

## **Monday, April 25, 2022**

10:45 am -  
11:00 am

### **Opening Session**

**Chair: Kensuke Nishioka (University of Miyazaki)**

- 10:45 am Opening Declaration  
Kensuke Nishioka, University of Miyazaki
- 10:48 am Announcement of the Continuity of CPV-x  
Kenji Araki, University of Miyazaki
- 10:53 am Welcome Speech TPV-13  
Makoto Shimizu, Tohoku University, Alejandro Datas, IES-UPM,  
Rodolphe Vaillon, IES - CNRS - Uni Montpellier
- 10:57 am Instruction of the Conference System  
Beatrix Feuerbach, Conexio-PSE

11:00 am -  
01:00 pm

### **Micro CPV**

**Chair: Daisuke Sato (Nagaoka University of Technology), Rüdiger Löckenhoff (Azur Space)**

- 11:00 am Science in Micro-CPV  
Maïke Wiesenfarth, Fraunhofer Institute for Solar Energy Systems ISE
- 11:30 am Influence of the Thermally Induced Deflection of a Space  
Micro-Concentrator Photovoltaic Array on its Optical  
Performances using Finite Element Method  
**Victor Vareilles**<sup>1</sup>, Anderson Bermudez-Garcia<sup>1</sup>, Fabien Chabuel<sup>1</sup>,  
Mohamed Amara<sup>2</sup>, Yannick Veschetti<sup>1</sup>, Philippe Voarino<sup>1</sup>  
<sup>1</sup>CEA; <sup>2</sup>INL
- 11:45 am Experimental Characterization of Micro-Optics for  
Integrated Tracking Included in HIPERION micro-CPV  
Modules  
**Guido Vallerotto**<sup>1</sup>, Norman Jost<sup>1</sup>, Gaël Nardin<sup>2</sup>, Mathieu Ackermann<sup>2</sup>,  
Mathilde Duchemin<sup>2</sup>, Stephen Askins<sup>1</sup>, César Domínguez<sup>1</sup>, Ignacio  
Antón<sup>1</sup>  
<sup>1</sup>Instituto de Energía Solar (IES); <sup>2</sup>Insolight SA
- 12:00 pm High Efficiency Roof-Top Solar: Progress and Pilot  
Installation in the Hiperion Project  
**Steve Askins**<sup>1</sup>, Guido Vallerotto<sup>1</sup>, César Domínguez<sup>1</sup>, Gael Nardin<sup>2</sup>,  
Mathieu Ackerman<sup>2</sup>, Delphine Petri<sup>3</sup>, Matthieu Despeisse<sup>3</sup>, Jacques  
Levrat<sup>1</sup>, Xavier Niquelle<sup>3</sup>, Christophe Ballif<sup>3</sup>, Juan Francisco Martinez<sup>4</sup>,  
Marc Steiner<sup>5</sup>, Gerald Siefer<sup>4</sup>, Ignacio Anton<sup>1</sup>  
<sup>1</sup>Instituto de Energía Solar - UPM; <sup>2</sup>Insolight SA; <sup>3</sup>Centre Suisse d'Electronique et  
de Microtechnique SA; <sup>4</sup>Fraunhofer Institute for Solar Energy Systems ISE; <sup>5</sup>  
Fraunhofer Institute for Solar Energy Systems

- 12:15 pm **Effects of Manufacturing Tolerances on Micro-CPV Module Efficiency**  
**Elisa Kaiser**<sup>1</sup>, Maike Wiesenfarth<sup>1</sup>, Marc Steiner<sup>1</sup>, Peter Nitz<sup>1</sup>, Henning Helmers<sup>1</sup>  
<sup>1</sup> *Fraunhofer Institute for Solar Energy Systems ISE*
- 12:30 pm **On the Effect of Misalignment Distributions on the I-V Curve of Micro-CPV Modules**  
**Luis Javier San José**<sup>1</sup>, Guido Vallerotto<sup>2</sup>, Zubair Abdullah-Vetter<sup>3</sup>, Rebeca Herrero<sup>2</sup>, Ziv Hameiri<sup>4</sup>, Ignacio Antón<sup>2</sup>  
<sup>1</sup> *Instituto de Energía Solar, Universidad Politécnica de Madrid*; <sup>2</sup> *Institute of Solar Energy, Universidad Politécnica de Madrid*; <sup>3</sup> *School of Photovoltaic and Renewable Energy Engineering, The University of New South Wales*; <sup>4</sup> *School of Photovoltaic and Renewable Energy Engineering, University of New South Wales*
- 12:45 pm **Discussion**
- 01:00 pm - **Lunch Break**  
01:30 pm
- 01:30 pm - **CPV Technologies**  
03:50 pm  
**Chair: Maria Martinez (ISFOC) & Victor Vareilles (CEA) & Kareem Younes (Khalifa University)**
- 01:30 pm **Energy Yield Modeling of 5J Solar Cell Based CPV Modules**  
**Marc Steiner**<sup>1</sup>, Philipp Schroth<sup>2</sup>, Rüdiger Löckenhoff<sup>2</sup>, Gerald Siefer<sup>1</sup>, Maike Wiesenfarth<sup>1</sup>  
<sup>1</sup> *Fraunhofer ISE*; <sup>2</sup> *AZUR SPACE Solar Power GmbH*
- 01:50 pm **First Feedback from a CPV Plant in a Nordic Location, Québec, Canada**  
**Mehdi Talebi**<sup>1</sup>, Maïté Volatier<sup>1</sup>, Abdelatif Jaouad<sup>1</sup>, Christian Dubuc<sup>2</sup>, Vincent Aimez<sup>1</sup>, Maxime Darnon<sup>1</sup>  
<sup>1</sup> *Institut Interdisciplinaire d'Innovation Technologique (3IT), Université de Sherbrooke*; <sup>2</sup> *Saint-Augustin Canada Electric Inc*
- 02:05 pm **Design and Analysis of Hybrid Concentrator Photovoltaic Module Combining Low-Concentration Static Lens and Luminescent Solar Concentrator for Automobile Applications**  
**Daisuke Sato**<sup>1</sup>, Ryota Tomizawa<sup>2</sup>, Taizo Masuda<sup>2</sup>, Kenichi Okumura<sup>2</sup>, Noboru Yamada<sup>1</sup>  
<sup>1</sup> *Nagaoka University of Technology*; <sup>2</sup> *Toyota Motor Corporation*
- 02:20 pm **A Highly Efficient, Low-Cost Hybrid Module, Combining Multijunction and Silicon PV Cells**  
**James Roger Angel**<sup>1</sup>, Barry Hartweg<sup>2</sup>, Zach Holman<sup>3</sup>, Joel Berkson<sup>4</sup>  
<sup>1</sup> *homeUniversity of Arizona*; <sup>2</sup> *Arizona State University*; <sup>3</sup> *Arizona State University*; <sup>4</sup> *University of Arizona*
- 02:35 pm **Electronic Network Simulation of 5-Junction Solar Cells and Impacts on the Ideal Current Matching**  
**Ruediger F. Loekenhoff**<sup>1</sup>, Peter Schoettl<sup>2</sup>  
<sup>1</sup> *AZUR SPACE Solar Power*; <sup>2</sup> *Fraunhofer ISE*

- 02:50 pm High-Concentration Freeform Microtracking Concentrators with Single-Axis External Tracking  
**Håkon J. D. Johnsen**<sup>1</sup>, Jan Torgersen<sup>1</sup>  
*<sup>1</sup>NTNU, Department of Mechanical and Industrial Engineering*
- 03:05 pm A Universal Solar Tracker Controller  
**Ruediger F. Loeckenhoff**<sup>1</sup>, Ermanno Antonelli<sup>2</sup>  
*<sup>1</sup>AZUR SPACE Solar Power; <sup>2</sup>Volt4*
- 03:20 pm Output Analysis of Plastic-integrated Concentrating Photovoltaic Modules under Outdoor Operation  
**Taichi Uno**  
*University of Miyazaki*
- 03:35 pm Discussion

03:50 pm -  
05:00 pm

## Poster Session

*Chair: Kenji Araki (University of Miyazaki)*

- A01 A Comparative Study of 3D Printed Non-Imaging Solar V-Trough and Compound Parabolic Concentrators for Low-Cost, High-Performance CPV Applications  
**Mohammad Alnajideen**  
*Cardiff University*
- A02 Multi-Terminal Three-Junction Solar Cells for Sub-Cells Characterization  
**Farah Ayari**<sup>1</sup>, Maxime Darnon<sup>1</sup>, Abdelatif Jaouad<sup>1</sup>, Vincent Aimez<sup>1</sup>, Mathieu de Lafontaine<sup>1</sup>, Gwénaëlle Hamon<sup>1</sup>, Thomas Bidaud<sup>1</sup>, Maïté Volatier<sup>1</sup>, Solène Moreau<sup>1</sup>, Artur Turala<sup>1</sup>  
*<sup>1</sup>Interdisciplinary Institute for Technological Innovation (3IT)*
- A04 Terrestrial Solar Electric Power 24 Hours Per Day from Space Using 40% Efficient Gasb Concentrator Photovoltaic (CPV) Cells  
**Lewis Fraas**  
*JX Crystals Inc*
- A05 Measurement of III-V CPV Solar Cell Non-Linearity in the 1x to 1024x Light Concentration Range  
**Ruediger F. Loeckenhoff**<sup>1</sup>, Anton Ruban<sup>1</sup>  
*<sup>1</sup>AZUR SPACE Solar Power*
- A06 On-orbit Demonstration Plan of Micro CPV on HTV-X  
**Tepei Okumura**<sup>1</sup>, Taishi Sumita<sup>1</sup>, Daisuke Sato<sup>2</sup>, Shuto Tsuchida<sup>2</sup>, Noboru Yamada<sup>2</sup>  
*<sup>1</sup>Japan Aerospace Exploration Agency; <sup>2</sup>Nagaoka University of Technology*
- A07 GaAs Vertical-Tunnel-Junction Power Converter for Ultra-High Light Intensities  
**Celia Outes**<sup>1</sup>, Eduardo F. Fernández<sup>1</sup>, Natalia Seoane<sup>2</sup>, Florencia Almonacid<sup>1</sup>, Antonio J. García - Loureiro<sup>2</sup>  
*<sup>1</sup>University of Jaén; <sup>2</sup>University of Santiago de Compostela*

- A08      **Towards Directly Growing Arrays of Micro-Solar Cells In-Situ for Micro-Concentrator Applications**  
**Ricardo Poeira**<sup>1</sup>, Ana Pérez-Rodriguez<sup>2</sup>, Sascha Sadewasser<sup>2</sup>, Phillip Dale<sup>1</sup>  
*<sup>1</sup> University of Luxembourg; <sup>2</sup> INL - International Iberian Nanotechnology Laboratory*
- A09      **Consideration for Importance of Concentrating Photovoltaics for Creation of Future Net Zero Greenhouse Gas Emission Energy Systems**  
**Masafumi Yamaguchi**<sup>1</sup>, Kenji Araki<sup>2</sup>, Yuchao Zhang<sup>3</sup>, Brett Hallam<sup>3</sup>  
*<sup>1</sup> Toyota Technological Institute; <sup>2</sup> University of Miyazaki; <sup>3</sup> University of New South Wales*
- B01      **Novel Module Configurations Based on Multiple Concentrator Units and Optical Guides Towards High-Performance Ultra-High CPV Systems**  
**María de los Angeles Ceballos Pérez**<sup>1</sup>, Alvaro Valera Albacete<sup>1</sup>, Pedro J. Pérez-Higueras<sup>1</sup>, Florencia Almonacid Cruz<sup>1</sup>, Eduardo Fernández Fernández<sup>1</sup>  
*<sup>1</sup> University of Jaén*
- B02      **Computer Simulation of Heat and Mass Transfer inside a HCPV Module**  
**Alexander Chekalin**<sup>1</sup>, Yuri Ascheulov<sup>1</sup>, Yuri Chumakov<sup>2</sup>, Evgenii Khrapunov<sup>3</sup>  
*<sup>1</sup> Ioffe Institute; <sup>2</sup> Peter the Great St. Petersburg Polytechnic University; <sup>3</sup> Krylov State Research Centre*
- B03      **Smart Solar Concentrator Building Integrated for Nearly-Zero Energy Buildings**  
**Daniel Chemisana**<sup>1</sup>, Fabian Duerr<sup>2</sup>  
*<sup>1</sup> University of Lleida; <sup>2</sup> Vrije Universiteit Brussel*
- B04      **Estimating the Thermal Characteristics of Transparent Concentrator Photovoltaic Module**  
**Yasuyuki Ota**<sup>1</sup>, Sota Katsuhara<sup>1</sup>, Kenji Araki<sup>1</sup>, Kensuke Nishioka<sup>1</sup>  
*<sup>1</sup> University of Miyazaki*
- B05      **Optimization of the CPV Receiver Cooling System to Improve Energy Transfer Efficiency**  
**Joan Rosell Urrutia**<sup>1</sup>, Desideri Regany Vendrell<sup>1</sup>, Montse Vilarrubí<sup>1</sup>, Francesc Majós<sup>1</sup>, Manel Ibañez<sup>1</sup>, Jerome Barrau<sup>1</sup>  
*<sup>1</sup> Politechnical School, Universitat de Lleida*
- B06      **Optical, Electrical, and Thermal Characterization of a Novel Tracking-Integrated Semi-Transparent CPV Module**  
**Kareem Younes**<sup>1</sup>, Majed Bin Saad<sup>1</sup>, Harry Apostoleris<sup>2</sup>, Noé Bory<sup>3</sup>, Gaël Nardin<sup>3</sup>, Mathieu Ackermann<sup>3</sup>, Matteo Chiesa<sup>4</sup>  
*<sup>1</sup> Khalifa University; <sup>2</sup> DEWA Research & Development Center; <sup>3</sup> Insolight; <sup>4</sup> UiT The Arctic University of Norway*
- C01      **Spot Size Experiments with Diffractive Optical Elements on Glass Lenses: Correction of Chromatic Aberration**  
**Ralf Leutz**<sup>1</sup>, Harald Ries<sup>2</sup>  
*<sup>1</sup> leopol - Leutz Optics and Illumination UG (haftungsbeschränkt); <sup>2</sup> ffOptik GmbH*

- D03 **Comparative Analysis of Control Strategies for the Reduction of Tracking Error in CPV Systems**  
**Sergio Isai Palomino-Resendiz**<sup>1</sup>, Diego Alonso Flores-Hernández<sup>2</sup>, Basil Mohammed Al-Hadithi<sup>3</sup>, Víctor Cadix-Martín<sup>3</sup>  
<sup>1</sup> *Instituto Politécnico Nacional –ESIME-ZAC. Departamento de Control y Automatización*; <sup>2</sup> *Instituto Politécnico Nacional – UPIITA, Applied Dynamic Systems Laboratory*; <sup>3</sup> *Universidad Politécnica de Madrid*
- D04 **FNX an Innovative Tangential Solar Tracker**  
**Paolo Valente**  
*VT Energy Innovation*
- E01 **Solar Electric Power 24 hrs per day Using 40% Efficient GaSb CPV Modules**  
**Lewis Fraas**  
*JX Crystals Inc*
- E02 **Generation of H<sub>2</sub> from CPV sources**  
**Maria Martinez**<sup>1</sup>, Daniel Sanchez<sup>1</sup>, Oscar de la Rubia<sup>1</sup>, Rafael Cervantes<sup>2</sup>, Goulven Quéméré<sup>2</sup>, Ignacio Luque-Heredia<sup>2</sup>, Delia Muñoz<sup>3</sup>, Covadonga García<sup>3</sup>  
<sup>1</sup> *ISFOC*; <sup>2</sup> *BSQSOLAR*; <sup>3</sup> *H2B2 Electrolysis Technologies, SL*
- E03 **Prediction of PPF<sub>D</sub> (photosynthetic Photon Flux Density) Under Transparent CPV Modules**  
**Teruya Toyoda**<sup>1</sup>, Daisuke Yajima<sup>1</sup>, Masaaki Kirimura<sup>1</sup>, Kenji Araki<sup>1</sup>, Yasuyuki Ota<sup>1</sup>, Akira Nagaoka<sup>1</sup>, Kensuke Nishioka<sup>1</sup>  
<sup>1</sup> *University of Miyazaki*
- E04 **Indoor Measurements of Hybrid MJ Solar Cell and Thermoelectric Generator Receiver**  
**Alvaro Valera Albacete**<sup>1</sup>, Florencia Almonacid Cruz<sup>1</sup>, Eduardo Fernandez Fernandez<sup>1</sup>  
<sup>1</sup> *Advances in PhotoVoltaic Technology (AdPVTEch), Universidad de Jaén*
- F01 **Evaluation of Thermoelectric Properties of N-type (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>ZnSnS<sub>4</sub>**  
**Kouichi Okamoto**<sup>1</sup>, Akira Nagaoka<sup>1</sup>, Yusuke Shigeeda<sup>1</sup>, Kenji Yoshino<sup>1</sup>, Kenji Nishioka<sup>1</sup>  
<sup>1</sup> *University of Miyazaki*
- G02 **Enhanced Radiative Absorption Distribution in Near-Field Thermophotovoltaic System with Multilayer Emitter**  
**Bowen Li**  
*Huazhong University of Science and Technology*
- G03 **Nanospacer Configurations for Large-Area Near-Field Thermal Converters**  
**Esther Lopez**<sup>1</sup>, Pablo García-Linares<sup>1</sup>, Alejandro Datas<sup>1</sup>  
<sup>1</sup> *Instituto de Energía Solar, Universidad Politécnica de Madrid*
- H01 **Wide Band High Level Thermal Radiation Emission of Highly Doped Black Silicon**  
**Sreyash Sarkar**<sup>1</sup>, Tarik Bourouina<sup>1</sup>, Philippe Basset<sup>1</sup>, Frederic Marty<sup>1</sup>, Georges Hamaoui<sup>1</sup>  
Presented by Georges Hamaoui<sup>1</sup>  
<sup>1</sup> *ESYCOM Lab, Univ Gustave Eiffel, CNRS*

- I01 **Punctual Contact Formation in Ge for the Development of Interdigitated Back Contacted Thermophotovoltaic Cells**  
**Alba Jiménez Pagán**<sup>1</sup>, David Canteli<sup>2</sup>, Isidro Martín<sup>3</sup>, Gema López<sup>3</sup>, Alicia López de Ceballos Regife<sup>1</sup>, Álvaro Manuel Medrano Gómez<sup>1</sup>, Carlos Molpeceres Álvarez<sup>4</sup>, Carlos del Cañizo Nadal<sup>1</sup>, Alejandro Datas Medina<sup>1</sup>  
*<sup>1</sup> Instituto de Energía Solar, Universidad Politécnica de Madrid; <sup>2</sup> Centro Láser, Universidad Politécnica de Madrid; <sup>3</sup> Departament d'Enginyeria Electrònica, grup d'investigació MNT, Universidad Politécnica de Catalunya; <sup>4</sup> Centro Láser*
- I02 **Prototype Trial of a Thermophotovoltaic System for Industrial Waste Heat Recovery**  
**Graham Buckley**<sup>1</sup>, C. M. Iftexhar Hussain<sup>2</sup>, Aoife Kelly<sup>3</sup>, Brian Norton<sup>4</sup>  
*<sup>1</sup> Technical University Dublin; <sup>2</sup> TU Dublin; <sup>3</sup> Technological University Dublin; <sup>4</sup> Dublin Energy Lab, Technological University Dublin, Dublin*

04:30 pm -  
05:00 pm

### **Speed Dating**

*Speed dating is the quick (three to five minutes) discussion of three to five people by shuffling the members in every trigger. It is intended to meet as many people in different communities as possible and encourage speaking and discussing in a limited time. The theme of the meeting on the first day is "Warm-up session for the open discussion tomorrow." The dating organizer gives you two questions and shuffles the members. The first question is, "What is the future of CPV industries and technologies?" The second question is, "Do you find any solutions?"*

## Tuesday, April 26, 2022

10:30 am -  
10:45 am

### Meet & Greet: Ask Professors

*The second-day program is constructed for a transition of the CPV to TPV. Both CPV and TPV people are highly encouraged to participate. Several people are not familiar with CPV technologies or looking for specific solutions from established CPV technologies. This is the reason why professors are on the stage. Come to professors and ask them about cells, optics, alignment, reliability, trackers, field experience, and standards. The experts of CPV technologies will be ready to answer your technical questions.*

10:45 am -  
12:00 pm

### CPV/TPV Transition

**Chair: Marc Steiner (Fraunhofer ISE), Myles Steiner (NREL)**

- 10:45 am Radiative Recombination  
Prof. Hidefumi Akiyama  
University of Tokyo
- 11:15 am Humidity Control in Planar Micro-Tracking CPV Modules by Means of Passive Solutions  
**Ruben Nuñez<sup>1</sup>**, Steve Askins<sup>1</sup>, Laetitia Anglade<sup>2</sup>, Florian Gerlich<sup>2</sup>, Ignacio Anton<sup>1</sup>, Cesar Dominguez<sup>1</sup>  
<sup>1</sup>Instituto de Energía Solar, Universidad Politécnica de Madrid; <sup>2</sup>Insolight
- 11:30 am Analysis of Thermally Stressed GaAs Solar Cells for Operation in Terrestrial Hybrid Systems  
**Paul Oublon<sup>1</sup>**, Alexandre Arnoult<sup>2</sup>, Simon Hurand<sup>3</sup>, Maxime Levillayer<sup>2</sup>, Frédéric Martinez<sup>4</sup>, Inès Massiot<sup>2</sup>, Stéphanie Parola<sup>4</sup>, Jérémie Drevillon<sup>2</sup>, Daniel Chemisana<sup>5</sup>, Guilhem Almuneau<sup>2</sup>, Yvan Cuminal<sup>4</sup>, Rodolphe Vaillon<sup>4</sup>  
<sup>1</sup>IES - CNRS - Univ Montpellier; <sup>2</sup>Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS-CNRS), Université Toulouse, CNRS; <sup>3</sup>Institut Pprime, CNRS, Université de Poitiers, ISAE-ENSMA; <sup>4</sup>IES Institut d'Electronique et des Systèmes - UMR5214; <sup>5</sup>Applied Physics Section of the Environmental Science Department, University of Lleida, Jaume II 69
- 11:45 am Characterization of Antireflective Coatings on a Spherical Lens Secondary Optical Element  
**Lysander Treumann<sup>1</sup>**, Thomas Schmidt<sup>1</sup>, Peter Schöttl<sup>1</sup>, Peter Nitz<sup>1</sup>  
<sup>1</sup>Fraunhofer Institute for Solar Energy Systems ISE

12:00 pm -  
01:00 pm

### Special Session: Future of CPV

*This is the special session of Mitsuru Imaizumi, an entertainer from the space community (but always friends of the CPV community). It begins with three ice-breaking speeches from three generations (frontier, golden age, younger generation) and three technologies (cell, optics, and module/system). It is a kind of competition among generations and critical components. We will see how each key component can do in the future by different ages. Then, the open discussion starts. Everybody can write their opinion in the chat window, including TPV people. The conductor selects valuable comments from the equalized view and further encourages the discussion. What is the fate of CPV? Your participation will create the answer.*

**Chair: Mitsuru Imaizumi (JAXA)**

- 12:00 pm Intermission
- 12:05 pm Cell, Frontier  
Masafumi Yamaguchi, Toyota Technological Institute

- 12:15 pm Optics, Golden Age  
Ralf Leutz, leopil - Leutz Optics and Illumination UG  
(haftungsbeschränkt)
- 12:25 pm Module/System, Young Generation  
Norman Jost (PhD student), UPM
- 12:35 pm Open discussion

12:50 pm -  
01:00 pm

**CPV-18 Award Ceremony**  
*Chair: Kensuke Nishioka (University of Miyazaki)*

01:00 pm -  
01:30 pm

**Lunch Break**

01:30 pm -  
03:00 pm

**Materials and Cells**

*Chair: Mathieu Francoeur (University of Utah) & Tobias Burger (University of Michigan)*

- 01:30 pm Record Efficiency InGaAs Thermophotovoltaic Cells For Energy Storage Applications  
**Myles Steiner**<sup>1</sup>, Eric Tervo<sup>1</sup>, Ryan France<sup>1</sup>, Cecilia Luciano<sup>2</sup>, Dustin Nizamian<sup>2</sup>, Benjamin Johnson<sup>2</sup>, Alexandra Young<sup>2</sup>, Leah Kuritzky<sup>2</sup>, Emmett Perl<sup>2</sup>, Moritz Limpinsel<sup>2</sup>, Brendan Kayes<sup>2</sup>, Tarun Narayan<sup>2</sup>, Madhan Arulanandam<sup>3</sup>, Richard King<sup>3</sup>, Andrew Ponec<sup>2</sup>, David Bierman<sup>2</sup>, Justin Briggs<sup>2</sup>  
*<sup>1</sup>NREL; <sup>2</sup>Antora Energy; <sup>3</sup>Arizona State University*
- 01:45 pm Mitigating Nonradiative Losses in Low Bandgap Thermophotovoltaic and Thermoradiative Cells  
**Eric Tervo**<sup>1</sup>, Andrew Ferguson<sup>1</sup>, Myles Steiner<sup>1</sup>, Ryan France<sup>1</sup>  
*<sup>1</sup>National Renewable Energy Laboratory*
- 02:00 pm Maximizing Infrared Reflectance in Germanium TPV Cells  
**Pablo Martín**<sup>1</sup>, Clara Sánchez-Pérez<sup>2</sup>, Iván García<sup>2</sup>  
*<sup>1</sup>Instituto de Energía Solar, Universidad Politécnica de Madrid; <sup>2</sup>Instituto Energía Solar, Universidad Politécnica de Madrid*
- 02:15 pm Laser Processed Contacts on p-type c-Ge Based on Al<sub>2</sub>O<sub>3</sub> Films for TPV Devices  
**Isidro Martín**<sup>1</sup>, Gema López<sup>1</sup>, Moises Garín<sup>2</sup>, Alba Jiménez<sup>3</sup>, Alicia L. Ceballos<sup>3</sup>, Alvaro Manuel Medrano<sup>3</sup>, Carlos del Cañizo<sup>3</sup>, Alejandro Datas<sup>3</sup>  
*<sup>1</sup>Universitat Politècnica de Catalunya; <sup>2</sup>Universitat de Vic - Universitat Central de Catalunya; <sup>3</sup>Instituto de Energía Solar, Universidad Politécnica de Madrid*
- 02:30 pm Harvesting Mid-Wave Infrared Radiation with Type-II InAs/InAsSb Superlattices: from Photodetectors to Thermophotovoltaics Cells  
**Rodolphe Vaillon**<sup>1</sup>, Basile Roux<sup>2</sup>, Maxime Bouschet<sup>2</sup>, Stéphanie Parola<sup>2</sup>, Frédéric Martinez<sup>2</sup>, Philippe Christol<sup>2</sup>, Jean-Philippe Perez<sup>2</sup>, Rodolphe Vaillon<sup>2</sup>  
Presented by Basile Roux<sup>2</sup>  
*<sup>1</sup>IES - CNRS - Univ Montpellier; <sup>2</sup>Institut d'Electronique et des Systèmes*



02:45 pm Discussion

03:00 pm -  
03:15 pm

## Break

03:15 pm -  
04:15 pm

## Special Session: Pathways for TPV R&D

*While there have been several major TPV R&D movements in the past, they have yet to reach the point of practical application and widespread adoption.*

*The development of research over the past few years suggests that a new movement is underway. In order to make this R&D movements sustainable, we will hold a panel discussion on the "Pathway of TPV R&D". The session will start with short impulse talks, followed by a discussion.*

**Chair: Makoto Shimizu (Tohoku University), Alejandro Datas (IES-UPM), Rodolphe Vaillon (IES - CNRS - Uni Montpellier)**

03:15 pm History of TPV  
Taizo Shibuya, NEC

03:20 pm Thermophotovoltaic Batteries  
Alejandro Datas, IES-UPM

03:25 pm Making TPV Technology Marketable  
Moritz Limpinsel, Antora Energy

03:30 pm Towards Low-cost TPV Cell Manufacturing  
Myles Steiner, NREL

03:35 pm Pathways for TPV Research From Academic Point of View  
Rodolphe Vaillon, CNRS-IES

03:40 pm Panel Discussion

04:05 pm -  
04:15 pm

## Sponsor Session

04:05 pm Presentation Azur Space

04:15 pm -  
04:45 pm

## Lab Tour

*It is a pre-recorded lab tour of both University of Miyazaki (CPV) and Tohoku University (TPV). It is not limited to CPV/TPV. Miyazaki also shows the most advanced VIPV measurement (Vehicle-integrated photovoltaic) demonstration. The tour will be followed by Q&A.*

**Chair: Kensuke Nishioka, University of Miyazaki; Makoto Shimizu, Tohoku University**

04:15 pm Lab Tour of Miyazaki University  
Kensuke Nishioka, University of Miyazaki

04:25 pm Lab Tour of Tohoku University  
Makoto Shimizu, Tohoku University

04:45 pm -  
05:15 pm

## Speed Dating

*Speed dating is the quick (three to five minutes) discussion of three to five people by shuffling the members in every trigger. It is intended to meet as many people in different communities as possible and encourage speaking and discussing in a limited time. The agenda of the second day is: "What is the future of the CPV / TPV conference?"*

## Wednesday, April 27, 2022

10:45 am -  
11:00 am

### Meet & Greet

11:00 am -  
11:40 am

### Emitters

*Chair: Rodolphe Vaillon (University of Montpellier - CNRS)*

- 11:00 am Hybrid Resonance Mode Based Narrowband Emission in 2D Superlattice Photonic Microcavity  
**Zhen Liu**<sup>1</sup>, Makoto Shimizu<sup>1</sup>, Hiroo Yugami<sup>1</sup>  
*<sup>1</sup>Tohoku University*
- 11:15 am Porous Oxide Thermophotovoltaic Emitters Prepared by Plasma-assisted Aerosol Deposition  
**Taizo Shibuya**  
*NEC Corp.*
- 11:30 am Discussion

11:40 am -  
11:55 am

### Break

11:55 am -  
12:50 pm

### Advanced Concepts I

*Chair: Alejandro Datas (IES-UPM)*

- 11:55 am Temperature Dependence of Thermal Radiation and Impact on Near-Field Thermophotovoltaic Devices  
**P-Olivier Chapuis**<sup>1</sup>, Christophe Lucchesi<sup>1</sup>, Julien Legendre<sup>1</sup>, Rodolphe Vaillon<sup>2</sup>  
*<sup>1</sup>CNRS-CETHIL (Centre for Energy and Thermal Sciences, Lyon); <sup>2</sup>CNRS-IES (Institute for Electronics and systems, Montpellier)*
- 12:10 pm Near-Field Thermophotonic Devices with AlGaAs Emitters and Cells  
**Julien Legendre**<sup>1</sup>, Pierre-Olivier Chapuis<sup>1</sup>  
*<sup>1</sup>Centre for Energy and Thermal Sciences of Lyon (CETHIL)*
- 12:25 pm Comprehensive Energy Balance Analysis of Photon-Enhanced Thermionic Power Generation Considering Concentrated Solar Absorption Distribution  
**A N M Taufiq Elahi**  
*University of Utah*
- 12:40 pm Discussion

12:50 pm -  
01:30 pm

### Lunch Break

01:30 pm -  
03:00 pm

## Systems

**Chair: Myles Steiner (NREL) & Peter Bermel (Purdue University)**

- 01:30 pm 3D Ray Tracing Model for the Design and Development of Efficient Emitter-TPV Cavities  
**David Woolf**<sup>1</sup>, Joel Hensley<sup>1</sup>  
<sup>1</sup>Physical Sciences, Inc.
- 01:45 pm Performance Analysis of Tandem Near-Field Solar Thermophotovoltaic System  
**Bong Jae Lee**<sup>1</sup>, Jaeman Song<sup>1</sup>, Minwoo Choi<sup>1</sup>, Jihye Han<sup>1</sup>, Jungchul Lee<sup>1</sup>  
<sup>1</sup>KAIST
- 02:00 pm Effect of Spectrally Selective Emission on a Solar-Thermophotovoltaics Equipped with a Confined System  
**Makoto Shimizu**<sup>1</sup>, Tomoya Furuhashi<sup>1</sup>, Zhen Liu<sup>1</sup>, Hiroo Yugami<sup>1</sup>  
<sup>1</sup>Tohoku University
- 02:15 pm 50 W-scale Demonstration of Thermophotovoltaic Energy Conversion using a Metamaterial Selective Emitter  
**David Woolf**<sup>1</sup>, Joel Hensley<sup>1</sup>, Rick Wainner<sup>1</sup>, Brandon Young<sup>1</sup>  
<sup>1</sup>Physical Sciences, Inc.
- 02:30 pm The Effect of Optical Cavities on Thermophotovoltaic Systems  
**Nima Talebzadeh**<sup>1</sup>, Paul G. O'Brien<sup>1</sup>  
<sup>1</sup>York University
- 02:45 pm Discussion

03:00 pm -  
03:15 pm

## Break

03:15 pm -  
04:10 pm

## Advanced Concepts II

**Chair: Pierre-Olivier Chapuis (CNRS-CETHIL)**

- 03:15 pm Non-Local Effects on Near-Field Radiative Heat Transfer Between Graphene Sheets  
**Saman Zare**<sup>1</sup>, Sheila Edalatpour<sup>1</sup>  
<sup>1</sup>University of Maine
- 03:30 pm A Comprehensive Model of the External Radiative Recombination in Thin-Film Near-Field Radiative Energy Converters  
**Dudong Feng**  
Georgia Institute of Technology
- 03:45 pm Impact of Absorption Layer Thickness on InAs-Based NFTPV Device Performance  
**Gavin Forcade**<sup>1</sup>, Christopher Valdivia<sup>1</sup>, Sean Molesky<sup>2</sup>, Shengyuan Lu<sup>3</sup>, Alejandro W. Rodriguez<sup>3</sup>, Raphael St-Gelais<sup>1</sup>, Karin Hinzer<sup>1</sup>, Jacob Krich<sup>1</sup>  
<sup>1</sup>University of Ottawa; <sup>2</sup>Polytechnique Montreal; <sup>3</sup>Princeton University
- 04:00 pm Discussion

04:10 pm -  
04:30 pm

## **Closing Session**

- 04:10 pm CPV Wrap-up  
Kenji Araki, University of Miyazaki
- 04:15 pm TPV Wrap-up  
Makoto Shimizu, Tohoku University
- 04:20 pm TPV Award Ceremony
- 04:25 pm Closing Remarks  
Kensuke Nishioka, University of Miyazaki

04:30 pm -  
05:00 pm

## **Scientific Cosplay**

*Please, dress up with something implying "Science and Technology" with a glass of drink. Since there is no intermission time from the closing session, some of the committee members (at least the program chair) dress something cosplay while presenting the scientific summary of the conference during the closing session. So, please do not be surprised.*

***Personal Notes***

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