

PROGRAM

The 2021 U.S. WORKSHOP on the PHYSICS and CHEMISTRY of II-VI MATERIALS

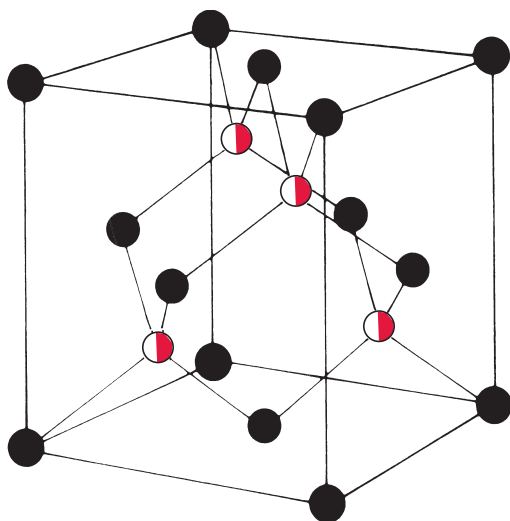
**Embassy Suites Chicago Downtown – Lakefront
Chicago, Illinois, US
October 25–28, 2021**

II-VI Detector Materials

- IR
- UV
- Gamma-Ray
- X-Ray
- Photovoltaic
- CdZnTe
- HgCdTe
- ZnO
- ZnS
- History of IR Detectors

Special Sessions

- Superlattices: II-VI and III-As/Sb
- II-VI Based Solar Cells
- Alternatives to CdZnTe Substrates
- HgCdTe Avalanche Photodiodes
- X-Ray and Gamma-Ray Detectors
- Surfaces and Interfaces
- ZnO Materials and Devices
- Defects and Doping
- Surface Passivation



Participating Organizations

*U.S. Army C5ISR Center 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
Army Research Office
The Minerals, Metals & Materials Society*

Endorsed by

The American Physical Society

Promotional Partners and Exhibitors

The 2021 II-VI Workshop would like to express sincere thanks to our supporting organizations and for the contributions from our very generous corporate partners.

Gold Partners



Silver Partner



Tabletop Exhibitor

Pulse Instruments

2021 II-VI WORKSHOP

Welcome

In the 40 years since the first MCT Workshop was held 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 and poster 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 peer-reviewed 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, and a Wine and Cheese Reception has been scheduled for Tuesday evening.

Don't Miss the Solar Sessions

This year, we are pleased to offer three additional sessions dedicated to solar technology. These papers will be presented on Thursday, October 28.

Virtual Access

2021 II-VI attendees will have digital access to all Workshop content. Instructions for logging onto the online II-VI Workshop will be sent via email following the event.

The 2021 II-VI Workshop Brings Together Industrial Leaders!

We are excited to announce this year's invited speakers:

Keynote Speaker:

Craig Hoffman, *Naval Research Laboratory*

"The Naval Research Enterprise"

Invited Speakers:

Oğuz Altun, *ASELSAN Inc.*

"Progress in IR Technology at ASELSAN"

Phillipe Ballet, *CEA-LETI*

"Advanced X-Ray Characterization and Imaging of IR"

Jim Beletic, *Teledyne Imaging Sensors*

"nBn/SLS FPA Progress"

Enrico Bellotti, *Boston University*

"Theoretical Study of the Vertical Carrier Transport
in Strain Balanced Antimony-Based Superlattices"

David Benson, *NVESD*

"Analysis of HgCdTe/CdZnTe Defects"

Lorenzo Faraone, *University of Western Australia*

"Status and Future of IR Technology Research at UWA"

Heinrich Figgemeier, *AIM Infrarot-Module GmbH*

"Progress in FPA Technology at AIM"

Chad Fulk, *Raytheon Vision Systems*

"State of the Art and Future of HgCdTe Detectors at RVS"

Chung Han, *i3system, Inc.*

Paper title TBD

Pierre Jenouvrier, *LYNRED*

"Progress in FPA Technology at LYNRED"

Whitney Mason, *DARPA*

"Latest Efforts in EO/IR Imaging at DARPA"

Koji Murakami, *JX Nippon Mining & Metals Corporation*

"6 inch CdZnTe Crystal Growth and Characterization by
JX"

Tony Ragucci, *Leonardo DRS*

"Sensing for Perception"

David Rhiger, *Raytheon Vision Systems*

"Current-Voltage Analysis of Dual-Band n-p-n HgCdTe
Detectors"

Antoni Rogalski, *Military University of Technology*

"Whether 2d Materials Will Constitute the Real
Competitors to LWIR HgCdTe HOT Photodiodes in the
Future?"

Uptal Roy, *Savannah River National Laboratory*

"CdZnTeSe: An Emerging Material Toward Advancement
of Radiation Detector and Substrate Applications"

David Ting, JPL

“nBn/SLS Technology”

James Wilson, Leonardo UK

“Current State of IR Detectors at Leonardo”

Tutorial:

Philip Klipstein, Semiconductor Devices

“III-V Barrier Detectors”

WORKSHOP CO-CHAIRS

Sivalingam Sivananthan, *University of Illinois at Chicago*
(*Proceedings Editor*)

Scott Johnson, *Raytheon Vision Systems*

Daniel Lofgreen, *Raytheon Vision Systems*

PROGRAM COMMITTEE

Tony Almeida, *U.S. Army CCDC C5ISR NVESD*

Fikri Aqariden, *Leonardo DRS (Electro-Optical & Infrared Systems)*

Jose M. Arias, *CACI / U.S. Army CCDC C5ISR NVESD*

Enrico Bellotti, *Boston University*

Ishwara Bhat, *Rensselaer Polytechnic Institute*

Joseph Burns, *Air Force Research Laboratory*

Roger DeWames, *MTEQ / U.S. Army C5ISR NVESD*

Nibir Dhar, *U.S. C5ISR Center NVESD*
(*Proceedings Co-Editor and Web Site Manager*)

Tim Gessert, *National Renewable Energy Laboratory*

Ralph James, *Savannah River National Lab*

Pradip Mitra, *Leonardo DRS, Electro-Optical and Infrared Systems (EOIS)*

Thomas Myers, *Texas State University – San Marcos*

Jill Nolde, *Naval Research Laboratory*

Joe Pellegrino, *Army NVESD*

Eric Piquette, *Teledyne Imaging Sensors*

Marion Reine, *Consultant, Infrared Detectors*

Priyalal Wijewarnasuriya, *Teledyne Imaging Sensors*

WORKSHOP COORDINATORS

Samantha Tola
Palisades Convention Management, Inc.
Phone: (727) 289-4195
Fax: (212) 460-5460
E-mail: stola@pcm411.com

Paola Caicedo
Sivananthan Laboratories, Inc.
590 Territorial Drive
Bolingbrook, IL 60440
E-mail: pcaicedo@sivananthanlabs.us

SPECIAL ISSUE EDITORIAL COORDINATOR

Paola Caicedo
Sivananthan Laboratories, Inc.
590 Territorial Drive
Bolingbrook, IL 60440
E-mail: pcaicedo@sivananthanlabs.us

WORKSHOP PARTICIPATING ORGANIZATIONS

*U.S. Army C5ISR Center 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

Army Research Office

The Minerals, Metals & Materials Society

Endorsed by

The American Physical Society

WORKSHOP PARTICULARS

LOCATION AND DATE

The 2021 II-VI Workshop will be held from October 25–28 at the Embassy Suites Chicago, Magnificent Mile, Chicago, Illinois

WORKSHOP REGISTRATION

Registration for the 2021 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 sending it to:

The 2021 II-VI Workshop

Attn.: Samantha Tola

411 Lafayette St., Suite 201

New York, NY 10003

fax: (212) 460-5460; e-mail: stola@pcm411.com

or

(2) By using the secure direct on-line link provided on the Workshop Website.

The deadline for advance registration is October 15, 2021. The fees include attendance at the technical sessions, lunches, refreshments, a copy of the Book of Extended Abstracts, and a copy of the Workshop Proceedings (printed soft-cover and electronic versions available). All checks must be payable in U.S. currency and be drawn from a U.S. bank and made payable to THE II-VI WORKSHOP. Refunds will not be issued after October 15, 2021.

Registration Type	Advanced Registration Rate (Before October 15, 2021)	On-Site Registration Rate (After October 15, 2021)
Registration Fee w/Electronic Proceedings (Industrial, Government, or University)	\$825.00	\$895.00
Registration Fee w/Printed (Soft-Cover) Proceedings (Industrial, Government, or University)	\$875.00	\$915.00
Full-Time University Student or Retiree Fee w/Electronic Proceedings (Student ID Required)	\$255.00	\$255.00
Full-Time University Student or Retiree Fee w/Printed (Soft-Cover) Proceedings (Student ID Required)	\$310.00	\$310.00

For registration confirmation, please contact Palisades Convention Management, Inc., at 1-800-350-0111 or (813) 284-0634 or stola@pcm411.com.

TRAVEL ARRANGEMENTS

FROM THE AIRPORT

Chicago-O’Hare International Airport

Directions:
Take I-190 to I-90 East to Downtown. Exit Ohio Street. Hotel is on left corner of State and Ohio.

Distance from Hotel: 17 mi.

Limousine	\$70.00 USD	Subway/Rail	\$7.50 USD
Taxi	\$50.00 USD	Various other	\$30.00 USD

Chicago Midway Airport

Directions:
Cicero Ave. to I-55 North. I-55 North to I-90/94 West (Dan Ryan Expy). Exit Ohio Street. Hotel is on left corner of State and Ohio.

Distance from Hotel: 11 mi.

Limousine	\$60.00 USD	Rental Car	\$50.00 USD
Subway/Rail	\$2.50 USD	Taxi	\$40.00 USD
Various other	\$25.00 USD		

For additional map and direction information visit:
<http://embassysuites3.hilton.com/en/hotels/illinois/embassy-suites-chicago-downtown-magnificent-mile-CHIREES/maps-directions/index.html>

WORKSHOP CHECK-IN

Attendees arriving on Monday, October 25, will be able to pick up their Workshop material at the II-VI Registration Desk located in the Lobby between 4:00 and 6:30 pm.

Please see the below registration hours throughout the week for attendees to pick-up their Workshop Materials at the II-VI Registration Desk:

Tuesday, October 26:	7:30 am–6:00 pm
Wednesday, October 27:	7:45 am–5:00 pm
Thursday, October 28:	8:00 am–3:00 pm

LUNCHES

Lunches will be served in a section of the hotel on all three days of the Workshop. To keep the Workshop on schedule, attendees are encouraged to participate.

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 several Tabletop Displays from commercial vendors displaying products of interest to the II-VI community. The tabletops will be on view during the Tuesday evening Reception as well as during the day on

Wednesday and Thursday in the Chicago River Ballroom Foyer. The poster session will also take place at the same time of the reception in a section of the Ballroom adjacent to the foyer.

WORKSHOP MEETING ROOMS

The Workshop presentations as well as the Poster Session on Tuesday will be held in the Chicago River Ballroom. The Wine and Cheese Reception, tabletop displays, and refreshment breaks will all take place in the Chicago River Ballroom Foyer.

BOOK OF EXTENDED ABSTRACTS

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

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. A copy of the Workshop Proceedings (printed soft-cover and electronic versions available) is included with the registration fees.

INSTRUCTIONS TO AUTHORS PLANNING TO SUBMIT FULL-LENGTH MANUSCRIPTS

We are asking all authors to submit their manuscripts to II-VI workshop for online peer review using the link provided by *Journal of Electronic Materials* (JEM) <http://www.editorial-manager.com/jems/>. Please click on “submit manuscript” at the top of the page. The online manuscript submission will close on December 17, 2021.

II-VI Paper Submission

- Authors (both oral and poster) who presented their work at the Workshop can submit their manuscripts either by going to the JEM’s editorial web page at <http://www.editorial-manager.com/jems/> or via II-VI workshop’s website, <http://www.ii-viworkshop.org/>. The link to the manuscript submission can be accessed by clicking on the Author’s Info link located under “About Workshop” link on the navigation banner on top of the II-VI Workshop’s website. Submissions via e-mail will not be accepted.
- New users will need to create an account. During the submission process, authors will be asked to enter additional information.
- The type of paper is “Special Issue” and the category is “2021 U.S. II-VI Workshop”.
- All submissions require an abstract of 200 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 editors’ 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 on a 22 × 28-cm sheet. Should manuscripts contain too many grammatical errors or awkward passages, the papers will be returned without review. Assistance of a professional proofreader (such as www.journalexperts.com) or qualified native speaker of English is recommended under these circumstances and may not only accelerate the review process but also allow for an early publication date.
- 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 works' 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, including common abbreviations for time such as h, min, and s.
- Figures may be published online in color with no charge, but color figures in the print version of the *Journal* carry a mandatory fee.

To avoid delays, please:

1. Define all acronyms upon first use, including in the abstract, in this style: scanning electron microscopy (SEM).
2. All micrographs must have scale markers. All plots must have both axes labeled with the variable name (units).
3. Contact author e-mail address and keywords must be included on the abstract page.

For detailed guidelines on artwork and the copyright issue please visit:

<http://www.springer.com/materials/optical+%26+electronic+materials/journal/11664#>

NOTE to ALL ATTENDEES: The 2021 Workshop content will be available online after the meeting.

PROGRAM

MONDAY, OCTOBER 25, 2021

- 4:00– 6:30 pm Workshop Pre-Registration
5:00– 6:15 pm Tutorial: **Philip Klipstein**

TUESDAY, OCTOBER 26, 2021

- 7:30– 6:00 pm Registration
7:30– 9:30 am Continental Breakfast
7:55– 8:00 am Welcoming Remarks
8:00– 8:30 am Keynote Address: **Craig Hoffman**
8:30–10:00 am 1: Industrial Overview I
10:00–10:15 am **BREAK**
10:15–12:00 pm 2: Devices I
12:00– 1:15 pm **LUNCH**
1:15– 3:30 pm 3: Avalanche Photodiodes
3:30– 3:45 pm **BREAK**
3:45– 6:00 pm 4: Quantum Dots & Materials I
6:00– 7:30 pm **RECEPTION / TABLETOPS /
WINE & CHEESE / POSTERS**

WEDNESDAY, OCTOBER 27, 2021

- 7:45– 5:00 pm Registration
7:30– 9:30 am Continental Breakfast
7:55– 8:00 am Welcoming Remarks
8:00– 8:30 am Featured Presentation: **Michael Eismann**
8:30–10:00 am 5: Industrial Overview II
10:00–10:15 am **BREAK**
10:15–12:00 pm 6: Heteroepitaxy
12:00– 1:15 pm **LUNCH**
1:15– 2:15 pm 7: Industrial Overview III
2:15– 4:00 pm 8: Superlattice I and Devices II
4:15– 5:00 pm 9: Materials II
5:00– 6:00 pm 10: Devices III

THURSDAY, OCTOBER 28, 2021

- 8:00– 3:00 pm Registration
7:30– 9:30 am Continental Breakfast
7:55– 8:00 am Welcoming Remarks
8:00– 9:15 am 11: Materials III
9:15– 9:30 am **BREAK**
9:30–10:30 pm 12: Superlattice II and Devices III
10:30–10:45 pm **BREAK**
10:45–12:15 pm 13: II-VI Solar Industry
12:15– 1:15 pm **LUNCH**
1:15– 2:55 pm 14: Solar I
2:55– 3:15 pm **WILLIAM E. SPICER AND
THOMAS N. CASSELMAN AWARDS**
3:15– 5:00 pm 15: Solar II

MONDAY, OCTOBER 25, 2021
Chicago River Ballroom
(4:00 – 6:30 pm)

Workshop Pre-Registration (4:00–6:30)

Tutorial (5:00–6:15)

“III-V Barrier Detectors”

Philip Klipstein

Semiconductor Devices

Haifa, Israel

The 2021 II-VI Workshop will feature a tutorial section on Monday, October 25, on III-V Barrier Detectors. The tutorial welcomes all interested and registered II-VI workshop participants. The workshop committee particularly encourages graduate students, post-docs, and junior researchers to attend the tutorial.

TUESDAY, OCTOBER 26, 2021
Chicago River Ballroom
(7:30 am – 7:30 pm)

Registration (7:30–6:00)

Continental Breakfast (7:30–9:30)

Welcome Remarks (7:55–8:00)

II-VI Workshop Co-Chairs

Sivalingam Sivananthan
University of Illinois at Chicago

Scott Johnson
Raytheon Vision Systems

Daniel Lofgreen
Raytheon Vision Systems

KEYNOTE ADDRESS

8:00 – 8:30 am

Craig Hoffman

Naval Research Laboratory

“The Naval Research Enterprise”

Session 1: Industrial Overview I

(8:30 – 10:00 am)

Chair: Dan Lofgreen
Raytheon Vision Systems, US

Co-Chair: Sivalingam Sivananthan
University of Illinois at Chicago, Chicago, IL, US

1.1

Invited Paper: Sensing for Perception (8:30)

Tony Ragucci
Leonardo DRS, Dallas, TX, US

1.2

Invited Paper: State of the Art and Future of HgCdTe Detectors at RVS (9:00)

Chad Fulk
Raytheon Vision Systems, Goleta, CA, US

1.3

Invited Paper: From Technology to Industrial Excellence at LYNRED (9:30)

*P. Jenouvrier, L. Rubaldo, Y. Loquet, A. Brunner,
N. Péré-Laperne, J. Berthoz, A. Cathignol, N. Ricard*
LYNRED, Veurey-Voroize, France

O. Gravrand
CEA-LETI, Grenoble, France

BREAK (10:00–10:15)

Session 2: Devices I
(10:15 am – 12:00 pm)

Chair: Jonathan Schuster
*U.S. Army DEVCOM Army Research
Laboratory (ARL), Adelphi, MD, US*

2.1

Invited Paper: Current-Voltage Analysis of Dual-Band n-p-n HgCdTe Detectors (10:15)

David Rhiger
Raytheon Vision Systems, Goleta, CA, US

2.2

Design of SWIR HgCdTe Detectors for High QE Applications (10:45)

N. D. Akhavan, G. A. Umana-Membreno, R. Gu,
J. Antoszewski, L. Faraone,
University of Western Australia, Crawley, Australia

2.3

150 mm Wafer Scale Manufacturing of HDVIP HgCdTe MWIR FPAs Operating at 140 K Grown by MBE with In-situ Passivation (11:00)

John Armstrong, Christopher Schaa, Justin Wilks,
Sameer Ajmera
Leonardo DRS, Dallas, TX, US
Jun Zhao, Fikri Aqariden
Leonardo DRS, Bolingbrook, IL, US

2.4

Performance of Very Long Wavelength Planar P+/n Devices (11:15)

Priyalal Wijewarnasuriya, Bo Shojaei, John Gruenewald,
Mitchell Dreiske, Jon Ellsworth, Annie Chen,
Stephanie Tallarico, Kenneth Cante, Gernot Hildebrandt,
Justin Eakins, Devraj Maitra, Aristo Yulius, Yibin Bai,
Mike Carmody
Teledyne Imaging Sensors, Camarillo, CA, US

2.5

High Energy Neutron Irradiation Effects on HgCdTe and III-V Type II Superlattice Focal Plane Array (11:30)

Yong Chang, Silviu Velicu, Sushant Sonde
EPIR, Inc., Bolingbrook, IL, US
Thomas Kroc
Fermi National Accelerator Laboratory, Batavia, IL, US

2.6

Student Paper: HgCdTe LWIR nBn Photodetectors Grown on Silicon Substrates (11:45)

Ryan Sellers, Sivalingam Sivananthan
UIC Department of Physics, Chicago, IL, US

Also presented as poster session P.10

LUNCH (12:00–1:15)

Session 3: Avalanche Photodiodes (1:15–3:30 pm)

Chair: Gregory Brill
*DEVCOM Army Research Lab, Adelphi, MD,
US*

3.1

Invited Paper: Latest Efforts in EO/IR Imaging at DARPA (1:15)

*Whitney Mason
DARPA, US*

3.2

Optimized High Gain 2-um Linear-Mode Avalanche Photodiode (1:45)

*Leye Aina, David Ramirez, Alex Harwit, William Painter,
Brandon Hanold, Dave Shelton, Peter Kondratko
Ball Aerospace & Technology Corp, Boulder, CO, US
Joel Fastenau, Ying Wu, Scott Nelson, Dmitri Loubyshev,
Amy Liu
IQE, Inc., Bethlehem, PA, US*

3.3

HgCdTe Avalanche Photodiodes for the 500–3300 nm spectral band operating at ≤ 240 K (2:00)

*P. Mitra, R. E. Scritchfield, C. A. Schaake, J. M. Martin,
J. D. Beck, P. D. Anderson, F. Aqariden, J. H. Park
Leonardo DRS, Dallas, TX, US
M. Zhu, I. Prigozhin, E. Bellotti
Boston University, Boston, MA, US*

3.4

Student Paper: Modeling of Compositionally Graded HgCdTe Avalanche Photodiodes for Midwave and Shortwave Infrared Detection (2:15)

*M. Zhu, I. Prigozhin, E. Bellotti
Boston University, Boston, MA, US
P. Mitra, R. E. Scritchfield, C. A. Schaake, J. M. Martin,
J. D. Beck, P. D. Anderson, F. Aqariden, J. H. Park
Leonardo DRS, Dallas, TX, US*

Also presented as poster session P.11.

3.5

Student Paper: Numerical Modeling of the Field-Aided HgCdTe APD for High Bandwidth Applications (2:30)

*Ilya Prigozhin, Enrico Bellotti
Boston University, Boston, MA, US
A. I. D'Souza
Leonardo DRS, Cypress, CA, US*

Also presented as poster session P.12.

3.6

WITHDRAWN

3.7

Recent Advancements in HgCdTe APDs for Space Applications (2:45)

*P. Duke Anderson, Jeff Beck, Chris Schaaake, James McCurdy,
Richard Scritchfield, Pradip Mitra
Leonardo DRS, Dallas, TX, US*

Xiaoli Sun

NASA Goddard Space Flight Center, Greenbelt, MD, US

3.8

Observation of Hole Multiplication in SWIR HgCdTe APDs (3:00)

*J. Rothman, J. Abergel, S. Gout, A. Coquiard, J. L. Santailier,
D. Giotta, S. Renet, F. Berger, A. Dumas, G. Badano,
T. Ligozat*

University of Grenoble Alpes, Grenoble, France

3.9

***Student Paper:* Metasurface-Coupled HgCdTe Avalanche Photodiodes – A Modeling Study (3:15)**

*Prathmesh Deshmukh, C. H. Grein, P. Boieriu,
S. Krishnamurthy
Sivananthan Laboratories, Bolingbrook, IL, US*

J. C. Campbell

University of Virginia, Charlottesville, VA, US

Also presented as poster session P.13.

BREAK

(3:30–3:45)

Session 4: Quantum Dots & Materials I

(3:45 – 6:00 pm)

Chair: Tony Almeida
NVESD, Fort Belvoir, VA, US

4.1

Invited Paper: Advanced X-Ray Characterization and Imaging of IR Materials (3:45)

Philippe Ballet
Université Grenoble Alpes, Grenoble, France

4.2

Carrier Recombination Lifetime Measurements of Semiconductor Wafers Using Optical Probing (4:15)

Yong Chang, Silviu Velicu, Sushant Sonde
EPIR Inc., Bolingbrook, IL, US

4.3

Defects Characterization of HgCdTe and CdZnTe Compounds by Positron Annihilation Spectroscopy (4:30)

Valentin Léger, Gilles Patriarche
C2N, Palaiseau, France
Pierre Desgardin, Jacques Botsoa, Marie-France Barthe
Institut Polytechnique de Paris, Palaiseau, France
Vincent Destefanis, Laurent Rubaldo
LYNRED, Veurey-Voroize, France
Catherine Corbel
CEMHTI-UPR3079 CNRS, Orléans, France

4.4

Student Paper: First Principles Study of Giant Stark Effect in 2D Materials (4:45)

Rathnayake Kandegedara, Eranjan Rathnayake,
Carlos A. Polanco, Zhi-Gang Yu
Sivananthan Laboratories, Inc., Bolingbrook, IL, US
Srini Krishnamurthy
Sivananthan Laboratories, Inc., Bolingbrook, IL, US and
University of Illinois-Chicago, Chicago, IL, US

Also presented as poster session P.14.

4.5

Study of MBE LWIR HgCdTe Characteristics on CdZnTe Substrates of Closely Lattice-Matched Zn Concentrations (5:00)

M. Reddy, F. Torres, M. Seas, G. M. Venzor, J. M. Peterson,
X. Jin, K. Doyle, A. Hampp, S. M. Johnson
Raytheon Vision Systems, Goleta, CA, US
J. D. Benson, B. Pinkie, J. A. Arias, A. E. Brown
U.S. Army RDECOM, CERDEC Night Vision and
Electronic Sensors Directorate, Fort Belvoir, VA, US

4.6

A Library of Models for Computing HgCdTe Material Properties (5:15)

*Jamal I. Mustafa, David R. Rhiger, Chad W. Fulk
Raytheon Vision Systems, Goleta, CA, US*

4.7

Investigation of Surfaces and Ligands for α -Sn Colloidal Quantum Dot Devices (5:30)

*R. M. E. B. Kandegedara, S. Sivananthan
University of Illinois at Chicago, Chicago, IL, US*

*P. T. Darancet
Argonne National Laboratory, Argonne, IL, US*

*S. Krishnamurthy, C. H. Grein
University of Illinois at Chicago, Chicago, IL, US and
Sivananthan Laboratories, Bolingbrook, IL, US*

4.8

***Student Paper:* Transport Measurements of Mercury Telluride Colloidal Quantum Dot Field Effect Transistors (5:45)**

*Thomas Mlynarski, Richard Pimpinella
Sivananthan Laboratories, Inc., Bolingbrook, IL, US*

Also presented as poster session P.15.

RECEPTION/TABLETOPS (6:00–7:30)

Poster Sessions

(6:00 pm)

P.1

MOCVD and ALD Thin Film Growth Hardware and Coatings for IR Applications; Including: Antireflection, Transparent Conductors and Metalenses

*G. S. Tompa, Arul Chakkaravarthi Arjunan, A. Feldman,
L. Gary Provost, R. Moonsammy
Structured Materials Industries, Inc. (SMI), Piscataway, NJ,
US*

P.2

Electrical Characteristic of Ga-Free T2SL MWIR nBn Detector Based on InAs/AlAsSb/InAsSb Barrier

*A. Jang, H.-J. Lee, Y. C. Kim, J. H. Eom, H. C. Jung,
K. K. Kang, S. M. Ryu, T. H. Lee, J. G. Kim, Y. H. Kim,
H. Jung
i3system, Inc., Daejeon, South Korea*

P.3

Correlating Lateral and Vertical Electronic Transport Parameters in InAs/GaSb Type-II Superlattices

*G. A. Umana-Membreno, N. D. Akhavan, J. Antoszewski,
L. Faraone
University of Western Australia, Crawley, Australia*

P.4

Update on Mid-Infrared HgTe Colloidal Quantum Dot PV Detectors

*John Peterson, Haozhi Zhang, Philippe Guyot-Sionnest
University of Chicago, Chicago, IL, US*

P.5

Production of CdZnTe Crystals Grown by THM Furnace in METU-CGL for Radiation Detection Applications

*Mustafa Ünal, Özden Başar Balbaşı, Mehmet Can Karaman,
Ayşe Merve Ünal, Mehmet Parlak, Raşit Turan
Middle East Technical University, Ankara, Turkey*

P.6

Suppression of Trapped Carriers of HgTe Colloidal Quantum Dots in a High-Frequency Photodetector System

*Jungchul Noh, Brian Korgel
University of Texas at Austin, Austin, TX, US
Rich Pimpinella
Sivananthan Laboratories, Inc., Bolingbrook, IL, US*

P.7

Optical Properties of Molecular Beam Epitaxy Grown $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ Films

*Aofeng Bai, F. C. Peiris
Kenyon College, Gambier, OH, US
X. Liu, M. Dobrowolska, J. K. Furdyna
University of Notre Dame, Notre Dame, IN, US*

P.8

WITHDRAWN

P.9

Photodetectors Using Intra-Band Transitions in GeOx Cladded Ge Quantum Dot Superlattice (QDSL) for Mid-to-Long Infrared Range

F. Jain, R. Mays, R. H. Gudlavalleti, J. Chandy

University of Connecticut, Storrs, CT, US

E. Heller

Synopsys Inc., Ossining, NY, US

P.10

***Student Poster:* HgCdTe LWIR nBn Photodetectors Grown on Silicon Substrates**

Ryan Sellers, Sivalingam Sivananthan

University of Illinois at Chicago, Chicago, IL, US

Also presented as oral session 2.6.

P.11

***Student Poster:* Modeling of Compositionally Graded HgCdTe Avalanche Photodiodes for Midwave and Shortwave Infrared Detection**

M. Zhu, I. Prigozhin, E. Bellotti

Boston University, Boston, MA, US

P. Mitra, R. E. Scritchfield, C. A. Schaaque, J. M. Martin,

J. D. Beck, P. D. Anderson, F. Aqariden, J. H. Park

Leonardo DRS, Dallas, TX, US

Also presented as oral session 3.4.

P.12

***Student Poster:* Numerical Modeling of the Field-Aided HgCdTe APD for High Bandwidth Applications**

Ilya Prigozhin, Enrico Bellotti

Boston University, Boston, MA, US

A. I. D'Souza

Leonardo DRS, Cypress, CA, US

Also presented as oral session 3.5.

P.13

***Student Poster:* Metasurface-Coupled HgCdTe Avalanche Photodiodes – A Modeling Study**

P. Deshmukh, C. H. Grein, P. Boieriu, S. Krishnamurthy

Sivananthan Laboratories, Bolingbrook, IL, US

J. C. Campbell

University of Virginia, Charlottesville, VA, US

Also presented as oral session 3.9.

P.14

***Student Poster:* First Principles Study of Giant Stark Effect in 2D Materials**

Eranjan Rathnayake, Carlos A. Polanco, Zhi-Gang Yu

Sivananthan Laboratories, Inc., Bolingbrook, IL, US

Srini Krishnamurthy

Sivananthan Laboratories, Inc., Bolingbrook, IL, US and

University of Illinois-Chicago, Chicago, IL, US

Also presented as oral session 4.4.

P.15

***Student Poster:* Transport Measurements of Mercury Telluride Colloidal Quantum Dot Field Effect Transistors**

Thomas Mlynarski, Richard Pimpinella

Sivananthan Laboratories, Inc., Bolingbrook, IL, US

Also presented as oral session 4.8.

P.16

***Student Poster:* First-Principles Study of the 30° Partial and 90° Partial Dislocations in HgTe, Hg_{0.7}Cd_{0.3}Te, and CdTe**

N. Hew, D. Spagnoli, L. Faraone

University of Western Australia, Crawley, Australia

Also presented as oral session 6.3.

P.17

***Student Poster:* Model and Characterization of Persistence on HgCdTe SWIR Imager**

T. Le Goff, O. Gravrand, N. Baier

University of Grenoble Alpes, Grenoble, France

T. Pichon, O. Boulade

CEA – IRFU, Gif sur Yvette, France

Also presented as oral session 6.4.

P.18

***Student Poster:* Photoluminescence Decay Signal Analysis of the Recombination Dynamics in Midwave Infrared HgCdTe**

M. Soria, P. Bleuet, A. Ferron, F. Boulard, J.-L. Santailler,

S. Gout, B. Hoarau, J. Rothman

University of Grenoble Alpes, Grenoble, France

Also presented as oral session 6.5.

P.19

***Student Poster:* MBE Growth of High Quality HgCdSe on GaSb Substrate**

Zekai Zhang, Wenwu Pan, Wen Lei,

Gilberto A. Umana-Membreno, Renjie Gu, Shuo Ma,

Lorenzo Faraone

University of Western Australia, Crawley, Australia

Also presented as oral session 6.6.

P.20

***Student Poster:* Bandgap-Engineering of InGaAs/GaAsSb Superlattices Lattice-Matched to InP**

Armando Gil

University of Michigan, Ann Arbor, MI, US

Jamie Phillips

University of Delaware, Newark, DE, US

Martin Ettenberg

Princeton Infrared Technologies, Inc., Monmouth Junction, NJ, US

Also presented as oral session 8.4.

P.21

***Student Poster:* II-VI Organic-Inorganic Hybrid Superlattices with Greatly Enhanced Optoelectronic Properties, Perfectly Ordered Structures and Unprecedented Long-Term Stability**

*Tang Ye, Margaret Kocherga, Damian Beasock,
Andrei Nesmelov, Daniel S. Jones, Fan Zhang, Wanseok Oh,
Yong Zhang, Thomas A. Schmedake
University of North Carolina at Charlotte, Charlotte, NC,
US*

*Yi-Yang Sun
Chinese Academy of Sciences, Shanghai, China*

*Xiao-Ying Huang
Rutgers University, Piscataway, NJ, US and Chinese
Academy of Sciences, Fuzhou, China*

*Jing Li
Rutgers University, Piscataway, NJ, US*

Also presented as oral session 10.3.

WEDNESDAY, OCTOBER 27, 2021

Chicago River Ballroom

(7:45 am–5:00 pm)

Registration (7:45–5:00)

Continental Breakfast (7:30–9:30)

Welcome Remarks (7:55–8:00)

II-VI Workshop Co-Chairs

Sivalingam Sivananthan

University of Illinois at Chicago

Scott Johnson

Raytheon Vision Systems

Daniel Lofgreen

Raytheon Vision Systems

Featured Presentation (8:00–8:30)

Michael Eismann

AFRL

Session 5: Industrial Overview II

(8:30 – 10:00 am)

Chair: Nibir Dhar
NVESD, Fort Belvoir, VA, US

5.1

Invited Paper: nBn/SLS FPA Progress (8:30)

Jim Beletic

Teledyne Imaging Sensors, US

5.2

Invited Paper (9:00)

Chung Han

i3systems, Inc., Mumbai, India

5.3

Invited Paper: Progress in FPA Technology at AIM (9:30)

Heinrich Figgemeier

AIM Infrarot-Module GmbH, Heilbronn, Germany

BREAK (10:00–10:15)

Session 6: Heteroepitaxy
(10:15 am – 12:00 pm)

Chair: Enrico Bellotti
Boston University, Boston, MA, US

6.1

Invited Paper: Status and Future Direction of IR Technology Research at UWA (10:15)

Lorenzo Faraone

University of Western Australia, Perth, Australia

6.2

Multi-wafer Growth Simultaneously on Four 6 cm × 6 cm CdZnTe Substrates and CdZnTe Substrate Recovery Process for Step Increase in MBE HgCdTe Wafer Production (10:45)

M. Reddy, J. M. Peterson, F. Torres, B. T. Fennel, X. Jin, K. Doyle, T. Vang, N. Juanko, S. M. Johnson, A. Hampp
Raytheon Vision Systems, Goleta, CA, US

6.3

Student Paper: First-Principles Study of the 30° Partial and 90° Partial Dislocations in HgTe, $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$, and CdTe (11:00)

N. Hew, D. Spagnoli, L. Faraone

University of Western Australia, Crawley, Australia

Also presented as poster session P.16.

6.4

Student Paper: Model and Characterization of Persistence on HgCdTe SWIR Imager (11:15)

T. Le Goff, O. Gravrand, N. Baier

University of Grenoble Alpes, Grenoble, France

T. Pichon, O. Boulade

CEA – IRFU, Gif sur Yvette, France

Also presented as poster session P.17.

6.5

Student Paper: Photoluminescence Decay Signal Analysis of the Recombination Dynamics in Midwave Infrared HgCdTe (11:30)

M. Soria, P. Bleuet, A. Ferron, F. Boulard, J.-L. Santailler, S. Gout, B. Hoarau, J. Rothman

University of Grenoble Alpes, Grenoble, France

Also presented as poster session P.18.

6.6

Student Paper: MBE Growth of High Quality HgCdSe on GaSb Substrate (11:45)

Zekai Zhang, Wenwu Pan, Wen Lei,

Gilberto. A. Umana-Membreno, Renjie Gu, Shuo Ma, Lorenzo Faraone

University of Western Australia, Crawley, Australia

Also presented as poster session P.19.

LUNCH

(12:00–1:15)

Session 7: Industrial Overview III

(1:15–2:15 pm)

Chair: Jill Nolde,
Naval Research Laboratory, US

7.1

***Invited Paper:* Current State of IR Detectors at Leonardo (1:15)**

*J. Wilson, C. Maxey, I. Baker, K. Lake
Leonardo(UK), Southampton, UK*

7.2

***Invited Paper:* Progress in IR Technology at ASELSAN (1:45)**

*Oguz Altun
ASELSAN, Inc., Yanamahalle, Turkey*

Session 8: Superlattice I and Devices II

(2:15 – 4:00 pm)

Chair: Eric Piquette
Teledyne, Camarillo, CA, US

8.1

Invited Paper: nBn/SLS Technology (2:15)

David Ting
JPL, US

8.2

Invited Paper: A Theoretical Study of the Vertical Carrier Transport in Strain Balanced Antimony-Based Superlattices (2:45)

E. Bellotti

Boston University, Boston, MA, US

F. Bertazzi, A. Tibaldi

DET, Politecnico di Torino and IEIT-CNR, Torino, Italy

J. Schuster, J. Bajaj, M. Reed

U.S. Army Combat Capabilities Development Command (CCDC), FCDD-RLS-ED, Adelphi, MD, US

8.3

Prediction of Shockley-Read-Hall Centers in Strained Layer Superlattices for Mid-Wave Infrared Photodetectors (3:00)

Zhi-Gang Yu, S. Krishnamurthy

Sivananthan Laboratories, Bolingbrook, IL, US

Preston T. Webster, Christian P. Morath

Air Force Research Laboratory, Kirtland AFB, NM, US

8.4

Student Paper: Bandgap-Engineering of InGaAs/GaAsSb Superlattices Lattice-Matched to InP (3:15)

Armando Gil

University of Michigan, Ann Arbor, MI, US

Jamie Phillips

University of Delaware, Newark, DE, US

Martin Ettenberg

Princeton Infrared Technologies, Inc., Monmouth Junction, NJ, US

Also presented as poster session P.20.

8.5

Assessing Sb-Cross Incorporation in InAs/InAsSb Superlattices (3:30)

Zahira El Khalidi, Christoph H. Grein

University of Illinois at Chicago, Chicago, IL, US

Anthony Ciani

Sivananthan Laboratories, Bolingbrook, IL, US

Sivalingam Sivananthan

University of Illinois at Chicago, Chicago, IL, US and Sivananthan Laboratories, Bolingbrook, IL, US

8.6

XBn and XBp Detectors Based on Type II Superlattices

(3:45)

*P. C. Klipstein, Y. Benny, Y. Cohen, S. Gliksman, A. Glozman,
I. Hirsh, O. Klin, L. Langof, I. Lukomsky, I. Marderfeld,
M. Nitzani, D. Rakhmilevich, I. Shtrichman, N. Snapi,
N. Yaron*

SemiConductor Devices, Haifa, Israel

M. Katz, S. Schusterman, N. Sicron

The Israel Center for Advanced Photonics, Yavne, Israel

I. Shafir

Soreq NRC, Yavne, Israel

Session 9: Materials II

(4:15–5:00 pm)

Chair: **Fikri Aqariden**
DRS Electro-Optical & Infrared Systems
(EOIS)

9.1

***Invited Paper:* 6-inch CdZnTe Crystal Growth and Characterization by JX** **(4:15)**

K. Murakami

JX Nippon Mining & Metals Corporation, Tokyo, Japan

A. Noda, H. Kurita

JX Nippon Mining & Metals Corporation, Ibaraki, Japan

9.2

II-VI Materials Growth and Characterization at the WSU IMR **(4:45)**

John S. McCloy, Rubi Gul, Magesh Murugesan, Marc Weber,

Santosh Swain, Saketh Kakkireni, Samuel Bigbee-Hansen

Washington State University, Pullman, WA, US

THURSDAY, OCTOBER 28, 2021

Chicago River Ballroom

(8:00 am – 3:00 pm)

Registration (8:00–3:00)

Continental Breakfast (7:30–9:30)

Welcome Remarks (7:55–8:00)

II-VI Workshop Co-Chairs

Sivalingam Sivananthan

University of Illinois at Chicago

Scott Johnson

Raytheon Vision Systems

Daniel Lofgreen

Raytheon Vision Systems

Session 11: Materials III

(8:00 – 9:15 am)

Chair: Joseph Burns

Air Force Research Laboratory – AFRL/

RXAN, Wright-Patterson AFB, OH, US

11.1

Invited Paper: Defect Analysis of HgCdTe (8:00)

David Benson

NVESD, Fort Belvoir, VA, US

11.2

RVS MBE Process for High Quality, High Throughput, Cost Effective, Substrate Size and Type Independent HgCdTe Wafer Production (8:30)

M. Reddy, J. M. Peterson, X. Jin, F. Torres, K. Doyle,

T. Vang, N. Juanko, K. Singer, B. T. Fennel, S. M. Johnson,

A. Hampp

Raytheon Vision Systems, Goleta, CA, US

11.3

CdZnTe/CdTe Dislocation Filters for MBE Growth of CdTe Buffer Layers on GaAs (211)B Substrates (8:45)

W. Pan, R. Gu, Z. Zhang, W. Lei, G. A. Umana-Membreno,

J. Antoszewski, L. Faraone

University of Western Australia, Crawley, Australia

D. J. Smith

Arizona State University, Tempe, AZ, US

11.4

Invited Paper: CdZnTeSe: An Emerging Material Towards Advancement of Radiation Detector and Substrate Applications (9:00)

Utpal Roy

Savannah River National Laboratory, Jackson, SC, US

BREAK (9:15–9:30)

Session 12: Superlattice II and Devices III

(9:30 – 10:30 am)

Chair: Priyalal Wijewarnasuriya
*Teledyne Imaging Sensors, Camarillo,
CA, US*

12.1

Studies of Scattering Mechanisms in Multilayer HgCdTe Heterostructures (9:30)

*B. Shojaei, S. Wang, J. Gruenewald, J. Ellsworth, D. Edwall,
A. Yulius, M. Carmody
Teledyne Scientific and Imaging, Camarillo, CA, US*

12.2

Mid-Wavelength HgCdTe Infrared Detectors with Plasmon-Enhanced Performance (9:45)

*Marco Vallone, Giovanni Ghione
Politecnico di Torino, Torino, Italy
Alberto Tibaldi, Francesco Bertazzi, Michele Goano
Politecnico di Torino, Torino, Italy and CNR-IEIT, Torino,
Italy
Stefan Hanna, Anne Wegmann, Detlef Eich,
Heinrich Figgemeier
AIM INFRAROT-MODULE GmbH, Heilbronn, Germany*

12.3

Infinite-Melt Vertical Liquid-Phase Epitaxy of HgCdTe from Hg Solution: From VLWIR to SWIR (10:00)

*Mauro F. Vilela, Jack Hogan, Brian T. Fennell,
Gregory M. Venzor, Paul M. Goetz, Diane L. Baley,
George Paloczi, Andreas Hampp
Raytheon Intelligence & Space – Raytheon Vision Systems,
Goleta, CA, US*

12.4

Optimizing Modified Direct Bond Interconnect Technology for IRFPA Hybridization (10:15)

*Sushant Sonde, Yong Chang, Suk-Ryong Hahn, Silviu Velicu
EPIR, Inc., Bolingbrook, IL, US
Kiran Sasikumar, Troy Loeffler
Argonne National Laboratory, Lemont, IL, US
Subramanian KRS Sankaranarayanan
Argonne National Laboratory, Lemont, IL, US and
University of Illinois, Chicago, IL, US*

BREAK

(10:30–10:45)

Session 13: II-VI Solar Industry
(10:45 am – 12:15 pm)

Chair: Wyatt Metzger
First Solar, Tempe, AZ, US

INTRODUCTION (10:45)

13.1

First Solar Update (10:55)

Bill Huber

First Solar, Tempe, AZ, US

13.2

Transitioning CdTe to Existing and Emerging PV Markets: Technical Challenges in Traditional Rooftop and Rooftile Markets and Opportunities in Emerging BIPV and AIPV Markets (11:05)

Aaron Bates

Toledo Solar, Perrysburg, OH, US

13.3

Sustainable Development of High Performance II-VI Semiconductors (11:15)

Jean-Nicolas Beaudry

5N Plus, Montreal, QC, Canada

13.4

Pilkington PV Activities (11:25)

Kevin Sanderson

Nippon Sheet Glass Co., Ltd, US

13.5

Semitransparent CdTe for PV Windows: Ultrathin or Laser Ablated? (11:35)

Al Compaan

Toledo Solar, Toledo, OH, US

13.6

Thin Film Encapsulation and Reliability Developments (11:45)

Kurt Barth

Direct Solar, US

13.7

Electro-Optic Characterization Techniques for PV (11:55)

Greg Horner

TauScience, Hillsboro, OH, US

13.8

Solution Processed TCO Films: A Path to , Low-Cost High-Performance Materials for CdTe Modules (12:05)

Cory Perkins

NexTC, Corvallis, OR, US

LUNCH (12:15–1:15)

Session 14: Solar I

(1:15 – 2:55 pm)

Chair: Wyatt Metzger
First Solar, Tempe, AZ, US

14.1 Update on the CdTe PB R&D Landscape (1:15)

Brion Bob and Inna Kozinsky
Department of Energy, Solar Energy Technology Office, US

14.2 Progress Towards Bifacial CdTe PV: Past, Present, and Future (1:28)

Adam Phillips, Kamala Subedi, Dipendra Pokhrel,
Aesha Patel, Manoj Jamarkattel, Gazi Quader,
Prabodika Kaluarachchi, Andrei Los, Jailiu Ma,
James Becker, Chungho Lee, Gang Xiong, Bill Huber,
Ebin Bastola, Michael Heben, Randy Ellingson
University of Toledo, Toledo, OH, US

14.3 Back-Contact Evaluation: Key Measurements and Pitfalls (1:40)

James R. Sites
Colorado State University, Fort Collins, CO, US

14.4 Low Dimensional Materials for Passivation in Successful PX Thin Film PV (1:52)

Deborah L. McGott, Christopher P. Muzzillo,
Craig L. Perkins, Joseph J. Berry, Kai Zhu, Joel N. Duenow,
Eric Colegrove, Colin A. Wolden, Matthew O. Reese
National Renewable Energy Laboratory, US

14.5 N-Type CdTe for Photovoltaics (2:04)

L. Thomas, T. D. C. Hobson, L. J. Phillips, H. Shiel,
T. D. Veal, V. R. Dhanak, J. D. Major, K. Durose
University of Liverpool, Liverpool, UK
S. Campbell, V. Barrioz
Northumbria University, Newcastle upon Tyne, UK

14.6 Void, Gas Bubble and Blister Formation in Sputtered Thin Film CdTe and CdSe (2:16)

Michael Walls
Loughborough University, Loughborough, UK

14.7 Doped Emitters and the Pathway to 25% Efficient Solar Cells (2:28)

Stuart Irvine
Swansea University, Swansea, Wales, UK

14.8

Investigating the Role of Copper in Arsenic Doped CdSeTe Photovoltaics (2:40)

*Eric Colegrove, Xin Zheng, John Moseley, Craig Perkins,
Helio Moutinho, Steve Johnson, Chun-Sheng Jiang,
Patrick O'Keefe, Matthew Reese, David Albin
National Renewable Energy Laboratory, US*

WILLIAM E. SPICER

and

THOMAS N. CASSELMAN AWARDS

(2:55 – 3:15 pm)

Session 15: Solar II
(3:15 – 5:00 pm)

Chair: Wyatt Metzger
First Solar, Tempe, AZ, US

15.1
Group-V Acceptor Ionization Energies and Compensation Centers in CdTe Revisited **(3:15)**

Intuon Chatratin, Anderson Janotti
University of Delaware, Newark, DE, US

15.2
Advances in Lifetimes and Arsenic Doping in Cd(Se)Te Solar Cells **(3:28)**

W. S. Sampath
Colorado State University, Fort Collins, CO, US

15.3
Multisource Deposition System for CdTe Photovoltaic Device Fabrication **(3:40)**

Adam Phillips, Ebin Bastola, Griffin Barros-King, Zulkifl Hussain, Aesha Patel, Jared Friedl, Zhaoning Song, Abasi Abudulimu, Jacob Gibbs, Manoj Jamarkattel, Gazi Quader, Dipendra Pokhrel, Dengbing Li, Sandip Bista, Yanfa Yan, Randy Ellingson, Michael Heben
University of Toledo, Toledo, OH, US

15.4
TBD **(3:52)**

Mariana Bertoni
Arizona State University, Tempe, AZ, US

15.5
Parsing Voltage Losses in CdSeTe Solar Cells: Drafting a Pathway to Reach Voc = 1 V **(4:04)**

Arthur Onno
Arizona State University, Tempe, AZ, US

15.6
Characterizing Local Carrier Dynamics of CdTe Solar Cells Using Micro/Nanocontacts **(4:16)**

Heayoung Yoon
University of Utah, Salt Lake City, UT, US

15.7
Multi-Mode Simulation of Cd(Se,Te) Devices **(4:28)**

Marco Nardone
Bowling Green State University, Bowling, OH, US

15.8
Analytical Scanning Transmission Electron Microscopy Studies of Back-Contacts in Group-V Doped CdSeTe Devices **(4:40)**

Robert Klie
University of Illinois, Chicago, IL, US

NOTES

NOTES
