7:00 am. The Registration Desk will be open for the duration of the Workshop beginning at 7:00 am each day.

INFORMATION/MESSAGE CENTER

The Information/Message Desk will be located adjacent to the II-VI Registration Desk. For incoming messages, call the hotel at 312/836-5900 and ask to be transferred to the II-VI Workshop message center. Incoming messages will be posted on a message board.

LUNCHES

Lunches will be served in the Atrium Breakfast Area on all three days of the Workshop. To keep the Workshop on schedule, attendees are encouraged to participate. Requests for kosher or vegetarian meals should be requested in advance.

WINE AND CHEESE/TABLETOP DISPLAYS

Following the presentations on Tuesday afternoon, a Wine and Cheese Reception has been scheduled to help promote informal discussion and attendee interaction.

The Wine and Cheese Reception will be accompanied by Tabletop Displays from commercial vendors displaying products of interest to the II-VI community. The tabletops will be on view during the Tuesday evening Wine and Cheese Reception as well as during the day on Wednesday and Thursday in the Ballroom Pre-Function Area.

WORKSHOP MEETING ROOMS

The Workshop presentations will be given in the Chicago River Ballroom Salons A–D. The Wine and Cheese reception, tabletop displays, lunches, and refreshment breaks will all take place in the Ballroom Pre-Function Area.

EXTENDED ABSTRACTS

A copy of the *Extended Abstracts* will be distributed to all attendees at the Workshop. The *Extended Abstracts* will contain summaries of all papers presented.

WORKSHOP PROCEEDINGS

The II-VI Workshop papers will be published in a special issue of the *Journal of Electronic Materials*. The *Proceedings* will contain full-length refereed versions of papers presented at the Workshop. The cost of a copy of the softbound *Proceedings* is included in the fee (a hardbound copy can be purchased for an additional \$20, see registration card). The *Proceedings* will be mailed to all attendees when available. Additional copies of the *Proceedings* can be ordered at a single-copy price of \$20 (soft bound) or \$40 (hard bound). Back issues of recent *Proceedings* will be on sale during the Workshop.

INSTRUCTIONS TO AUTHORS PLANNING TO SUBMIT FULL-LENGTH MANUSCRIPTS

We are asking all authors to submit their manuscripts to the II-VI Workshop for peer review via online using the link provided by *Journal of Electronic Materials (JEM)* <http://www.editorialmanager.com/jems/>. The online manuscript submission will be open between September 28 and October 18, 2009.

II-VI Paper Submission

- The papers can be submitted through II-VI Workshop's Web page <http://www.ii-viworkshop.org/> by clicking the link "Submit Manuscript" at the bottom-right of the Web page. This will direct you to *JEM's* Web page.
- New users will need to create an account. During the submission process, authors will be asked to enter information.
- The type of paper is "Special Issue" and the category is "2009 U.S. II-VI Workshop."

- JEM can now accept the higher-resolution figures (that is preferred) early in the process. The Web site automatically reduces the resolution if needed to keep the file from being too big (and allows reviewers to link to the high-resolution image if they need it).
- All submissions require an abstract of 100 words or less, a keywords line, a transfer of copyright form, and an electronic file. Papers are reviewed by two qualified referees to determine suitability. The editor's decision to accept or reject a paper, based on referees' comments, is final. Please employ the following guidelines when submitting a paper for review:
 - Manuscripts, written in English, should be in a single column and formatted to fit an 22 × 28-cm sheet of paper.
 - The title of the article and abstract should be separate from the text. References, figure captions, and tables should also be on separate pages.
 - The work's significance and its relation to the work of others should be detailed in the "Introduction." Major assumptions should be stated and procedures adequately outlined.
 - References should be cited by Arabic numbers as superscripts. Include the names of all authors, standard abbreviated name of journal [see, for example, <http://library.caltech.edu/reference/abbreviations/>], the volume number, initial page number, and year of publication in parenthesis. For books, include city of publication and publisher.
 - Measurements should be given in metric units.

WORKSHOP CONTACT

Anyone requiring additional information should contact the Workshop Coordinator, Ralph Nadell, at 212/460-8090 ×203, fax 212/460-5460, e-mail: Rnadell@pcm411.com.

WORKSHOP DEADLINES

- Extended Abstracts **Aug. 14**
- Hotel Reservations **Sept. 11**
- Registration Deadline **Sept. 18**
- Refund Deadline **Sept. 18**
- Paper Submission **Sept. 28 – Oct. 18**
- 2009 II-VI Workshop **Oct. 6–8**

PROGRAM

MONDAY, OCTOBER 5, 2009

5:00–9:00 pm Pre-Workshop Check-In

TUESDAY, OCTOBER 6, 2009

7:00– 8:00 am Workshop Check-In
8:00– 8:15 am Welcoming Remarks
8:15– 9:45 am Keynote Address & Focus
Presentations
9:45–10:30 am 1: Devices I
10:30–10:45 am BREAK
10:45–11:45 am 1: Devices I (continued)
11:45– 1:15 pm LUNCH
1:15– 2:15 pm 2: Dopants & Defects
2:15– 3:45 pm 3: Solar Cells
3:45– 4:00 pm BREAK
4:00– 6:15 pm 4: Gamma Detectors
6:15– 8:00 pm TABLETOPS / WINE & CHEESE
RECEPTION

WEDNESDAY, OCTOBER 7, 2009

8:00–10:00 am 5: Alternative Substrates I
10:00–10:15 am BREAK
10:15–11:45 am 6: Devices II
11:45– 1:15 pm LUNCH
1:15– 3:45 pm 7: Wide Gap
3:45– 4:00 pm BREAK
4:00– 6:15 pm 8: Type-II Strained Layer
Superlattices
6:15– 6:45 pm 9: Late-News Papers

THURSDAY, OCTOBER 8, 2009

8:00– 9:00 am 10: Processing
9:00–10:15 am 11: CdZnTe Substrates
10:15–10:30 am BREAK
10:30–12:00 pm 12: Characterization
12:00– 1:30 pm LUNCH
1:30– 3:15 pm 13: Alternate Substrates II
3:15– 3:45 pm STUDENT PAPER AWARDS
3:45– 4:00 pm BREAK
4:00– 6:15 pm 14: Devices III

TUESDAY, OCTOBER 6, 2009
Chicago River Ballroom
(8:00 am – 6:15 pm)

WELCOMING REMARKS (8:00–8:15)

Workshop Co-Chairs

Marion B. Reine, *BAE Systems, USA*
Sivalingam Sivanathan, *University of Illinois at Chicago, USA*

**KEYNOTE ADDRESS
AND
FOCUS PRESENTATIONS
(8:15 – 9:45)**

Chair: Marion B. Reine
BAE Systems, Lexington, MA, USA

K.1:

Keynote: The Navy EO/IR Technology Roadmap (8:15)

*K. Lannan, A. Cole, T. Bradley, E. Calhoun,
J. Curry, R. Goetz, G. Manke, R. Sweet,
B. Tussey, R. Volpone, R. Woodruff, M. Zimmer,
Naval Surface Warfare Center, Crane, IN, USA*
*B. Kleinbecker
HBMG, Inc., Austin, TX, USA*
*C. Hoffman, J. Neumann
Naval Research Laboratory, Washington, DC, USA*
*C. Lindstrom, F. Chan
Naval Undersea Warfare Center, Newport, RI, USA*
*H. Sokoloff
Naval Air Warfare Center, Patuxent River, MD, USA*
*J. Grossen, A. Muralidhar
Naval Surface Warfare Center, Dahlgren, VA, USA*

K.2:

Focus Paper: HgCdTe: Recent Trends in (8:45)
the Ultimate IR Semiconductor

*M. A. Kinch
DRS RSTA, Inc., Dallas, TX, USA*

K.3:

Focus Paper: Pushing the State of the Art in IR (9:15)
**Materials and FPAs: Addressing the Changing
Military Scenario**

*Stuart Horn
DARPA/MTO, Arlington, DC, USA*

1: DEVICES I
(9:45 – 11:45 am)

Chair: **Scott M. Johnson**
Raytheon Vision Systems, Goleta, CA, USA

1.1:
HgCdTe Growth on 6 cm × 6 cm CdZnTe Substrates for Large-Format Dual-Band Infrared Focal Plane Arrays (9:45)

*M. Reddy, J. M. Peterson, D. D. Lofgreen, T. Vang,
E. A. Patten, W. A. Radford, S. M. Johnson
Raytheon Vision Systems, Goleta, CA, USA*

1.2:
An Accurate Numerical Simulation of Temperature Dependence of Dark Current in HgCdTe Infrared Detector Assisted by Analytical Modeling (10:00)

*W. D. Hu, X. S. Chen, F. Yin, Z. H. Ye, C. Lin,
Z. F. Li, W. Lu
Shanghai Institute of Technical Physics, Chinese
Academy of Sciences, Shanghai, China*

1.3:
Analysis of Current versus Voltage Measurements on Long-Wavelength HgCdTe Photodiodes Fabricated on Si Composite Substrates (10:15)

*P. Wijewarnasuriya, Y. Chen, G. Brill, N. Dhar
U.S. Army Research Laboratory, Adelphi, MD, USA
D. Benson, L. Bubulac
U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA
D. Edwall
Teledyne Scientific & Imaging, Camarillo, CA, USA*

BREAK (10:30–10:45)

1.4:
Invited Paper: HgCdTe APDs (10:45)

*M. Jack
Raytheon Vision Systems, Goleta, CA, USA*

1.5:
Full-Band Monte Carlo Simulation of HgCdTe APDs (11:15)

*M. Moresco, M. Penna, F. Bertazzi, E. Bellotti
Boston University, Boston, MA, USA
M. Goano
Politecnico di Torino, Torino, Italy*

1.6:

**Minority-Carrier Drift-Velocity, Diffusion Coefficient
and Lifetime Shockley-Haynes Characterization in
HgCdTe Avalanche Photodiodes (11:30)**

*J. Rothman, G. Vaujetta, B. Moselle, L. Mollard,
S. Gout, J.-P. Chamonal
CEA/LETI/DOPT, Grenoble, France*

LUNCH

(11:45–1:15)

2: DOPANTS AND DEFECTS
(1:15 – 2:15 pm)

Chair: Lynette E. Brown
AFRL, Wright-Patterson AFB, OH, USA

2.1:
Surface Voids and Their Crystallographic Formation Mechanisms on HgCdTe (211)B Alloys and Related Superlattices (1:15)

Y. Chang, C. R. Becker, X. J. Wang, C. H. Grein, S. Sivananthan
University of Illinois at Chicago, Chicago, IL, USA
J. Zhao, S. Velicu, M. Carmody
EPIR Technologies, Inc., Bolingbrook, IL, USA
V. Nathan
Air Force Laboratory, Kirtland AFB, NM, USA

2.2:
Arsenic Diffusion Study in HgCdTe for Low P-Type Doping in Auger-Suppressed Photodiodes (1:30)

A. M. Itsuno, P. Y. Emelie, J. D. Phillips
The University of Michigan, Ann Arbor, MI, USA
S. Velicu, C. H. Grein
EPIR Technologies, Bolingbrook, IL, USA
P. S. Wijewarnasuriya
U.S. Army Research Laboratory, Adelphi, MD, USA

2.3:
Withdrawn (1:45)

2.4:
First-Principle Study on Coupling between Arsenic In-Situ Impurities and Mercury Vacancies in HgCdTe (2:00)

Y. Huang, X. S. Chen, X. H. Zhou, W. D. Hu, W. Lu
Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, China

3: SOLAR CELLS
(2:15 – 3:45 pm)

Chair: Nibir K. Dhar
DARPA/MTO, Arlington, VA, USA

3.1:
Withdrawn (2:15)

3.2:
**The Optimization of Thin CdS Films Grown by
Chemical Bath Deposition (2:45)**
C. Lennon, P. Bechmann, T. Biegala, D. Xu
EPIR Technologies, Inc., Bolingbrook, IL, USA

3.3:
**Carrier Generation and Recombination Processes
in ZnTeO for Intermediate-Band Solar Cells (3:00)**
W. Wang, A. S. Lin, J. D. Phillips
The University of Michigan, Ann Arbor, MI, USA
W. Metzger
*National Renewable Energy Laboratory, Golden,
CO, USA*

3.4:
SIMS Study of CdTe-Based Solar Cell (3:15)
L. Wang, A. Wang
Evans Analytical Group, Sunnyvale, CA, USA

3.5:
Withdrawn (3:30)

BREAK (3:45–4:00)

4: GAMMA DETECTORS (4:00 – 6:15 pm)

Chair: **Ralph B. James**
*Brookhaven National Laboratory, Upton,
NY, USA*

4.1:
**Invited Paper: CdTe and CdZnTe Pixel Detectors:
Material Characterization, Technology, and Device
Performance (4:00)**
M. Fiederle
*Freiburg Materials Research Center,
Albert-Ludwigs-Universität, Freiburg, Germany*

4.2:
**Invited Paper: Crystal Growth and Characterization
of CdZnTe for X-Ray and Gamma-Ray (4:30)
Detector Applications**
W. Jie, G. Yang, G. Zhan, T. Wang, Y. Xu
Northwestern Polytechnical University, Xi'an, China

4.3:
**Point Defects in CdZnTe Crystals Grown (5:00)
by Different Technologies**
R. Gul
*Brookhaven National Laboratory, Upton, NY, USA
and Idaho State University, Pocatello, ID USA*
*K. Kim, Z. Li, A. Bolotnikov, G. Genda,
G. S. Camarda, A. Hossain, G. Yang, Y. Cui, and
R.B. James*
Brookhaven National Laboratory, Upton, NY, USA
*R. Rodriguez, K. Keeter,
Idaho State University, Pocatello, ID, USA*

4.4:
**Investigation of CdMnTe Crystals for Room-
Temperature Radiation Detection (5:15)**
*G. Yang, A. E. Bolotnikov, A. Hossain, Y. Cui,
G. S. Camarda, K. Kim, V. Carcelen, R. B. James*
Brookhaven National Laboratory, Upton, NY, USA

4.5:
**Effective Surface Passivation of CdMnTe (5:30)
Materials**
*K-H. Kim, A. E. Bolotnikov, A. Hossain, G. Yang,
R. Gul, Y. Cui, R. B. James*
Brookhaven National Laboratory, Upton, NY, USA
V. Carcelén
*Brookhaven National Laboratory, Upton, NY, USA
and
University Autónoma de Madrid, Madrid, Spain*

4.6:

Investigation of Effects of Selective Surface Modification of CdZnTe Crystals on Detector Performance (5:45)

*A. L. Washington, II, L. C. Teague, M. C. Duff
Savannah River National Laboratory, Aiken, SC, USA
A. Burger, M. Groza, V. Buliga
Fisk University, Nashville, TN, USA*

4.7:

Electrical Properties of Halogen-Doped CdTe Layers on Si Substrates Grown by Metalorganic Vapor Phase Epitaxy (6:00)

*K. Yasuda, M. Niraula, M. Oka, T. Yoneyama,
K. Matsumoto, H. Nakashima, T. Nakanishi,
D. Katoh, Y. Agata
Nagoya Institute of Technology, Nagoya, Japan*

**WINE AND CHESSE RECEPTION (6:15–8:00)
TABLETOPS**

WEDNESDAY, OCTOBER 7, 2009
Chicago River Ballroom
(8:00 am – 6:45 pm)

5: ALTERNATIVE SUBSTRATES I
(8:00 – 10:00 am)

Chair: Tony Almeida
U.S. Army RDECOM CERDEC, NVESD

5.1:
Alternative Substrates for Lead Chalcogenide Epilayers for Infrared Focal Plane Arrays (8:00)
F. Aquariden, P. D. Dreiske, S. Rafol
EPIR Technologies, Inc., Bolingbrook, IL, USA
P. S. Wijewarnasuriya
Army Research Laboratory, Adelphi, MD, USA

5.2:
Studies on Defects in MBE-Grown Lead Selenide Epilayer (8:15)
J. Ma, F. Zhao, D. Li, S. Mukherjee, Z. Shi
University of Oklahoma, Norman, OK, USA
M. E. Curtis, J. C. Keay, M. B. Johnson,
University of Oklahoma, Norman, OK, USA
M. A. Zurbuchen
The Aerospace Corp., El Segundo, CA, USA

5.3:
Invited Paper: Design Considerations for Composite Substrates for HgCdTe Epitaxy (8:30)
E. Fitzgerald
MIT, Cambridge, MA, USA

5.4:
Metalorganic Vapor-Phase Epitaxial Growth of (211)B CdTe on (211) Si Substrates Using Ge and ZnTe Interfacial Layers (9:00)
S. Rao, S. Shintri, I. B. Bhat
Rensselaer Polytechnic Institute, Troy, NY, USA
J. Markunas, R. Jacobs
U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA

5.5:

Characterization of Dislocations in (112)B HgCdTe/CdTe/Si (9:15)

*J. D. Benson, L.O. Bubulac, P. J. Smith,
R. N. Jacobs, J. K. Markunas, M. Jaime-Vasquez,
L. A. Almeida, A. Stoltz |
U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA*

*P. S. Wijewarnasuriya, G. Brill, Y. Chen, U. Lee
Army Research Laboratory, Adelphi, MD, USA*

*M. F. Vilela, J. Peterson, S. M. Johnson,
D. D. Lofgreen, D. Rhinger, E. A. Patten,
P. M. Goetz*

Raytheon Vision Systems, Goleta, CA, USA

5.6:

Feasibility of Localized Substrate Thinning for Reduced Dislocation Density in CdTe/Si Heterostructures (9:30)

*R. N. Jacobs, P. J. Smith, J. K. Markunas,
J. D. Benson, J. Pellegrino
U. S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA*

5.7:

Dislocation Reduction of HgCdTe/Si through Ex-Situ Annealing (9:45)

*G. Brill, Y. P. Chen, P. S. Wijewarnasuriya, N. Dhar,
Army Research Laboratory, Adelphi, MD, USA*

*S. Farrell, M. V. Rao
George Mason University, Fairfax, VA, USA*

*J. D. Benson
U.S. Army RDECOM CERDEC, Ft. Belvoir, VA, USA*

BREAK

(10:00–10:15)

6: DEVICES II
(10:15 – 11:45 am)

Chair: Priyalal S. Wijewarnasuniya
Army Research Laboratory, Adelphi, MD, USA

6.1:
Invited Paper: Device Physics Modeling of IR Detectors: A Physics, Mathematical, and Computational Problem (10:15)

T. N. Casselman
EPIR Technologies, Inc., Bolingbrook, IL, USA

6.2:
3-D Numerical Analysis of HgCdTe Planar Pixel Arrays (10:45)

M. Moresco, A. Zononi, D. D'Orsogna, E. Bellotti
Boston University, Boston, MA, USA
P. Lamarre
Photonix, Inc., Burlington, MA, USA

6.3:
VLWIR HgCdTe Interdigitated Pixel Monte Carlo Response Modeling (11:00)

A. I. D'Souza
DRS Technologies, California Division, Cypress, CA, USA
M. G. Stapelbroek
University of Arizona, AZ, USA
P. S. Wijewarnasuriya
Army Research Laboratory, Adelphi, MD, USA

6.4:
Type-III HgTe/CdTe Superlattices for Very Long Wavelength Infrared Detectors (11:15)

M. Carmody, J. Zhao, C. Grein, J. Garland,
R. Kodama, R. Mallick
EPIR Technologies, Inc., Bolingbrook, IL, USA

6.5:
2-D LW- and VLW-IR FPAs at AIM (11:30)

J. Wenisch, D. Eich, S. Hanna, A. Bauer,
H. Bitterlich, M. Bruder, K.-M. Mahlein, H. Lutz,
R. Wollrab, J. Ziegler
AIM Infrarot-Module GmbH, Heilbronn, Germany

LUNCH (11:45–1:15)

7: WIDE GAP
(1:15 – 3:45 pm)

Chair: Ishwara B. Bhat
Rensselaer Polytechnic Institute, Troy, NY, USA

7.1:
Invited Paper: Molecular-Beam-Epitaxy-Grown II-VI Nanostructures (1:15)

I. K. Sou, S. K. Lok, G. Wang, G. K. L. Wong
The Hong Kong University of Science and Technology, Hong Kong, China

7.2:
Non-Volatile Memories Using Quantum Dot (QD) Floating Gate Assembled on II-VI Tunnel Insulator (1:45)

E. Suarez, M. Gogna, F. Al-Amoody, S. Karmakar, J. Ayers
University of Connecticut, Storrs, CT, USA
E. Heller, F. Jain
RSoft Design Group, Ossining, NY, USA

7.3:
MOCVD of ZnO Field-Effect Transistors (2:00)

B. I. Willner, S. Sun, G. S. Tompa
Structured Materials Industries, Inc., Piscataway, NJ, USA

7.4:
Electronic and Optical Properties of ZnO/Mg_xZn_{1-x}O and ZnO/Be_xZn_{1-x}O Quantum Wells (2:15)

E. Furno, M. Penna
Politecnico di Torino, Torino, Italy
and
Boston University, Boston, MA, USA
S. Chiaria, M. Goano
Politecnico di Torino, Torino, Italy
E. Bellotti
Boston University, Boston, MA, USA

7.5:
Numerical Simulation of ZnO-Based Terahertz Quantum Cascade Lasers (2:30)

E. Bellotti, R. Paiella
Boston University, Boston, MA, U.S.A

7.6:
X-Ray Diffraction Studies of ZnMgTe/ZnTe-Layered Structures and ZnTe/Si Structures (2:45)

M. Kobayashi, S. Imada, T. Baba, S. Sakurasawa
Waseda University, Tokyo, Japan

7.7:

E-Beam-Pumped Lasers Based on II-VI Compound Nanostructures from the Visible to UVA (3:00)

M. D. Tiberi

Principia Light Works, Inc., CA, USA

V. I. Kuznetsov

P. N. Lebedev Physical Institute, Moscow, Russia

P. I. Kuznetsov

Kotel'nikov Institute of Radio Engineering and Electronics, Fryzino, Russia

7.8:

Self-Assembled CdTe Quantum Dots Grown on ZnTe/GaSb (3:15)

R. E. Pimpinella, X. Liu, J. K. Furdyna,

M. Dobrowolska, A. M. Mintairov, J. L. Merz

University of Notre Dame, Notre Dame, IN, USA

7.9:

MBE-Grown Ni₂Se₃/ZnSe Heterostructured Nanowires (3:30)

G. Wang, S. K. Lok, I. K. Sou

The Hong Kong University of Science and Technology, Hong Kong, China

BREAK

(3:45-4:00)

**8: TYPE II STRAINED-LAYER
SUPERLATTICES
(4:00 – 6:15 pm)**

Chair: William W. Clark,
Army Research Office, Durham, NC, USA

8.1:
**Invited Paper: Theory and Modeling of Type II
Strained-Layer Superlattice Detectors (4:00)**

M. E. Flatté, C. E. Pryor
University of Iowa, Iowa City, IA, USA
C. H. Grein
University of Illinois at Chicago, Chicago, IL, USA

8.2:
Impact Ionization in Infrared Superlattices (4:30)

C. H. Grein
EPIR Technologies, Inc., Bolingbrook, IL, USA
M. E. Flatté
University of Iowa, Iowa City, IA, USA
S. Mallick, K. Banerjee, S. Ghosh
University of Illinois at Chicago, Chicago, IL, USA

8.3:
**Invited Paper: Antimonide Superlattices: Physics,
Technology, and Challenges (4:45)**

M. Walther, R. Rehm, J. Schmitz, J. Fleissner,
F. Rutz
Fraunhofer-Institut für Angewandte
Festkörperphysik (IAF), Freiburg, Germany
R. Scheibner, J. Wendler, J. Ziegler
AIM Infrarot-Module GmbH, Heilbronn, Germany

8.4:
**LWIR Strained-Layer Superlattice Materials and
Devices at Teledyne Imaging Sensors (5:15)**

A. Hood, A. Evans, A. Ikhlassi, D. Lee, W. Tennant
Teledyne Imaging Sensors, Camarillo, CA, USA

8.5:
**Investigation of the Diffusion Behavior of Zn for
the Fabrication of Planar P-on-n GaSb-Based Type
II Superlattice Detectors (5:30)**

H. R. Vydyanath
Avyd Devices, Inc., Costa Mesa, CA, USA
P. S. Wijewarnasuriya
Army Research Laboratory, Adelphi, MD, USA
W. Palosz, S. B. Trivedi
Brimrose Corp., Baltimore, MD, USA
D. R. Rhiger
Raytheon Vision System, Goleta, CA, USA

8.6:

Magneto-Transport in InAs/InSb–GaSb Type-II Superlattice (5:45)

*J. Antoszewski, B. Naran, G. Umana-Membreno,
L. Faraone
The University of Western Australia, Crawley,
Australia*

*A. Khoshakhlagh, J.-B. Rodriguez, E. Plis,
S. Krishina
University of New Mexico, Albuquerque, NM, USA*

*S. J. Lee, S. K. Noh
Korea Research Institute of Standards and
Science, Daejeon, South Korea*

8.7:

Radiation Damage in Type-II Superlattice Infrared Detectors (6:00)

*E. M. Jackson, E. H. Aifer, C. L. Canedy, J. Nolde,
C. D. Cress, B. D. Weaver, I. Vurgaftman,
J. Vurgaftman, J. H. Warner, J. R. Meyer,
J. G. Tischler
Naval Research Laboratory, Washington , DC, USA*

9: LATE-NEWS PAPERS
(6:15 – 6:45 pm)

Chair: Marion B. Reine
BAE Systems, Lexington, MA, USA

9.1:

***Late-News Paper:* Photoluminescence Studies of HgCdTe Epilayers (6:15)**

I. C. Robin, R. Derone, P. Ballet
CEA-LETI, Minatec, Grenoble, France

A. Lusson
GEMaC, CNRS, UVSQ, Meudon, France

9.2:

***Late-News Paper:* Effect of Hydrogen-Free Radicals on $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ (6:30)**

J. Wilks, C. Tavakoli, J. Kelber
University of North Texas, Denton, TX, USA

THURSDAY, OCTOBER 8, 2009
Chicago City Ballroom
(8:00 – 6:15 pm)

10: PROCESSING
(8:00 – 9:00 am)

Chair: **Jose M. Aris**
Teledyne Imaging Sensors, Camarillo, CA, USA

10.1:
Achieving Manufacturing Readiness for 6-in. HgCdTe on Silicon (8:00)
*L. A. Paden, J. W. Bangs, R. M. Emerson,
R. A. Cureghian
Raytheon Vision Systems, Goleta, CA, USA*

10.2:
Studying Sidewall Effects for HgCdTe Photoconductors with MBE-Grown CdTe (8:15)
*J. Zhang, G. K. O. Tsen, J. Antoszewski, J. M. Dell,
L. Faraone
The University of Western Australia, Crawley,
Australia*

10.3:
Effects of HgCdTe on the Optical Emission of Inductively Coupled Plasmas (8:30)
*A. J. Stoltz, J. D. Benson, P. J. Smith
U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA*

10.4:
Low-Roughness Plasma Etching for HgCdTe Material Patterened with Silicon Dioxide Mask (8:45)
*Z. H. Ye, W. D. Hu, W. T. Yin, J. Huang, C. Lin,
X. N. Hu, R. J. Ding, X. S. Chen, W. Lu, I. He
Shanghai Institute of Technical Physics, China*

11: CdZnTe Substrates
(9:00 – 10:15 am)

Chair: Herbert F. Schaake
DRS Infrared Technologies, Dallas, TX, USA

11.1:
***Invited Paper:* Crystal Growth of Large CdZnTe
Ingots Using Modified Horizontal Bridgman
Technique (9:00)**

P. K. Liao
DRS Infrared Technologies, Dallas, TX, USA

11.2:
Purification of (CdZn)Te Single Crystals (9:30)

E. Belas, R. Grill, J. Franc, P. Höschl
Charles University, Prague, Czech Republic

11.3:
**Polishing of CdZnTe Substrates for Molecular-
Beam-Epitaxy Growth of HgCdTe (9:45)**

F. Aqariden, J. Fletcher, K. Nissanka, S. Rafol
EPIR Technologies, Inc., Bolingbrook, IL, USA
P. S. Wijewarnasuriya
Army Research Laboratory, Adelphi, MD, USA

11.4:
**Chemical Polishing of CdTe and CdZnTe in Iodine-
Containing Etching Solutions (10:00)**

V. G. Ivanits'ka, L. P. Shcherbak
Chernivtsi National University, Chernivtsi, Ukraine
P. Moravec, J. Franc, K. Masek, P. Höschl,
J. Ulrych
Charles University, Prague, Czech Republic
V. M. Tomashik, Z. F. Tomashik,
Institute of Semiconductor Physics, National
Academy of Sciences, Kiev, Ukraine

BREAK (10:15–10:30)

12: CHARACTERIZATION (10:30 am – 12:00 pm)

Chair: Honnavalli R. Vydyanath
Avyd Devices, Inc., Costa Mesa, CA, USA

12.1:

Invited Paper: *Optical Transitions in HgCdTe* (10:30)

J. Chu

*Shanghai Institute of Technical Physics and East
China Normal University, Shanghai, China*

J. Shao

*Shanghai Institute of Technical Physics,
Shanghai, China*

12.2:

*A Newly Developed SIMS Technique for Revealing
Defects in HgCdTe* (11:00)

L. O. Bublac

*U. S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA and Rand Organization,
Santa Monica, CA, USA*

J. D. Benson, A. Stoltz, R. Jacobs, M. Jaime-Vasquez

*U. S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA*

R. Helmer, T. Golding

Amethyst Research Inc., Ardmore, OK, USA

A. Wang, L. Wang

Evans Analytical Group, Sunnyvale, CA, USA

12.3:

*Extraction of Transport Properties of Individual
Carriers in Multicarrier HgCdTe Systems* (11:15)

J. Antoszewski, H. Kala, G. Umana-Membreno,

L. Faraone

*The University of Western Australia, Crawley,
Australia*

12.4:

*TEM Characterization of CdTe/HgCdTe Surface
Passivation Layers* (11:30)

W. F. Zhao, D. J. Smith

Arizona State University, Tempe, AZ, USA

J. Cook, T. Parodos, S. Tobin

BAE Systems, Lexington, MA, USA

12.5:

*Wafer Mapping Using Deuterium-Enhanced Defect
Characterization* (11:45)

K. Hossain, O. W. Holland, R. Hellmer, T. D. Golding

Amethyst Research, Inc., Ardmore, OK, USA

LUNCH (12:00-1:30)

13: ALTERNATE SUBSTRATES II
(1:30 – 3:15 pm)

Chair: **Thomas H. Myers**
Texas State University, San Marcos, TX, USA

13.1:
MOCVD Growth of (331)CdTe Epilayer on (211)Si Substrates **(1:30)**
J-S. Kim, S-H. Suh
Korea Institute of Science and Technology (KIST), Seoul, Korea
K-C. Kim, H-J. Kim
Yonsei University, Seoul, Korea
M. Carmody, S. Sivananthan
EPIR Technologies, Inc., Bolingbrook, IL, USA

13.2:
Crystal Uniformity in Molecular-Beam-Epitaxy Growth of HgCdTe/CdTe/Si **(1:45)**
R. Kodama, D. Lim, J. Margetis, J. Zhao,
M. Carmody
EPIR Technologies, Inc., Bolingbrook, IL, USA

13.3:
Evaluation of the Surface Cleaning of Si(112) for Molecular Beam Epitaxy **(2:00)**
M. Jaime-Vasquez, R. N. Jacobs, J. D. Benson,
A. J. Stoltz, L. A. Almeida, L. O. Bublac
U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA
Y. Chen, G. Brill
Army Research Laboratory, Adelphi, MD, USA

13.4:
Simulations of Dislocations in CdZnTe/SL/Si Substrates **(2:15)**
A. J. Ciani, P. W. Chung
Army Research Laboratory, Aberdeen Proving Ground, MD, U.S.A

13.5:
Molecular-Beam-Epitaxy-Growth Modeling of CdTe/Si and InGaN Quantum Dots **(2:30)**
Z. Zhang, A. Chatterjee, C. Grein
EPIR Technologies, Inc., Bolingbrook, IL, USA
P. Chung
Army Research Laboratory, Aberdeen Proving Ground, MD, USA

13.6:

A Physical Mechanism for Electrical Activation of Dislocations in HgCdTe/CdTe/Si(211) (2:45)

L. O. Bublac

*U. S. Army RDECOM CERDEC, NIVESD,
Ft. Belvoir, VA, USA, and Rand Organization,
Santa Monica, CA, USA*

*J. D. Benson, R. N. Jacobs, M. Jaime-Vasquez,
L. A. Almeida, A. Stoltz*

*U. S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA*

A. Wang, L. Wang, R. Hellmer

Evans Analytical Group, Sunnyvale, CA, USA

T. D. Golding

Amethyst Research, Inc., Ardmore, CA, USA

13.7:

MBE Growth and Transfer of HgCdTe Epitaxial Films from InSb Substrates (3:00)

*T. J. de Lyon, R. D. Rajavel, B. Z. Nosho,
S. Terterian, M. L. Belicui, P. R. Patterson,
M. F. Boag-O'Brien*

HRL Laboratories, LLC, Malibu, CA, USA

R. N. Jacobs, J. D. Benson

*U.S. Army RDECOM CERDEC, NVESD,
Ft. Belvoir, VA, USA*

**WILLIAM E. SPICER
BEST STUDENT PAPER
AWARDS PRESENTATION
(3:15–3:45 pm)**

BREAK

(3:45–4:00)

14: DEVICES III
(4:00 – 6:15 pm)

Chair: **Craig A. Hoffman**
Naval Research Laboratory, Washington, DC

14.1:
Invited Paper: “Rule 07” Revisited. Still a Good Heuristic Predictor of HgCdTe Performance? (3:45)
W. Tennant
Teledyne Imaging Sensors, Camarillo, CA, USA

14.2:
Invited Paper: HgCdTe Research at FFI: MBE Growth and Characterization (4:15)
R. Haakenaasen
Norwegian Defence Research Establishment, Kjeller, Norway

14.3:
Comparative Study of MWIR and LWIR High-Operating-Temperature Non-Equilibrium Photovoltaic HgCdTe Devices (4:45)
S. Velicu, P. Dreiske, M. Carmody, C.H. Grein
EPIR Technologies, Bolingbrook, IL, USA
J. Philips, P. Emelie
University of Michigan, Ann Arbor, MI, USA
P. Wijewarnasuriya
Army Research Laboratory, Adelphi, MD, USA

14.4:
HgCdTe Position-Sensitive Detector Development (5:00)
E. P. G. Smith, G. M. Venzor, E. J. Bewille,
J. M. Peterson, M. Reddy, S. M. Johnson,
Raytheon Vision Systems, Goleta, CA, USA
R. Wolfshagen, B. Scott, M. Wilcox
Oceanit Laboratories, Inc., Waimea, HI, U.S.A

14.5:
Enhancement in Light Emission from CdHgTe Due to Surface Roughening (5:15)
C. R. Tonheim, E. Selvig, R. Haakenaasen
Norwegian Defence Research Establishment, Kjeller, Norway
A. Sudbo,
Norwegian Defence Research Establishment, Kjeller, Norway, and University of Solo, Kjeller, Norway

14.6:

**MBE-Grown HgCdTe-on-Si for Space-Based X-Ray
Calorimetry Applications (5:30)**

*P. Dreiske, C. H. Grein, M. Carmody, J. Zhao
EPIR Technologies, Inc., Bolingbrook, IL, USA
C. A. Kilbourne, R. Kelley
NASA Goddard Space Flight Center, USA
D. McCammon, D. Brandl
University of Wisconsin, WI, USA*

14.7:

**High-Performance M/L Dual-Band 480 × 640 (5:45)
HgCdTe/Si FPAs**

*E. A. Patten, P. M. Goetz, M. F. Vilela, K. Olsson,
D. Lofgreen, J. G. Vodicka, S. M. Johnson
Raytheon Vision Systems, Goleta, CA, USA*

14.8:

**HgTe Quantum Wells for Detection from (6:00)
IR up to THz**

*S. Dvoretzky, N. Mikhailov, Y. Sidorov, V. Shvets
A. V. Rzhhanov Institute of Semiconductor Physics of
SB RAS, Novosibirsk, Russia
S. Danilov, B. Wittmann, S. Ganichev
University of Regensburg, Regensburg, Germany*