



EUPVSEC

22 — 26
September

BEC —
Bilbao Exhibition Center

Bilbao —
Spain

EU PVSEC

42nd European
Photovoltaic Solar Energy
Conference and Exhibition

2025

**Conference
Programme —**

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42nd European Photovoltaic Solar Energy Conference and Exhibition

Conference Program

Monday, 22. September 2025

MONDAY MORNING

CONFERENCE OPENING

PLENARY PRESENTATIONS AP.1 / Scientific Opening

08:30 - 09:30 PV Everywhere

Chairpersons: Robert P. Kenny
European Commission JRC, Ispra, Italy
Carlos del Cañizo
UPM, Madrid, Spain

AP.1.1 Outlook Into PV Growth Beyond Grid Flexibility via Integration with Storage and Fuels

Uwe Rau¹, Oleksandr Astakhov¹, Thérèse Cibaka¹, Sergey Shcherbachenko¹, Tsvetelina Merdzhanova¹
¹ FZJ, Jülich, Germany

AP.1.2 Agrivoltaic System Potential to Mitigate Effects of Climate Change in Viticulture

Natalie Hanrieder¹, Stefan Wilbert¹, Álvaro Fernández Solas¹, Anna Kujawa¹, Rabea Weil², Lucía Garstka³, Claudia Kammann³, Manfred Stoll³, Matthias Meier⁴, M. del Carmen Alonso García⁵, Luis Zarzalejo⁵, Isabel Oller Alberola⁶, Estefanía Sánchez Vizcaíno⁷
¹ DLR, Almería, Spain; ² DLR, Oldenburg, Germany; ³ Hochschule Geisenheim University, Germany; ⁴ FZJ, Jülich, Germany; ⁵ CIEMAT, Madrid, Spain; ⁶ CIEMAT, Almería, Spain; ⁷ Cortijo el Cura, Laujar, Spain

AP.1.3 Micro-Concentrator Photovoltaics for Deep Space Missions: Overcoming LILT Challenges with High-Specific-Power Solar Arrays

Guido Vallerotto¹, Anderson Bermudez-Garcia², Gerald Siefer³, Maike Wiesenfarth³, Almudena Garcia-Sanchez¹, Ignacio Antón¹, César Domínguez¹, Carsten Baur⁴, Pier Luigi Coz⁴
¹ UPM, Madrid, Spain; ² Thales Alenia Space, Cannes, France; ³ Fraunhofer ISE, Freiburg, Germany; ⁴ European Space Agency – ESTEC, Noordwijk, The Netherlands

BECQUEREL PRIZE CEREMONY

09:30 - 10:00

Chairperson: Stefan Glunz
Fraunhofer ISE, Freiburg, Germany
Chairman of the Becquerel Prize Committee

Becquerel Prize Winner 2025

Walburga Hemetsberger
SolarPower Europe, Brussels, Belgium

Representative of the European Commission

C. Thiel
European Commission Joint Research Centre, Ispra, Italy

The Laudatio is given by:

Rutger Schlatmann
Helmholtz-Zentrum, Berlin, Germany

WELCOME MESSAGE

10:00 – 10:15

Carlos del Cañizo, General Chair 42nd EU PVSEC
Jon de Gregorio, WIP Renewables Energies

OPENING ADDRESSES

10:45 – 11:00

KEYNOTE SPEECH

11:00 - 11:15

“The Dual Face of global Solar Growth”

Gaëtan Masson
CEO at Becquerel Institute

MODERATED PANEL DISCUSSION – SOLAR IN TURBULENT TIMES: GLOBAL DYNAMICS AND THE WAY FORWARD

11:15 - 12:15

Chairpersons: Torsten Brammer
The Solar Journey

Anita Mohan Goel, Deputy General Manager, Solar Energy Corporation of India (SECI)

Yue (Max) Ma, CTO, Phoenixolar, China

Teresa Barnes, Research Director at NREL and leader of the DuraMAT Consortium

Walburga Hemetsberger, CEO Solar Power Europe

José Donoso, CEO, UNEF – Unión Española Fotovoltaica



ORAL PRESENTATIONS 1AO.4

13:30 - 15:00 UV-induced Degradation and Material Parameters | Contacting Approaches for Characterisation of Silicon Solar Cells

Chairpersons: Giso Hahn
University of Konstanz, Germany
Aloña Otaegi
UPV/EHU, Bilbao, Spain

1AO.4.1 Isotopic Analysis for Robust Traceability of Crystalline Silicon Wafers

Bertrand Paviet-Salomon¹, Sylvain Bérail², Julien Barre², Pascale Louvat³,
Christophe Pecheyran³

¹ CSEM, Neuchâtel, Switzerland; ² Advanced Isotopic Analysis, Pau, France; ³ UPPA/CNRS, Pau, France

1AO.4.2 Mitigating UV-Induced Degradation: Impact of PECVD and PEALD AlOx Layers Deposited in a Tube-Type Direct Plasma-Enhanced Chemical Vapor Deposition System

Christina Hollemann¹, Byungul Min¹, Sonja Bräunig¹, Thomas Daschinger¹, Kishan Moliya¹, Carolin Römer¹, Viet X. Nguyen², Thomas Pernau², Daniela Seiffert², Helge Haverkamp², Rolf Brendel¹, Henning Schulte-Huxel¹

¹ ISFH, Emmerthal, Germany; ² centrotherm international, Blaubeuren, Germany

1AO.4.3 New Insights on UV-Induced Degradation of SHJ Solar Cells

Hugo Lajoie¹, Frederic Jay¹, Maxime Babics¹, Romain Couderc¹, Sandrine Therias²

¹ CEA, Le Bourget-du-Lac, France; ² CNRS, Aubière, France

1AO.4.4 Bulk Carrier Lifetime Measurement of High Lifetime N-Type Silicon Ingots with Advanced Evaluation

Dávid Krisztián¹, Ferenc Korsós¹, Gergely Havasi¹, Kinga Szőke¹

¹ SEMILAB, Budapest, Hungary

1AO.4.5 Universal Contacting Approaches for the Characterization of Solar Cells

Michael Rauer¹, Andreas Fell¹, Katinka Kordelos¹, Martin C. Schubert¹, Jochen Hohl-Ebinger¹

¹ Fraunhofer ISE, Freiburg, Germany

1AO.4.6 Contact-Free J-V: a Simple Technique for Universal State-of-the-Art Solar Cells

Shuai Nie¹, Yan Zhu¹, Felix Gayot¹, Ziv Hameiri¹

¹ UNSW, Sydney, Australia

ORAL PRESENTATIONS 4AO.7

13:30 - 15:00 Solar Resource Assessment

Chairpersons: Vicente Lara-Fanego
Solargis, Malaga, Spain
Jan Remund
Meteotest, Bern, Switzerland

4AO.7.1 Worldwide Solar Radiation Measurement Database with Quality-Control Added Value

Anne Forstinger¹, Stefan Wilbert², Adam R. Jensen³, Dazhi Yang⁴, Ana Gracia⁵, Xavier Olano⁵, Niklas Blum², Diego Miranda², Elena Collino⁶, Dario Ronzio⁶, Anton Driesse⁷, Ioannis Sifnaios³, Birk Kraas¹, Faiza Azam⁸, Jesus Polo⁹, Christian Gueymard¹⁰, Carlos F. Peruchena¹¹, Yves-Marie Saint-Drenan¹², Irena Balog¹³, Josh Peterson¹⁴, Wilfried van Sark¹⁵, Cristina Cornaro¹⁶, Jorge Lezaca⁸, Thomas Schmidt⁸, Abdellatif Ghennioui¹⁷, Mounir Abriam¹⁷, Joaquin Alonso-Montesinos¹⁸

¹ CSP Services, Cologne, Germany; ² DLR, Tabernas, Germany; ³ DTU, Kgs. Lyngby, Denmark; ⁴ Harbin Institute of Technology, Harbin, China; ⁵ CENER, Sarriena, Spain; ⁶ RSE, Piacenza, Italy; ⁷ PVPL, Freiburg, Germany; ⁸ DLR, Cologne, Germany; ⁹ CIEMAT, Madrid, Spain; ¹⁰ Solar Consulting Services, Colebrook, United States of America; ¹¹ SERIM, , Spain; ¹² Mines ParisTech, Sophia-Antipolis, France; ¹³ ENEA, Rome, Italy; ¹⁴ University of Oregon, Oregon, United States of America; ¹⁵ Utrecht University, Utrecht, The Netherlands; ¹⁶ Tor Vergata University of Rome, Rome, Italy; ¹⁷ Green Energy, Ben Guerir, Morocco; ¹⁸ University of Almería, Almería, Spain

4AO.7.3 Localized Uncertainty Model of the CAMS Radiation Service Irradiance Product

Jorge Lezaca¹, Yves-Marie Saint-Drenan², Marion Schroedter-Homscheidt¹

¹ DLR, Oldenburg, Germany; ² MINES Paris, Sophia-Antipolis, France

4AO.7.4 Potential of Decimeter-Resolution Ground-Albedo Data for Bifacial Photovoltaics

Niklas Blum¹, Bijan Nouri¹, Yann Fabel¹, Stefan Wilbert¹

¹ DLR, Almería, Spain

4AO.7.5 Method for the Determination of Spectral Responsivity of Digital Solar Irradiance Sensors

David Hinken¹, Sebastian Denke¹, Karsten Bothe¹, Rolf Brendel¹

¹ ISFH, Emmerthal, Germany

4AO.7.6 AI Solar Spectra Prediction using few Basic Meteorological Inputs

Miguel Ángel Sevillano-Bendezú¹, Micaela Rodríguez-Peña¹, Jerónimo Buencuerpo¹, José María Ripalda¹

¹ CSIC, Madrid, Spain



ORAL PRESENTATIONS 2AO.1

13:30 - 15:00 CIGS Solar Cells

Chairpersons: Alessandro Romeo
University of Verona, Italy
Susanne Siebentritt
University of Luxembourg, Esch-sur-Alzette, Luxembourg

2AO.1.1 Toward High Efficiency Bifacial CIGS Solar Cells

Sascha Sadewasser¹, Pedro Salomé¹, Negar Naghavi², Stephane Collin³, Rico Gutzler⁴, Wolfram Witte⁴, Marika Edoff⁵, Romain Carron⁶, Saeed Bayat⁷, Susanne Siebentritt⁷, Phillip Dale⁷, Alejandro Pérez Rodríguez⁸, Roland Scheer⁹, Esko Niemi¹⁰, Andreas Zimmermann¹¹, Marcin Morawski¹², Conrad Spindler¹³, Capucine Tong¹⁴, Peter Borowski¹⁵, Ayodhya Tiwari¹⁶

¹ INL, Braga, Portugal; ² CNRS-IPVF, Palaiseau, France; ³ CNRS-C2N, Palaiseau, France; ⁴ ZSW, Stuttgart, Germany; ⁵ University of Uppsala, Uppsala, Sweden; ⁶ EMPA, Dübendorf, Switzerland; ⁷ University of Luxembourg, Luxembourg, Luxembourg; ⁸ IREC, Barcelona, Spain; ⁹ MLU, Halle, Germany; ¹⁰ Midsummer, Järfälla, Sweden; ¹¹ Sunplugged, Schwaz, Austria; ¹² Roltec, Poznan, Poland; ¹³ Greendelta, Berlin, Germany; ¹⁴ Saint Gobain Research, Aubervilliers, France; ¹⁵ Avancis, Munich, Germany; ¹⁶ SOLTIWA, Zurich, Switzerland

2AO.1.2 Voltage Losses in Bifacial CIGS Solar Cells

Matteo De Marzi¹, Ceren Mitmit¹, Matthias Diethelm¹, Romain Carron¹

¹ Empa, Dübendorf, Switzerland

2AO.1.3 Inline-Fabricated (Ag,Cu)(In,Ga)Se₂ Solar Cells with Transparent Conductive Oxides as Back Contacts

Rico Gutzler¹, Dimitrios Hariskos¹, Stefan Paetel¹, Wolfram Witte¹

¹ ZSW, Stuttgart, Germany

2AO.1.4 Optimizing ACIGSe/Si Tandem Solar Cells: Achieving Current Matching through Bifacial Operation

Julia Horstmann¹, Matthias Maiberg¹, Roland Scheer¹, Mario Hanser², Jana-Isabelle Polzin², Martin Hermle²

¹ MLU, Halle (Saale), Germany; ² Fraunhofer ISE, Freiburg, Germany

2AO.1.5 Device Characterization via Transient Model Involving VCu–VSe Complex for Cu(In,Ga)Se₂ Solar Cells

Takahito Nishimura¹, Ryotaro Fukuda¹, Akira Yamada¹

¹ Institute of Science Tokyo, Tokyo, Japan

2AO.1.6 14.2% Efficient and Stable Cu(In,Ga)S₂ Solar Cell on Transparent Back Contact for Top Cell in Tandem Devices

Kulwinder Kaur¹, Tien Le¹, Kai Ng¹, Boaz Koren¹, Michele Melchiorre¹, Susanne Siebentritt¹

¹ University of Luxembourg, Esch-sur-Alzette, Luxembourg

VISUAL PRESENTATIONS 3AV.1

13:30 - 15:00 PV Module Design and Manufacturing

Chairpersons: Ralf Preu
Fraunhofer ISE, Freiburg, Germany
Tudor Timofte
ISC Konstanz, Germany
Veronica Bermudez Benito
BERBETIN, Antibes, France

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 2AO.2

15:15 - 16:45 Advances in Chalcogenide Devices

Chairpersons: Mirjam Theelen
TNO/Solliance, Eindhoven, The Netherlands
Rico Gutzler
ZSW, Stuttgart, Germany

2AO.2.1 Special Introductory Presentation: Sulfur based CIGS - a Review of Recent Developments

Susanne Siebentritt¹

¹ University of Luxembourg, Esch-sur-Alzette, Luxembourg

2AO.2.2 Towards the Development of Advanced In-Line Methodology for Monitoring and Accelerated Research of Thin-Film PV Devices

Gina Y. Soracá-Pérez¹, Robert Fonoll Rubio¹, Jon Garí¹, Victoria Rotaru¹, Esko Niemi², Israr Qadir², Ginner Laurin³, Paul Pistor⁴, Thomas Unold⁵, Stefan Paetel⁶, Krzysztof Stanik⁷, Konrad Wojciechowski⁷, Andreas Zimmermann⁸, Fernando Miranda Bardales¹, Pedro Vidal Fuentes¹, Alejandro Pérez Rodríguez¹, Victor Izquierdo Roca¹, Maxim Guc¹

¹ IREC, Sant Adria del Besos, Spain; ² Midsummer, Järfälla, Sweden; ³ AIT, Vienna, Austria; ⁴ Pablo de Olavide University, Sevilla, Spain; ⁵ HZB, Berlin, Germany; ⁶ ZSW, Stuttgart, Germany; ⁷ Saule, Wrocław, Poland; ⁸ Sunplugged, Wildermieming, Austria

2AO.2.3 A New Method for Sb-doped CdSeTe/CdTe Devices with Superior Stability

Elisa Artegiani¹, Mariyam Mukhtar¹, Alessandro Romeo¹

¹ University of Verona, Verona, Italy

2AO.2.4 Explainable Artificial Intelligence Driven Methodology for Accelerated Research of Thin Film PV Technologies: Case Study of Kesterite-Based Devices

Jon Garí-Galíndez¹, Robert Fonoll-Rubio¹, Jacob Andrade-Arvizu¹, Alejandro Perez-Rodriguez¹, Pedro Vidal-Fuentes¹, Maxim Guc¹, Victor Izquierdo-Roca¹

¹ IREC, Barcelona, Spain



2AO.2.5 Over 10% Efficient Stannite Solar Cells with Bandgap Below 0.9 eV Through Dominant Defect Transformation and Microstructure Enhancement

Zixuan Yu¹, Guangxing Liang², Chang Yan¹

¹ The Hong Kong University of Science and Technology, Guangzhou, China; ² Shenzhen University, Shenzhen, China

ORAL PRESENTATIONS 1AO.5

15:15 - 16:45 Si TOPCon Solar Cells and Related Processing Steps

Chairpersons: Rolf Brendel
ISFH, Emmerthal, Germany
Francesca Menchini
ENEA, Rome, Italy

1AO.5.1 Large Area i-TOPCon Solar Cells with 25.9% Record Efficiency

Daming Chen¹, Zigang Wang¹, Tao Wang¹, Zhijun Wang¹, Kuiyi Wu¹, Lin Zhang¹, Jing Pan¹, Xiwen Chen¹, Keng Siew Chan¹, Chengfa Liu¹, Jian Huang¹, Pietro P. Altermatt¹, Pierre Verlinden¹, Zhiqiang Feng¹, Yifeng Chen¹

¹ TrinaSolar, Changzhou, China

1AO.5.2 A Comprehensive Investigation of the LECO Process on TOUCAN Solar Cells with N-Type and P-Type TOPCon Layers: LECO Parameter Study, Efficiency Potential and Microstructural Working Model

Stefan Lange¹, Sina Swatek¹, Marko Turek¹, Stephan Großer¹, Jan Hoß², Saman Sharbaf Kalaghchi², Jonathan Linke², Jan Lossen², Eve Krassowski³

¹ Fraunhofer CSP, Halle (Saale), Germany; ² ISC Konstanz, Konstanz, Germany; ³ CE Cell Engineering, Kabelsketal, Germany

1AO.5.3 Enhancing Broadband Antireflection Performance of Silicon Solar Cells Using Grass-Like Alumina via Atomic Layer Deposition

Jiahui Xu¹, Yuxuan Li², Wenjing Zhang¹, Geng Zhang³, Pierre Verlinden¹, Cui Liu², Xiao Yuan¹

¹ Yangtze Institute for Solar Technology, Jiangyin, China; ² East China University of Science and Technology, Shanghai, China; ³ Jolywood (ShanXi) Solar Technology, Taiyuan, China

1AO.5.4 Screen Printed Cu-TOPCon Cells With Reduced Ag Consumption

Jan Lossen¹, Justus Carstens¹, Mertcan Comak¹, Dominik Rudolph¹, Pirmin Preis¹, Lejo Koduvelikulathu¹

¹ ISC Konstanz, Konstanz, Germany

1AO.5.5 Gallium-Emitter Development for Lean TOPCon c-Si Solar Cells based on Plasma-Deposited Gallium Diffusion Source

Thibault Schaller¹, Ezgi Genç¹, Julien Hurni¹, Christophe Ballif¹, Audrey Morisset², Franz-Josef Haug¹

¹ EPFL, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland

1AO.5.6 Impact of Illumination on Solar Cell Properties: Insights into Atomic Hydrogen Release

Wolfram Kwapiel¹, Jonas Schön¹, Benjamin Hammann¹, Stefan W. Glunz¹

¹ University of Freiburg, Freiburg, Germany

ORAL PRESENTATIONS 4AO.8

15:15 - 16:45 Solar Irradiance Forecasting

Chairpersons: Shukla Poddar
UNSW, Sydney, Australia
Takashi Oozeki
AIST, Koriyama, Japan

4AO.8.2 Cutting-Edge Generative AI for Intra-Hour Solar Forecasting

Yann Fabel¹, Dominik Schnaus², Bijan Nouri¹, Niklas Blum¹, Stefan Wilbert¹, Luis F. Zarzalejo³, Julia Kowalski⁴, Robert Pitz-Paal⁵

¹ DLR, Almería, Spain; ² TUM, Garching, Germany; ³ CIEMAT, Madrid, Spain; ⁴ RWTH, Aachen, Germany; ⁵ DLR, Cologne, Germany

4AO.8.3 Short-Term Solar Irradiance Forecasting using All-Sky Imagers: a Hybrid Artificial Intelligence Approach Combining Support Vector Machines and Convolutional Neural Networks

Khadija Barhmi¹, Sara Mirbagheri Golroodbari¹, Wouter Knap², Wilfried van Sark¹

¹ Utrecht University, Utrecht, The Netherlands; ² KNMI, De Bilt, The Netherlands

4AO.8.4 Integrating Satellite Imagery and Graph Neural Networks for Improving Day-Ahead Solar Irradiance Forecasting

Baptiste Schubnel¹, Jelena Simeunovic¹, Corentin Tissier¹, Pierre-Jean Alet¹, Rafael E. Carrillo¹

¹ CSEM, Neuchâtel, Switzerland

4AO.8.5 Enhancing Intra-Hour Solar Irradiance Forecasting: Combining ASI and Satellite Forecasts

Bijan Nouri¹, Jorge Lezaca², Yann Fabel¹, Annette Hammer², Niklas Blum¹, Stefan Wilbert¹

¹ DLR, Almería, Spain; ² DLR, Oldenburg, Germany

4AO.8.6 Co-Simulating Photovoltaics and Environments to Improve Solar Forecasting

Baptiste Amiot¹, Joseph Vernier², Baptiste Berlioux², Benoit Cuilhé¹, Rémi Le Berre², Sylvain Edouard², Martin Ferrand³

¹ Ecole des Ponts, Marne la Vallée, France; ² EDF RD, Ecuelles, France; ³ EDF RD, Chatou, France

VISUAL PRESENTATIONS 3AV.2

15:15 - 16:45 PV Module Durability and Reliability

Chairpersons: Arnaud Morlier
imo-imomec, Diepenbeek, Belgium
Olatz Arriaga Arruti
CSEM, Neuchâtel, Switzerland
Paul Gebhardt
Fraunhofer ISE, Freiburg, Germany

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.



ORAL PRESENTATIONS 2AO.3

17:00 - 18:30 III-V Based Devices | Tandem and Perovskite Solar Cells

Chairpersons: Christiane Becker
HZB, Berlin, Germany
Gianluca Timò
RSE, Piacenza, Italy

2AO.3.1 III-V/Germanium Cells beyond Solar Photovoltaics: Recent Advances in Thermophotovoltaic and Laser Power Converters

Ignacio Rey-Stolle¹, Pablo Martín¹, Aitana Cano¹, Simeon Nikolaev¹, Iván García¹

¹ UPM, Madrid, Spain

2AO.3.2 Student Awards Finalist Presentation: Tandem III-V on Si Solar Cells using Low-Cost Multifunctional Bonding Layer

Elise Salmon¹, Jerónimo Buencuerpo², Jérémie Schuhmann³, Thomas Bidaud³, Oleh Ivashtenko³, Oliver Höhn⁴, David Lackner⁴, Frank Dimroth⁴, Amaury Delamarre³, Andrea Cattoni⁵, Stéphane Collin³

¹ IPVF, Palaiseau, France; ² IMN-CSIC, Madrid, Spain; ³ C2N, Palaiseau, France; ⁴ Fraunhofer ISE, Freiburg, Germany; ⁵ Polytechnic University of Milan, Milan, Italy

2AO.3.3 Micro-Crystal GaAs Array Sub-Cells for Si Tandem Solar Cells

James Patrick Connolly¹, Ahmed Nejim², Alexandre Jaffré¹, José Alvarez¹, Jean-Paul Kleider¹, Denis Mencaraglia¹, Laurie Dentz³, Géraldine Hallais³, Frederic Hamouda³, Laetitia Vincent³, Daniel Bouchier³, Charles Renard³

¹ CNRS, Gif-sur-Yvette, France; ² Silvaco, St Ives, United Kingdom; ³ CNRS, Palaiseau, France

2AO.3.4 Impact of Luminescent Coupling on Tandem EQE Quantified by Rigorous Opto-Electronic Simulation

Simon Zeder¹, Tabea Krucker², Davide Moia¹, Beat Ruhstaller¹, Urs Aeberhard¹

¹ Fluxim, Winterthur, Switzerland; ² ZHAW, Winterthur, Switzerland

2AO.3.5 Multiscale Models for Perovskite Optimisation

Philippe Baranek¹, James Connolly², Antoine Gissler¹, Philip Schulz³, Michel Rerat⁴, Roberto Dovesi⁵

¹ EDF R&D, Palaiseau, France; ² GEEPS, Gif sur Yvette, France; ³ UMR IPVF, Palaiseau, France; ⁴ IPREM, Pau, France; ⁵ Accademia Delle Scienze, Torino, Italy

2AO.3.6 Student Awards Finalist Presentation: Modelling Recovery in Perovskite Solar Cells Under Light and Dark to Address Stability Challenges

Guillem Álvarez-Pérez¹, Jean Baptiste Puel¹, Jean François Guillemoles¹

¹ IPVF, Palaiseau, France

ORAL PRESENTATIONS 1AO.6

17:00 - 18:30 Si Heterojunction Solar Cells and Related Processing Steps

Chairpersons: Pere Roca i Cabarrocas
LPICM-CNRS, Palaiseau, France
Audrey Morisset
CSEM, Neuchâtel, Switzerland

1AO.6.1 Student Awards Finalist Presentation: Evaluating Silicon Heterojunction Solar Cell Stability under Industrial Illuminated Hydrogenation Conditions

Maysa Sarsour¹, Chukwuka Madumelu¹, Alison Ciesla¹, Fiacre Rougieux¹, Martin Green¹, N.J. Ekins-Daukes¹, Jessica Yajie Jiang¹

¹ UNSW, Sydney, Australia

1AO.6.2 High Efficiency Silicon Heterojunction (SHJ) Solar Cells with Silver-Free Metallization; Comparing Ag, AgCu and Cu Metallization

Mohamed Issifi Yacouba¹, Andreas Lambert¹, Yanxin Liu¹, Henrike Gattermann¹, Volker Lauterbach¹, Karsten Bittkau¹, Uwe Rau¹, Kaining Ding¹

¹ FZJ, Jülich, Germany

1AO.6.3 Al-Doped ZnO as Highly Passivating, Transparent and Conductive Electron-Contacts in Silicon Solar Cells: from Fundamentals to Future Prospects

Leonard Simeonov¹, W. M. M. Kessels¹, Bart Macco¹

¹ TU Eindhoven, Eindhoven, The Netherlands

1AO.6.4 DC- and RF-Sputtered MoOx for Silicon Heterojunction Solar Cells

Yi Zheng¹, Yifeng Zhao¹, Liqi Cao¹, Christian Linke², Engin Özkol¹, Yingwen Zhao¹, Luana Mazzarella¹, Olindo Isabella¹

¹ TU Delft, Delft, The Netherlands; ² Plansee, Reutte, Austria

1AO.6.5 Indium-Free Silicon Heterojunction Solar Cells: Achieving High Conductivity with Magnetron-Sputtered SnO2

Takashi Koida¹, Takuya Matsui¹, Hitoshi Sai¹

¹ AIST, Tsukuba, Japan

1AO.6.6 Investigating the Degradation Behavior Induced by a Screen Printed Copper Paste on SHJ Solar Cells

Valentin Duval¹, Adeline Lanterne¹, Erwann Fourmond², Johann Jourdan¹, Gustavo Rodrigues Lopes¹, Benoit Marie¹, Gauthier Lefevre³

¹ CEA-INES, Le Bourget du Lac, France; ² INSA, Lyon, France; ³ CEA-LITEN, Grenoble, France



ORAL PRESENTATIONS 4AO.9

17:00 - 18:30 Irradiance for PV Design | Shading and Glare Mitigation

Chairpersons: Ana Maria Gracia Amillo
CENER, Sarriguren, Spain
Anton Driesse
PV Performance Labs, Freiburg, Germany

4AO.9.1 Reflective Properties of Urban Materials and Their Impact on PV Yield

Christian Schläger¹, Dennis Bredemeier¹, Arne Dittrich², Jan Hendrik Pfau¹, Philip Kühne¹, Rolf Brendel²

¹ Leibniz University Hannover, Hannover, Germany; ² ISFH, Emmerthal, Germany

4AO.9.2 Impact of Dust Storms on Photovoltaic Generation: Role of Weather Parameters in Dust Accumulation and Mitigation Strategies

Shukla Poddar¹, Merlinda Kay¹, Bram Hoex¹

¹ UNSW, Sydney, Australia

4AO.9.3 Short-Term Variability of PV Power Output based on Simulations with Solargis Time Series Data

Martin Opatovsky¹, Juraj Betak¹, Konstantin Rosina¹, Marta Plefort Ojer¹

¹ Solargis, Bratislava, Slovakia

4AO.9.4 Power Electronics Response to Moving Shade in Hybrid Solar Wind Park

Antonius R. (Teun) Burgers¹, Nico J.J. Dekker¹, Lenneke H. Slooff¹, Jaco Hovius²

¹ TNO, Petten, The Netherlands; ² Vattenfall, Amsterdam, The Netherlands

4AO.9.5 PV Shading Models with PVLIB

Adrián Blanco Aguiar¹, Brais González Rodríguez¹, María Martínez-Barbeito¹, Miguel Sánchez de León Peque¹, Clara Casas Castedo¹

¹ ieco.io, Vigo, Spain

4AO.9.6 Addressing Glare Problematics for Photovoltaic Projects in the Immediate Proximity of Roads and Railways through the Use of Accurate Digital Surface Models

John Coutel¹, Aina Razanajao¹, Christophe Vernay¹, Sébastien Pitaval¹

¹ SOLAIS, Valbonne, France

VISUAL PRESENTATIONS 3AV.3

17:00 - 18:30 PV Modules Characterisation and Performances Assessment

Chairpersons: Giorgio Bardizza
TÜV Rheinland Solar, Milan, Italy
Jaione Bengoechea
CENER, Sarriguren, Spain

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 1-2BO.1

08:30 - 10:00 Interplay of Interfaces on the Property of Perovskite | Silicon Tandems

Chairpersons: Ivan Gordon
imec, Genk, Belgium
Delfina Muñoz
CEA, Le Bourget-du-Lac, France

1BO.1.1 Optimization of TOPCon-based Bottom Cells for High Open-Circuit Voltage (>2V) Perovskite/Silicon Tandems

Julien Hurni¹, Kerem Artuk¹, Christophe Allebé², Bertrand Paviet-Salomon², Christian Wolff¹, Christophe Ballif¹, Audrey Morisset², Franz-Josef Haug¹

¹ EPFL, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland

1BO.1.2 TOPCon²-Based Perovskite/Silicon Tandem Solar Cells

Armin Richter¹, Mario Hanser¹, Jana-Isabelle Polzin¹, Anna Damm¹, Martin Bivour¹, Jan Benick¹, Stefan Glunz¹

¹ Fraunhofer ISE, Freiburg, Germany

1BO.1.3 Impact of c-Si Bottom Cell Nanoroughness on the Performance of Perovskite/c-Si Tandem Solar Cells

Yifeng Zhao¹, Esma Ugur², Arsalan Razzaq², Thomas G. Allen², Paul Procel¹, Adi Prasetyo², Katarina Kovačević¹, Luana Mazzarella¹, Erkan Aydin³, Stefaan De Wolf², Olindo Isabella¹

¹ TU Delft, Delft, The Netherlands; ² KAUST, Thuwal, Saudi Arabia; ³ LMU, Munich, Germany

2BO.1.4 Student Awards Finalist Presentation: Impact of Substrate Topography on Sequentially Evaporated Perovskite Film Growth: a Comparative Study of Planar and Textured Silicon Substrates for Tandem Application

Mohamed A. A. Mahmoud¹, Tobias Schulz², Yashika Gupta¹, Michael Günthel¹, Oussama Er-Raji¹, Oliver Fischer¹, Martin Bivour¹, Juliane Borchert¹

¹ Fraunhofer ISE, Freiburg, Germany; ² Martin-Luther-University, Halle, Germany

2BO.1.5 Indium-free Materials in the Tunnel Recombination Junction for Perovskite/Silicon Tandem Solar Cells

Angelika Harter¹, Dorothee Menzel¹, Lea Zimmermann¹, Sergei Trofimov¹, Darja Erfurt¹, Bor Li¹, Steve Albrecht¹, Bernd Stannowski¹

¹ HZB, Berlin, Germany

2BO.1.6 Hybrid Two-Step Inkjet-Printing for Scalable and Conformal Perovskite-Si Tandem Solar Cells

Raphael Pesch¹, Johannes Sutter¹, Ulrich Lemmer¹, Ulrich Wilhelm Paetzold¹

¹ KIT, Karlsruhe, Germany



ORAL PRESENTATIONS 4BO.6

08:30 - 10:00 Assessing the Reliability of PV Systems

Chairpersons: Gisele A. dos Reis Benatto
DTU, Roskilde, Denmark
Markus Rinio
University of Karlstad, Sweden

4BO.6.1 Three Decades, Three Climates: Insights and Lessons on PV Reliability

Hugo Quest¹, Ebrar Özkalay², Anika Gassner³, Alessandro Virtuani⁴,
Gabriele Eder³, Stefanie Vorstoffel⁵, Claudia Buerhop-Lutz⁵, Gabi Friesen²,
Christophe Ballif⁶, Matthias Burri⁷, Christof Bucher⁷
¹ 3S Swiss Solar Solutions, Gwatt (Thun), Switzerland; ² SUPSI, Mendrisio, Switzerland; ³
OFI, Vienna, Austria; ⁴ CSEM, Neuchâtel, Switzerland; ⁵ HI ERN, Erlangen, Germany; ⁶
EPFL, Neuchâtel, Switzerland; ⁷ BFH, Burgdorf, Switzerland

4BO.6.2 Solar Bankability: A Decade of Insights and Future Directions

Sandra Gallmetzer¹, Atse Louwen¹, Guillermo Hernandez², Paolo Busetta³,
David Moser¹
¹ Eurac Research, Bolzano, Italy; ² BayWa, Rome, Italy; ³ Saidea, Trento, Italy

4BO.6.3 Non-Destructive Detection of Water Ingress in Solar Modules using NIR Spectroscopy

Oleksandr Mashkov¹, Oleksandr Stroyuk¹, Claudia Buerhop¹, Sanna Bind²,
Dylan Clark², Jens Hauch¹, Ian Marius Peters¹
¹ HI ERN, Erlangen, Germany; ² i-MEET FAU, Erlangen, Germany

4BO.6.4 Massive LeTID Recovery Tool. Field Demonstration in a Utility Scale PV Plant

Mario Martinez¹, Sergio Suarez¹, Hanfei Liu¹, Manuel Rodríguez¹, Gustavo
Navas¹, Jose Manuel Rivas¹, Sofía Rodríguez-Conde¹
¹ Enertis Applus+, Madrid, Spain

4BO.6.5 Finding the Needle in a 100 MWp Haystack

Marie Syre Wiig¹, Magnus Moe Nygård¹, Bjørn Aarseth¹, Erik S. Marstein¹
¹ IFE, Kjeller, Norway

4BO.6.6 Cost-Benefit Analysis of Luminescence Techniques vs. Infrared Thermography in Utility-Scale PV Inspections

Lukas Koester¹, Sandra Gallmetzer¹, Mousa Sondoqah¹, Atse Louwen¹,
Giampaolo Manzolini², David Moser¹
¹ Eurac Research, Bolzano, Italy; ² Polytechnic University of Milan, Milan, Italy

ORAL PRESENTATIONS 3BO.11

08:30 - 10:00 Imaging Techniques for PV Modules

Chairpersons: Jaione Bengoechea
CENER, Sarriguren, Spain
Silvia Maria Pietralunga
CNR, Milano, Italy

3BO.11.1 Latent Fault Identification for HJT Modules Subjected to Severe Hailstorm

Nicola Trivellin¹, Marco Nicoletto¹, Davide Panizzon¹, Alessandro Caria¹,
Carlo De Santi¹, Matteo Buffolo¹, Gaudenzio Meneghesso¹, Enrico
Zanoni¹, Matteo Meneghini¹
¹ University of Padova, Padova, Italy

3BO.11.2 Investigating the Correlation between Cracks and the Extracted Performance Parameters in PV Modules

Ahmad Hashem¹, Zonghan Jiang¹, Guido Willers¹, Leila Mortazavifar¹,
Bengt Jaeckel², Ralph Gottschalg²
¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle
(Saale), Germany

3BO.11.3 An Electroluminescence Dataset for Visual Question Answering Foundation Models

Mohanad Diab¹, Lukas Koester¹, Atse Louwen¹, David Moser¹
¹ Eurac Research, Bolzano, Italy

3BO.11.4 Unlocking PV Performance: AI-Driven Defect Detection with Multi-Spectral Imaging

Ebrar Özkalay¹, Ralf Jandl², Danuta Paraficz², Martina Perani², Mattia
Ceretti¹, Mauro Caccivio¹
¹ SUPSI, Mendrisio, Switzerland; ² FFHS, Zurich, Switzerland

3BO.11.5 Asynchronous Daylight Luminescence obtained without Programmable Power Sources

Cristian Terrados¹, Eva de la Viuda¹, Kabir Paul Sulca¹, Julian Anaya¹,
Miguel Ángel González¹, Oscar Martínez¹
¹ University of Valladolid, Valladolid, Spain

3BO.11.6 Luminescence Measurement with a Cost-Effective and Small-Sized Hood-based Tool under Daylight Condition

Marc Köntges¹, Michael Siebert¹, Michael Fuß²
¹ ISFH, Emmerthal, Germany; ² MBJ Solutions, Ahrensburg, Germany

ORAL PRESENTATIONS 4BO.16

08:30 - 10:00 Color in Photovoltaics

Chairpersons: Gabriele C. Eder
OFI, Vienna, Austria
Jun-Tae Kim
Kongju National University, Cheonan, South Korea

4BO.16.1 Student Awards Finalist Presentation: Experimental Investigation of Colored BIPV/T Systems for Wood-Framed Roofs

Anna-Maria Sigounis¹, Andreas Athienitis¹
¹ Concordia University, Montreal, Canada



4BO.16.2 Beyond 21% Coloured PV Cell Enabled by Ultra-Stable Perovskite Quantum Dots/ EVA Composite Film

Minya Zhou¹, Yuanxun Liao¹, Hanchen Li¹, Shujuan Huang², Robert Patterson¹, Martin A. Green¹, Jessica Yajie Jiang¹

¹ UNSW, Sydney, Australia; ² Macquarie University, Sydney, Australia

4BO.16.3 How to Perform Accurate Colour Measurements for BIPV Module Glass Covers: an IEA PVPS Task 15 Round-Robin Measurement Campaign

Markus Babin¹, Gabriele C. Eder², Helen R. Wilson³, Yuliya Voronko², Sune Thorsteinsson¹, Janina Willmann³, Janne Halme⁴, Thomas Friesen⁵, Martina Pelle⁶, Laura Maturi⁶, Fabrizio Leonforte⁷, Niccolò Aste⁷, Claudio Del Pero⁷, Jun-Tae Kim⁸, Gabriele Friesen⁹, Francesco Frontini⁹

¹ DTU, Roskilde, Denmark; ² OFI, Vienna, Austria; ³ Fraunhofer ISE, Freiburg, Germany; ⁴ Aalto University, Espoo, Finland; ⁵ Megasol Energie, Deitingen, Switzerland; ⁶ Eurac Research, Bolzano, Italy; ⁷ Polytechnic University of Milan, Milan, Italy; ⁸ Kongju National University, Chungnam, South Korea; ⁹ SUPSI, Mendrisio, Switzerland

4BO.16.4 Optical Design of Structural Colored Interlayers with Low Angular Color Dependence for Building-Integrated Photovoltaic Modules

Catarina Ferreira¹, Jani Lamminaho², Ananta Paul², Markus Babin³, Nanna Lysgaard Andersen³, Peter Behrendorff Poulsen³, Sune Thorsteinsson³, Karlis Petersons⁴, Leif Yde⁴, Jan Stensborg⁴, Joel Cox¹, Morten Madsen²

¹ SDU, Odense, Denmark; ² SDU, Sønderborg, Denmark; ³ DTU, Roskilde, Denmark; ⁴ Stensborg, Roskilde, Denmark

4BO.16.5 A New Algorithm to Design PV with Arbitrary Color

Jonas Schaible¹, Markus Götz², Sven Burger³, Christiane Becker⁴, Klaus Jäger¹

¹ HZB, Berlin, Germany; ² KIT, Karlsruhe, Germany; ³ Zuse Institute Berlin, Berlin, Germany; ⁴ HTW, Berlin, Germany

4BO.16.6 'Predicting Light Scatter in Structural Colored BIPV Modules and Textured Glass using Radiance

Nanna L. Andersen¹, Markus Babin¹, Karlis Petersons², Leif Yde², Jan F. Stensborg², Catarina G. Ferreira³, Ananta Paul³, Jani Lamminaho³, Joel D. Cox³, Morten Madsen³, Peter B. Poulsen¹, Sune Thorsteinsson¹

¹ DTU, Roskilde, Denmark; ² Stensborg, Roskilde, Denmark; ³ University of Southern Denmark, Odense, Denmark

VISUAL PRESENTATIONS 2BV.1

08:30 - 10:00 New Materials, Devices and Conversion Concepts | New Modelling and Characterisation Techniques

Chairpersons: Jozef (Jef) Poortmans
imec, Leuven, Belgium

Iñigo Ramiro
UPM, Madrid, Spain

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 1BO.2

10:30 - 12:00 Characterisation and Modelling of Si Solar Cells

Chairpersons: Ronald Sinton
Sinton Instruments, Boulder, United States of America
Hatice Duman
KalyonPV, Ankara, Türkiye

1BO.2.1 Special Introductory Presentation: Novel c-Si Solar Cell Designs for Unlocking 28% Efficiency and Beyond

Paul Procel Moya¹, Yifeng Zhao¹, Olindo Isabella¹
¹ TU Delft, Delft, The Netherlands

1BO.2.2 Detecting Local Laser-Doping Variations by Hyperspectral Imaging and Machine Learning Models

Marko Turek¹, Stefan Eiternick¹, Jonathan Linke², Jan Hoß²
¹ Fraunhofer CSP, Halle (Saale), Germany; ² ISC Konstanz, Konstanz, Germany

1BO.2.3 Student Awards Finalist Presentation: Correlation Between Chemical Bonding State and Interface Passivation in TiOx Electron Selective Passivating Contact for Si Solar Cells

Shohei Fukaya¹, Kazuhiro Gotoh², Tappei Nishihara³, Hitoshi Sai⁴, Yasuyoshi Kurokawa¹, Noritaka Usami¹, Takuya Matsui⁴
¹ Nagoya University, Nagoya, Japan; ² Niigata University, Niigata, Japan; ³ JASRI, Hyogo, Japan; ⁴ AIST, Tsukuba, Japan

1BO.2.4 Numerical Modelling of UV Down-shifting Layers for Improved Stability and Energy Yield of Silicon Solar Cells

Benjamin Lipovšek¹, Nicolas Frédéric Rochat², Franz-Josef Haug², Antonin Faes², Christophe Ballif², Marko Topič¹
¹ University of Ljubljana, Ljubljana, Slovenia; ² EPFL, Neuchâtel, Switzerland

1BO.2.5 Ultrathin a-Si:H/Oxide Transparent Solar Cells Exceeding 2% Light Utilization Efficiency for Indoor PV Applications

Alex J. Lopez-Garcia¹, Gustavo Álvarez-Suárez², Pau Estarlich², Gerard Masmitja², José Miguel Asensi³, Cristóbal Voz², Joaquim Puigdollers², Alejandro Perez Rodriguez¹
¹ IREC, Barcelona, Spain; ² UPC, Barcelona, Spain; ³ UB, Barcelona, Spain

ORAL PRESENTATIONS 4BO.7

10:30 - 12:00 Field Insights, Performance and Modelling of PV Systems

Chairpersons: Roland Einhaus
ZSW, Stuttgart, Germany
Alessandro Virtuani
CSEM, Neuchâtel, Switzerland

4BO.7.1 Special Introductory Presentation: LiDAR Meets Modelling: Collaborative Insights from a Round-Robin of Vertical Bifacial PV Simulations

Ioannis (John) Tsanakas¹, Stéphane Mollier¹, Hervé Colin¹, Ismaël Lokhat², Branislav Schnierer³, Daniel Chrkavy³, Martin Opatovsky³, S. Prithivi Rajan⁴, Jesús Robledo⁴, Jonathan Leloux⁴
¹ CEA, Le Bourget-du-Lac, France; ² Cythelia Energy, La Motte-Servolex, France; ³ Solargis, Bratislava, Slovakia; ⁴ LucSun, Villers-la-Ville, Belgium



- 4BO.7.2 Robust PV Performance Loss Rate Calculation for High Latitudes**
Lauri Karttunen¹, Sami Jouttijärvi¹, Väinö Anttalainen¹, Juha A. Karhu², Anders V. Lindfors², Samuli Ranta³, Kati Miettunen¹
¹ University of Turku, Turku, Finland; ² Finnish Meteorological Institute, Helsinki, Finland; ³ TUAS, Turku, Finland
- 4BO.7.3 Detailed Analysis of Degradation Rates of Operating PV Assets in Tropical Climate Conditions**
Xiaoqi Xu¹, André M Nobre², Han Cao¹, Yu Xu¹, Ian Marius Peters³, Thomas Reindl¹
¹ SERIS, Singapore, Singapore; ² PV Doctor, Singapore, Singapore; ³ FZ Jülich, Erlangen, Germany
- 4BO.7.4 Modeling the Electrical Mismatch Caused by Potential Induced Degradation in Crystalline Silicon Photovoltaic Modules and Strings**
Aysha Mahmood¹, Peter B. Poulsen¹, Sergiu V. Spataru¹
¹ DTU, Roskilde, Denmark
- 4BO.7.5 Detect, Decouple, Optimise: Insights into PV Faults and Performance Trends**
Hugo Quest¹, Christophe Ballif², Alessandro Virtuani³
¹ 3S Swiss Solar Solutions, Gwatt (Thun), Switzerland; ² EPFL, Neuchâtel, Switzerland; ³ CSEM, Neuchâtel, Switzerland

ORAL PRESENTATIONS 3BO.12

- 10:30 - 12:00 Characterisation and Energy Rating of PV Modules**
Chairpersons: Hanna Ellis
European Commission JRC, Ispra, Italy
Ana Maria Gracia Amillo
CENER, Sarriuren, Spain

- 3BO.12.1 Developing a Novel I-V Translation Methodology in Accordance with IEC 60891:2021 Correction Procedure 1 and 2**
Wenhao (Frank) Xu¹, Yating Zhang¹, Mengdi Liu¹, Christos Monokroussos¹, Werner Herrmann², Giorgio Bardizza², Harald Mülleians³
¹ TÜV Rheinland, Shanghai, China; ² TÜV Rheinland Solar, Cologne, Germany; ³ European Commission JRC, Ispra, Italy
- 3BO.12.2 Student Awards Finalist Presentation: Testing VIPV Curved Modules: Methods and Challenges**
Ricardo Moruno¹, Rubén Núñez¹, Rebeca Herrero¹, Luis Javier San José¹, Francisco Martín¹, Guido Vallerotto¹, Ignacio Antón¹
¹ UPM, Madrid, Spain
- 3BO.12.3 Stable, Standardized PV Reference Cells for Field Performance and Yield Assessment**
Anton Driesse¹, Aron Habte², Manajit Sengupta², Tao Song²
¹ PV Performance Labs, Freiburg, Germany; ² NREL, Golden, United States of America
- 3BO.12.4 Estimating the Energy Yield of Bifacial Photovoltaics with the JRC's Photovoltaic Geographic Information System**
Nigel Taylor¹, Teodora Lyubenova¹, Lavanya Malarkannan², Nikos Alexandris¹, Alexandros Falangas³, Robert Kenny¹, Ewan D. Dunlop¹, Blago Mihaylov¹
¹ European Commission JRC, Ispra, Italy; ² NPL, Teddington, United Kingdom; ³ Trasy, Brussels, Belgium

3BO.12.5 An Update on Energy Rating Amendments – Integration of Bifacial Modules

Stefan Riechelmann¹, Hendrik Sträter¹, Ana María Gracia², Sophie Pelland³, Driesse Anton⁴
¹ PTB, Braunschweig, Germany; ² CENER, Pamplona, Spain; ³ Natural Resources Canada, Varennes, Canada; ⁴ PV Performance Labs, Freiburg, Germany

3BO.12.6 Characterization, Modeling, and Simulation of Ultraviolet Downshifting Front Encapsulant for Photovoltaic Modules

Nicolas Frédéric Rochat¹, Florian Ollagnon¹, Benjamin Lipovšek², Marko Topič², Hengyu Li³, Matthieu Despeisse³, Lison Marthey³, Jordi Escarré Palou³, Franz-Josef Haug¹, Antonin Faes¹, Christophe Ballif¹
¹ EPFL, Neuchâtel, Switzerland; ² University of Ljubljana, Ljubljana, Slovenia; ³ CSEM, Neuchâtel, Switzerland

ORAL PRESENTATIONS 4BO.17

- 10:30 - 12:00 Performance of PV on/in Buildings**
Chairpersons: Angele Reinders
Eindhoven University of Technology, The Netherlands
Simon Boddaert
CSTB, Sophia Antipolis, France

- 4BO.17.1 Modeling Partial Shading at the Cell Level on Photovoltaic Modules**
Jean-Paul Calin¹, Jacques Levrat², Antonin Faes², Fahrudin Mujović², Paul Rémondeau³, Kléber Nicolet-dit-Félix³, Bénédicte Bonnet-Eymard², Didier Dalmazzone¹, Aïcha Hessler-Wyser³, Christophe Ballif³
¹ ENSTA Paris, Palaiseau, France; ² CSEM, Neuchâtel, Switzerland; ³ EPFL, Neuchâtel, Switzerland

- 4BO.17.2 Market Potential of Building-Integrated Photovoltaics: a Granular Analysis of the European Building Stock**
Juan Ignacio Martinez¹, Julien Van Overstraeten², Philippe Macé², José María Vega de Seoane¹, Elina Bosch², Mélodie de l'Epine³
¹ Becquerel Institute España, San Sebastian, Spain; ² Becquerel Institute, Brussels, Belgium; ³ Becquerel Institute France, Lyon, France

- 4BO.17.3 Photovoltaics in the Built Environment – an Overview of Timely Topics for Research and Development**
Francesco Frontini¹, Angele Reinders²
¹ SUPSI, Mendrisio, Switzerland; ² TU Eindhoven, Eindhoven, The Netherlands

- 4BO.17.4 Comparing the Energy Yield and Degradation Rates of Smart PV Modules Compared to Conventional PV System Designs in Shaded Urban Scenario's**
Youri Blom¹, Rudi Santbergen¹, Olindo Isabella¹, Malte Ruben Vogt¹
¹ TU Delft, Delft, The Netherlands

- 4BO.17.5 Advancing BIPV: Shingled HJT Technology for High-Efficiency and Aesthetic Solar Integration**
Gabiella Gonnella¹, Alvaro De Gruijter¹, Jordi Veirman¹, Laura Maturi¹, David Moser¹
¹ Eurac Research, Bolzano, Italy



4BO.17.6 PV-Planning and Simulation, Daylight Simulation and Energy-Certificate Calculation based on an Open-BIM-Building-Model

Astrid Schneider¹, Karin Stieldorf¹, Christian Schranz¹, Harald Urban¹, Alfred Waschl², Markus Feichtner³, Fedele Rende⁴, Andrea Aiello⁴, Martin Hauer⁵, Kurt Battisti⁶, Markus Dörn⁶, Jacqueline Scherret⁶, Martin Treberspurg⁷, Christoph Treberspurg⁷

¹ TU Wien, Vienna, Austria; ² buildingSMART, Vienna, Austria; ³ Sonnenkraft, St. Veit an der Glan, Austria; ⁴ ACCA Software, Cosenza, Italy; ⁵ Bartenbach, Vienna, Austria; ⁶ A-Null Development, Vienna, Austria; ⁷ Treberspurg & Partner Architekten, Vienna, Austria

VISUAL PRESENTATIONS 2BV.2

10:30 - 12:00 Compound and Organic Semiconductors

Chairpersons: Mirjam Theelen
TNO/Solliance, Eindhoven, The Netherlands
Alessandro Romeo
University of Verona, Italy

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 1BO.3

13:30 - 15:00 Si Solar Cell Manufacturing Processes

Chairpersons: Marina Foti
3Sun, Catania, Italy
Qi Wang
YIST, Jiangyin, China

1BO.3.1 Strong and Resilient European High-Tech Manufacturing by Advancing Solar Innovation

Rudolf Harney¹, Puzant Baliozian², Thorsten Dullweber³, Wolfgang Jooß⁴, Ivona Kafedjiska⁵, Radovan Kopecek¹, Joris Libal¹, Sebastian Nold⁶, Ralf Preu⁶, Julian Reichle⁴, Udo Römer³, Rutger Schlatmann⁵, Bernd Stannowski⁵

¹ ISC Konstanz, Konstanz, Germany; ² VDMA, Frankfurt, Germany; ³ ISFH, Hamelin, Germany; ⁴ RCT Solutions, Konstanz, Germany; ⁵ HZB, Berlin, Germany; ⁶ Fraunhofer ISE, Freiburg, Germany

1BO.3.2 Pathway to TBC: Process, Design, and Cost Implications for New PERC & TOPCon Lines

Julian Reichle¹, Sraisth Sraisth¹, Mehul Raval¹, Gourab Das¹, Andreas Teppe¹, Wolfgang Jooss¹, Peter Fath¹

¹ RCT Solutions, Constance, Germany

1BO.3.3 Industrial Implementation of 24.1% Efficient POLO IBC Solar Cells and Future Upgrade to > 26% POLO2 IBC

Thorsten Dullweber¹, Yevgeniya Larionova¹, Philip Jaeger¹, Sabrina Schimanke¹, Melanie Ripke¹, Ulrike Baumann¹, Alaa Osman¹, Udo Roemer¹, Robby Peibst¹, Rolf Brendel¹, Ozlem Coskun², Gamze Cekerek², Meric Caliskan Arslan², Geoffrey Gregory³, Erik Hoffmann³, Massimo Centazzo³

¹ ISFH, Emmerthal, Germany; ² Kalyon PV, Ankara, Türkiye; ³ EnPV, Karlsruhe, Germany

1BO.3.4 Using a Shadow Mask during Gas-Phase Etching: a one Step, Single-Side Patterning Method for Poly-Silicon Layers

Laurent Clochard¹, Thorsten Dullweber², Yevgeniya Larionova²

¹ Nines Photovoltaics, Dublin, Ireland; ² ISFH, Hamelin, Germany

1BO.3.5 From Pixels to Performance: Predicting Quality at Early-Stage and Revealing Defect-Formation in HJT Solar Cell Production

Matthias Demant¹, Aasapriya Chandran¹, Alexandra Wörnhör¹, Jonas Haunschild¹, Thomas Brox², Stefan Rein¹

¹ Fraunhofer ISE, Freiburg, Germany; ² University of Freiburg, Freiburg, Germany

1BO.3.6 UV Stable Passivation Stack with Plasma-Enhanced Atomic Layer Deposition of Aluminum Oxide from an Industrial Tube-Type Direct Plasma-Enhanced Chemical Vapor Deposition System

Byungsul Min¹, Christina Hollemann¹, Viet Xuan Nguyen², Thomas Pernau², Daniela Seiffert², Helge Haverkamp², Thorsten Dullweber¹, Verena Mertens¹, Henning Schulte-Huxel¹, Rolf Brendel¹

¹ ISFH, Emmerthal, Germany; ² centrotherm international, Blaubeuren, Germany

ORAL PRESENTATIONS 2BO.8

13:30 - 15:00 Advanced Conversion Devices

Chairpersons: Claudia Malerba
ENEA, Rome, Italy
Govind Padmakumar
TU Delft, The Netherlands

2BO.8.1 Singlet Fission Route for >30% Efficient Solar Cells: Silicon Cell Requirements

Shona McNab¹, Alex J. Baldacchino¹, Pheobe Pearce¹, Alvin Mo¹, Alison Ciesla¹, Bram Hoex¹, Nicholas J. Ekins-Daukes¹, Murad J. Y. Tayebjee¹, Michael P. Nielsen¹

¹ UNSW, Sydney, Australia

2BO.8.2 Over 18% Efficient Cu₂ZnSnS₄ Solar Cells for Indoor Applications Enabled by Alkali Doping and Cation Alloying

Yuancai Gong¹, Alex Jimenez-Arguijo¹, Ivan Cano¹, Romain Scaffidi², Alejandro Navarro-Güell¹, Oriol Segura-Blanch¹, Sergio Giraldo¹, Marcel Placidi¹, Zacharie Jehl Li-Kaoa¹, Edgardo Saucedo¹

¹ UPC, Barcelona, Spain; ² Hasselt University, Hasselt, Belgium

2BO.8.3 Fully Transparent Photovoltaic Devices based on ZnO_{1-x}S_x Absorbers: Study of the MoO_x Hole Transport Layer

Marta Miró-Llorente¹, Gustavo Alvarez¹, Alex J. Lopez-Garcia¹, Victoria Rotaru¹, Diouldé Sylla¹, Maxim Guc¹, Victor Izquierdo-Roca¹, Alejandro Pérez-Rodríguez¹, Pedro Vidal-Fuentes¹

¹ IREC, Sant Adrià de Besòs, Spain

2BO.8.4 Surface Passivation of Black Germanium for Interdigitated Back Contact Thermophotovoltaic Cell

Mansur Gamel¹, Gerard Rivera¹, Gema Lopez¹, Mariia Terletskaia², Hanchen Liu², Ville Vahanissi², Hele Savin², Moises Garin³, Isidro Martin¹

¹ UPC, Barcelona, Spain; ² Aalto University, Espoo, Finland; ³ UVIC-UCC, Vic, Spain



2BO.8.5 Performance of a 4-Terminals Spectral Splitting Asymmetric Solar Concentrator in Diffuse Sunlight: a Numerical Study

Floriana Morabito¹, Daniela Fontani², Paola Sansoni², Mehdi Ahmadi³, Salvatore Lombardo³, Andrea Farina¹, Silvia Maria Pietralunga¹
¹ CNR-IFN, Milan, Italy; ² CNR-INO, Florence, Italy; ³ CNR-IMM, Catania, Italy

2BO.8.6 GaAs for Thermophotonics: from Thin-Film Solar Cells to Highly Efficient LEDs

Natasha Gruginskie¹, Peter Mulder¹, Gerard Bauhuis¹, Jani Oksanen², John Schermer¹
¹ Radboud University, Nijmegen, The Netherlands; ² Aalto University, Espoo, Finland

VISUAL PRESENTATIONS 4BV.3

13:30 - 15:00 Solar Resource and Forecasting

Chairpersons: Ana Maria Gracia Amillo
CENER, Sarriguren, Spain
Dunia Bachour
HBKU/ Qatar Foundation, Doha, Qatar

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

PANEL DISCUSSION

13:30 - 15:00 BO.13: Reliability and Bankability in PV

Moderators: Alessandro Virtuani
CSEM, Neuchâtel, Switzerland
Ulrike Jahn
Fraunhofer CSP, Germany

This panel discussion will explore the critical link between module reliability and bankability in the context of advanced silicon PV technologies, specifically TOPCon and HJT. As these high efficiency modules enter the market at scale, concerns arise over the lack of technology specific reliability tests and the limitations of existing standards in predicting long-term field performance. The discussion will highlight the urgent need for stronger, harmonized qualification protocols to reduce financial risk, ensure investor confidence, and support the sustainable deployment of next generation PV.

1 Introductory Presentation: Alessandro Virtuani, CSEM, Switzerland

2 Panelist 1 - Ronald Sastrawan, Green Tech Solution, Germany

3 Panelist 2 - Ralph Gottschalg, Fraunhofer CSP, Germany

4 Panelist 3 - Giorgio Bardizza, TÜV Rheinland, Germany

5 Panelist 4 - Ruben Martínez, Banco Sabadell, Spain

6 Panelist 5 - Julien Dupuis, EDF, France

ORAL PRESENTATIONS 1BO.4

15:15 - 16:45 Novel Metallisation Techniques

Chairpersons: Peter Fath
RCT-Solutions, Konstanz, Germany
Pierre Verlinden
AMROCK, McLaren Vale, Australia

1BO.4.1 Stability of Barrier Layer Stacks against Aluminum for Solar Cells with poly-Si/SiO_x Passivating Contacts

Heiko Plagwitz¹, Benjamin Gapp¹, David Bäurle¹, Emanuel Auerbacher¹, Barbara Terheiden¹
¹ University of Konstanz, Konstanz, Germany

1BO.4.2 Advancements on Post-processing of High Efficiency Cells: Data from Mass Production and Experimental Roadmap

Alessandro Voltan¹, Francesco Dalla Torre¹, Bertrand Hladys², Grazia Litrico³, Alessandro Furnari³, Marcello Sciuto³
¹ Applied Materials, Treviso, Italy; ² CEA, Grenoble, France; ³ Enel Green Power, Catania, Italy

1BO.4.3 Reduction of Silver and Indium Consumption by Copper Plating with a Dielectric Masking Layer for Sustainable Production of Heterojunction Cells

Bertrand Paviet-Salomon¹, Agata Lachowicz¹, Jun Zhao¹, Jörg Schube², Christophe Ballif¹
¹ CSEM, Neuchâtel, Switzerland; ² Fraunhofer ISE, Freiburg, Germany

1BO.4.4 Influence of Particle Shape and Size in Copper based Low-Temperature Metallization Paste for Solar Cells

Oumaima Mhirs¹, M. Noah Wengenmeyr¹, Jonas Bartsch¹
¹ Fraunhofer ISE, Freiburg, Germany

1BO.4.5 Advancements in String Printing for High Aspect Ratio Front Contacts

Jonas Valentijn¹, Hidde Stokkel¹, Mathis Van de Voorde¹, Janis Anderson¹, Rebecca Saive¹

¹ University of Twente, Enschede, The Netherlands

1BO.4.6 Inline Plating of Ni/Cu Contacts for Industrial TOPCon Si Solar Cells - Status and Outlook

Sven Kluska¹, Jonas Eckert¹, René Haberstroh¹, Christian Schmiga¹, Sebastian Mack¹, Mathias Kamp², Damian Brunner², Florian Clement¹
¹ Fraunhofer ISE, Freiburg, Germany; ² Rena Technologies, Freiburg, Germany



ORAL PRESENTATIONS 2BO.9

15:15 - 16:45 New Materials and Structures for PV

Chairpersons: Natasha Gruginskie
Radboud University, Nijmegen, The Netherlands
Shona McNab
UNSW, Sydney, Australia

2BO.9.1 Student Awards Finalist Presentation: High Thermoelectric Performance in Few-Layered p-Type Molybdenum Disulfide for Photovoltaics

Inés Durán Rupérez¹, Jorge Rodríguez-Muro¹, Patricia Cancho García¹, Der-Yuh Lin², Antonio Martí¹, Elisa Antolin¹, Simon A. Svatek¹
¹ UPM, Madrid, Spain; ² National Changhua University of Education, Changhua, Taiwan

2BO.9.2 Experimental Study of Hole Transport Layers for Enhanced Efficiency in Selenium Solar Cells

Oriol Segura Blanch¹, Arnau Torrens Dinarés¹, Ivan Caño Prades¹, Lorenzo Calvo-Barrio¹, Zacharie Jehl¹, Pablo Ortego Villasclaras¹, Marcel Placidi¹, Joaquim Puigdollers Gonzalez¹, Edgardo Saucedo¹
¹ UPC, Barcelona, Spain

2BO.9.3 Advancing Transparent Conductive Oxides: SrNbO₃ as a New Interconnecting Layer in Si-Perovskite 2T Tandem Cells

Johnny Azzi¹, Hervé Roussel¹, Sonia Ortega¹, Jean-Luc Deschanvres¹, Frédérique Ducroquet¹
¹ University of Grenoble Alpes, Grenoble, France

2BO.9.4 CsPbCl₃:Yb³⁺/Mn²⁺ Nanocrystals in Free-Space Luminescent Solar Concentrators for Photovoltaic Yield Enhancement

Mathis Van de Voorde¹, Tim Bekius¹, Rebecca Saive¹
¹ University of Twente, Enschede, The Netherlands

2BO.9.5 Honeycomb Textures on Glass for Solar Cells in Superstrate Configuration

Govind Padmakumar¹, Aravind S. Balaji¹, Federica Saitta¹, Paula Rodriguez¹, Arno H. M. Smets¹
¹ TU Delft, Delft, The Netherlands

2BO.9.6 Next-Generation Agrivoltaic Solutions: Novel Organic and Inorganic Spectrally Selective Thin-Film Solar Cells

Pasquale Morvillo¹, Rosa Ricciardi¹, Manuela Ferrara¹, Marco Della Noce¹, Iurie Usatii¹, Paola Delli Veneri¹, Lucia Vittoria Mercaldo¹
¹ ENEA, Portici, Italy

ORAL PRESENTATIONS 3BO.14

15:15 - 16:45 Characterisation and Outdoor Monitoring of Perovskite-based PV Modules

Chairpersons: Gabi Friesen
SUPSI, Mendrisio, Switzerland
Janina Moereke
Avancis, Munich, Germany

3BO.14.1 Outdoor Measurements of Perovskite Modules

Hanna Ellis¹, Tony Sample¹, Harald Mülleians¹, Ewan D. Dunlop¹
¹ European Commission JRC, Ispra, Italy

3BO.14.2 Module-level Comparison of the Performance and the Effects of Degradation in Two-, Three- and Four-Terminal Perovskite Silicon Tandems under Real-World Operating Conditions

Youri Blom¹, Wenang Suprayogi¹, Malte Ruben Vogt¹, Olindo Isabella¹, Rudi Santbergen¹
¹ TU Delft, Delft, The Netherlands

3BO.14.3 Advanced Outdoor Characterization and Analysis of Meta-Stability in Perovskite Solar Cells using Bayesian Inference

Antoine Burgaud¹, Joseph Chakar², Karim Medjoubi³, Jorge Posadas⁴, Aimad-Eddine Admane³, Jean-Baptiste Puel⁵, Yvan Bonnassieux²
¹ IPVF, Cachan, France; ² LPICM, Paris, France; ³ IPVF, Palaiseau, France; ⁴ EDF, Palaiseau, France; ⁵ EDF, Paris, France

3BO.14.4 Perovskite Mini-Module Voltage Loss Quantification and Analysis by Large Scale Hyperspectral Photoluminescence Imaging

Alexandra Levchenko¹, Pilar Lopez-Varo¹, Marion Provost¹, Karim Medjoubi¹, Jean Rousset², Daniel Ory²
¹ IPVF, Palaiseau, France; ² EDF R&D, Palaiseau, France

3BO.14.5 Stability is (Almost) All You Need: Techno-Economic Assessment of All Dry Perovskite-on-Silicon Tandem PV Modules

Dmitry Bogachuk¹, Peter Tillmann¹, Hao-Cheng Wang², Li Wan², Yewei Zhang², Ye Tian², Delin Lu², Christian Peter¹, Bhaskar Singh³
¹ Solarlab Aiko Europe, Freiburg, Germany; ² Zhejiang Aiko Solar, YiWu, China; ³ Solarlab Aiko Europe GmbH, Freiburg, Germany

3BO.14.6 Towards Inline IV Characterization of Commercial Perovskite PV Modules

Peter Pasmans¹, Stefan Roest¹
¹ Eternal Sun, The Hague, The Netherlands



VISUAL PRESENTATIONS 4BV.4

15:15 - 16:45

BIPV

Chairpersons:

Gabriele C. Eder
OFI, Vienna, Austria
Eduardo Román Medina
Tecnalia, Derio, Spain

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4BO.5

17:00 - 18:30

PV-Products for Buildings

Chairpersons:

Francesco Frontini
SUPSI, Mendrisio, Switzerland
Lenneke H. Slooff
TNO Energy Transition, Petten, The Netherlands

4BO.5.1 Fabrication of a Novel Semi-Translucent BIPV Module Providing High Power Density and Active Daylight Management

Almudena Garcia-Sanchez¹, Guido Vallerotto¹, Jaime J. Hernández², Alejandro García-Cañas², Steve Askins¹, Ignacio Antón¹, Isabel Rodríguez², César Domínguez¹
¹ UPM, Madrid, Spain; ² IMDEA Nanoscience, Madrid, Spain

4BO.5.2 Development of PV-Activated Design Façade Elements and Their Long-Term Stability

Kevin Meyer¹, Wiebke Wirtz¹, Iris Kunze¹, Danny Lorenz², Fynn Klopp², Henning Schulte-Huxel¹
¹ ISFH, Emmerthal, Germany; ² MN-Metall, Neustadt (Holstein), Germany

4BO.5.3 A Comparative Study of Photovoltaic Shading Devices for Net Zero Energy Buildings across French Climates

Mohammad Nazififard¹, Erwin Franquet¹
¹ Côte d'Azur University, Nice, France

4BO.5.4 Module Layout for Reliable Aluminum-based Building-Integrated Photovoltaics

Wiebke Wirtz¹, Kevin Meyer¹, Henning Schulte-Huxel¹, Rolf Brendel¹
¹ ISFH, Emmerthal, Germany

4BO.5.5 Impact of Honeycomb Height and Orientation on the Bending Stiffness of Honeycomb Sandwich Backplanes for Solar Modules

Jessica Ruffiner¹, Kléber Nicolet-dit-Félix², Umang Desai², Antonin Faes², Aïcha Hessler-Wyser², Christophe Ballif²
¹ University of Fribourg, Fribourg, Switzerland; ² EPFL, Neuchâtel, Switzerland

4BO.5.6 Technical and Economic Aspects of Adhesives for Integrated Photovoltaics

Sonja Feldbacher¹, Petra Christöfl¹, Suzanne Westerdijk², Andreas Haller³, Pascal Suter³, Jochen Schuermans⁴, Filip Uyttenhoven⁵, Nikoleta Kyranaki⁶, Roland Valckenborg⁷, Gernot Oreski¹
¹ PCCL, Leoben, Austria; ² MAAN Horti Automation, Raalte, The Netherlands; ³ Ernst Schweizer, Zurich, Switzerland; ⁴ Roartis, Genk, Belgium; ⁵ VDL ETG, Eindhoven, The Netherlands; ⁶ Hasselt University, Hasselt, Belgium; ⁷ TNO, Eindhoven, The Netherlands

ORAL PRESENTATIONS 2BO.10

17:00 - 18:30 Advanced Modelling and Characterisation of Perovskite Solar Cells

Chairpersons: Iñigo Ramiro

UPM, Madrid, Spain

Theresa Magorian Friedlmeier

ZSW, Stuttgart, Germany

2BO.10.1 Special Introductory Presentation: Next-Generation Characterisation: Combining Reflectance and Luminescence Hyperspectral Spectroscopy with Statistical Modelling

Arthur Julien¹, Shuai Nie¹, Ziv Hameiri¹
¹ UNSW, Sydney, Australia

2BO.10.2 On Perimeter Losses in Perovskite Top- and Poly-Si-Passivated Silicon Bottom Cells – do Small Area Tandems Reveal the Full Efficiency Potential?

Felix Haase¹, Lukas Brockmann¹, Annika Raugewitz¹, Verena Steckenreiter¹, Verena Barnscheidt¹, Roland Clausung¹, Sara Baumann¹, Joachim Vollbrecht¹, Welmoed Veurman¹, Johannes Löhr¹, Dongyang Liu¹, Mircea Turcu¹, Lasse Nasebandt¹, Udo Römer¹, David Sylla¹, Jessica Strey¹, Martha Löhning¹, Larissa Mettner¹, Renate Winter¹, Anja Christ¹, Heike Kohlenberg¹, Cornelia Marquardt¹, Emanuel Brueckner¹, Hossein Rabiei¹, Michael Rienäcker¹, Sarah Kajari-Schröder¹, Tobias Wietler¹, Robby Peibst¹
¹ ISFH, Emmerthal, Germany

2BO.10.3 Identifying Performance Limiting Factors in Halide Perovskite Solar Cells: Ionic Effects, Contact Resistance and Inhomogeneities

Davide Moia¹, Ennio Luigi Comi², Mattia Battaglia², Roland Wirth², Daniele Braga¹, Urs Aeberhard¹, Evelyne Knapp², Sandra Jenatsch¹, Beat Rushstaller²
¹ FLUXim, Winterthur, Switzerland; ² ZHAW, Winterthur, Switzerland

2BO.10.4 Imaging Efficiency of Perovskite Solar Cells via Voltage-Dependent Photoluminescence

Anh Dinh Bui¹, Dang-Thuan Nguyen¹, Andreas Fell², Oliver Fischer², Florian Schindler², Martin C. Schubert², Hieu T. Nguyen¹, Daniel MacDonald¹
¹ ANU, Canberra, Australia; ² Fraunhofer ISE, Freiburg, Germany



2BO.10.5 In-depth Characterization and Simulation Approach for the Understanding of In- and Outdoor Degradation of Perovskite Solar Cells

Jonathan Parion¹, Amit Kumar Harit¹, Elias Peraticos², Vasiliki Paraskeva², Maria Hadjipanayi², Aranzazu Aguirre¹, Filip Duerinckx¹, Hariharsudan Sivaramakrishnan Radhakrishnan¹, Jef Poortmans¹, Johan Lauwaert³, Bart Vermang¹

¹ Hasselt University, Genk, Belgium; ² University of Cyprus, Nicosia, Cyprus; ³ Ghent University, Zwijnaarde, Belgium

ORAL PRESENTATIONS 3BO.15

17:00 - 18:30 Outdoor Performances and Degradation Analysis of PV Modules

Chairpersons: Ebrar Özkalay
SUPSI, Mendrisio, Switzerland
Carolyn Ulbrich
HZB, Berlin, Germany

3BO.15.1 Experimental Performance Assessment of Bifacial Modules under Inhomogeneous Rear Irradiance in High Radiation Environments

Robinson Cavieres¹, Felipe Valencia¹, Nicole Torres¹, Edward Fuentealba², Jorge Rabanal-Arabach²

¹ ATAMOSTEC, Antofagasta, Chile; ² University of Antofagasta, Antofagasta, Chile

3BO.15.2 Performance Characterization of Monofacial and Bifacial Modules in French Polynesia: Case Study of Tahiti

Maira Itzel Torres Aguilar¹, Pascal Ortega¹, Jordi Badosa Franch², Johan Parra²

¹ University of French Polynesia, Faa'a, French Polynesia; ² Polytechnic School, Palaiseau, France

3BO.15.3 Spectrally Resolved Energy Yield Prediction of SHJ Modules with UV Downshifting Encapsulant

Maxime Babics¹, Diego Di Girolamo², Vincent Barth¹, Yannick Roujol¹, Jeremie Aime¹, Gabriele Bianca², Antonio Ragonesi², Sandra Desvergne-Bleneau¹, Eszter Voroshazi¹

¹ CEA-INES, Le Bourget-du-Lac, France; ² 3SUN, Catania, Italy

3BO.15.4 Statistical Trends in Nominal vs. Measured Performance of PV Modules and the Impact of Meta-Stability

Daniel Philipp¹, Martin Kaiser¹, Ulli Kräling¹, Paul Gebhardt¹, Alexandra Schmid¹

¹ Fraunhofer ISE, Freiburg, Germany

3BO.15.5 Towards Standardized Test Protocol for Evaluating UV Susceptibility in PV Industry

Ting Huang¹, Ruirui Lv¹, Liang Wu¹, Yuanjie Yu¹, Alan Xu¹, Bram Hoex²

¹ Canadian Solar, Suzhou, China; ² UNSW, Sydney, Australia

3BO.15.6 Fifteen Years Under the Sun: Real-Field Degradation Analysis of Veteran PV Modules

Frédéric Mezzasalma¹, Alexandre Mignonac¹, Hervé Colin¹, Romain Couderc¹, Lionel Sicot¹, Philippe Marechal¹, Guillaume Capron¹, Ioannis Tsanakas¹, Jérémie Aimé¹

¹ CEA INES, Le Bourget-du-Lac, France

VISUAL PRESENTATIONS 1BV.5

17:00 - 18:30 Crystalline Silicon Material: Defects and Recycling | Processes and Concepts for the Manufacturing of Silicon Solar Cells

Chairpersons: Marina Foti
3Sun, Catania, Italy
Bertrand Paviet-Salomon
CSEM, Neuchâtel, Switzerland

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.



PLENARY PRESENTATIONS CP.1

08:30 - 10:00 Si PV Manufacturing: Pushing the Limits of Performance

Chairpersons: Stefan W. Glunz
Fraunhofer ISE, Freiburg, Germany
Paola Delli Veneri
ENEA, Portici, Italy

CP.1.1 Keynote Presentation: Silicon Surface and Interface Study for >27% Efficient SHJ Solar Cell

Guangtao Yang¹, Haijiang Lu¹, Cong Guo¹, Zhan Gao¹, Kun Zhu¹, Yongheng Wang¹, Hongwei Li¹, Qianqian Jiang¹, Haiyang Pei¹, Fangxu Shi¹, Rui He¹, Chong Di¹, Zhigang Xie¹, Yifeng Chen¹

¹ Trina Solar, Changzhou, China

CP.1.2 IBC4EU: European Back Contact Technology

Florian Buchholz¹, Daniel Tune¹, Tobias Meßmer¹, Jonathan Linke¹, Manjunath Prasad¹, Valentin Mihailetchi¹, Juras Ulbikas², Arne Dahle³, Martijn Meereboer⁴, Francesca Fabris⁵, Erik Eikelboom⁵, Tom Borger⁶, Rik Van Dyck⁶, Filip Duerinckx⁶, Hariharsudan Sivaramakrishnan⁶, Timea Bejat⁷, Samuel Harrison⁷, Ashish Binani⁸, Nicolas Guillevin⁸, Jan Kroon⁸, Yevgeniya Larionova⁹, Thorsten Dullweber⁹, Ofer Shochet¹⁰, Isaac Rosen¹⁰, Ingo Röver¹¹, Wolfram Palitzsch¹¹, Yasmin Zaror¹², Johannes Stierstorfer¹², Aurimas Radzevicius¹³, Julius Denafas¹³, Tuomas Vanhanen¹⁴, Tuukka Savisalo¹⁴, Maximilian Pospischil¹⁵, Marian Breitenbücher¹⁵, Ozlem Coskun¹⁶, Melodie de l'Epine¹⁷, Philippe Macé¹⁸, Ian Kenchington¹⁸

¹ ISC Konstanz, Konstanz, Germany; ² Protechnology, Vilnius, Lithuania; ³ Norsun, Årdal, Norway; ⁴ Energyra, Westknollendam, The Netherlands; ⁵ Futurasun, Citadella, Italy; ⁶ IMEC, Genk, Belgium; ⁷ CEA, Le Bourget-du-Lac, France; ⁸ TNO, Petten, The Netherlands; ⁹ ISFH, Hameln, Germany; ¹⁰ Copprint, Jerusalem, Israel; ¹¹ LuxChemTech, Freiburg, Germany; ¹² WIP - Renewable Energies, Munich, Germany; ¹³ Valoe Cells, Vilnius, Lithuania; ¹⁴ Valoe, Mikkeli, Finland; ¹⁵ Highline Technologies, Freiburg, Germany; ¹⁶ Kalyon PV, Ankara, Türkiye; ¹⁷ Becquerel Institute France, Lyon, France; ¹⁸ Becquerel Institute, Brussels, Belgium

CP.1.3 Challenges and Opportunities in Scaling HJT Manufacturing at GW Level in Europe - Navigating the Path to Large-Scale Solar Success

Cosimo Gerardi¹
¹ 3Sun, Catania, Italy

CP.1.4 Business Model Optimization for European Solar PV: a Study on Costs and Commercial Strategies

Ian Kenchington¹, Philippe Macé¹, Gaëtan Masson¹, Joris Libal²
¹ Becquerel Institute, Brussels, Belgium; ² ISC Konstanz, Konstanz, Germany

PLENARY PRESENTATIONS CP.2 | CP.3

10:30 - 12:30 Perovskite – Silicon Tandems: Towards Commercialisation | PV Stability in the Field

Chairpersons: Eszter Voroshazi
CEA, Le Bourget-du-Lac, France
Teresa M. Barnes
NREL, Evergreen, United States of America

CP.2.1 World-Record Industrial Tandem Solar Cells on M10 Wafer Size

Lukas Kegelmann¹, Dominik Siebert¹, Felix Frühauf¹, Hussein Osman¹, Marco Ruiz¹, Natasha Hjerrild¹, Nora Buschmann¹, Raphael Edem Agbenyeke¹, Rene Hönig¹, Saba Gharibzadeh¹, Stefan Hartnauer¹, Torben Klinkert¹, Andre Wirtz¹, Doreen Foitzik¹, Fabian Schackmar¹, Marcus Wolff¹, Moritz Loy¹, Jose Garcia Cerrillo¹, Klaus Duncker¹, Ralf Niemann¹, Steffen Geissler¹, Patrick Mende¹, Hans-Christoph Ploigt¹, Axel Schwabedissen¹, Gregor Zimmermann¹, Matthias Schütze¹, Björn Eisenhawer¹, Adam Pockett¹, Birte Kressdorf¹, Kenza Djeghdi¹, Filipe Martinho¹, Carsten Baer¹, Lorenzo Burtone¹, Olaf Schnelting¹, Florian Daniel¹, Alaaeldin Gad¹, Andy Szpeth¹, Dirk Wissen¹, DongJu Jang¹, Maximilian Kauert¹, Steffen Laube¹, Anika Weihrauch¹, Azhar Fakhar Uddin¹, Eoin Elliott¹, Friederike Kersten¹, Hans Köbler¹, Joel Smith¹, Martina Gille¹, Pietro Caprioglio¹, Sarah Brückner¹, Sven Wasmer¹, Henry Weber¹, Kevin Wachsmuth¹, Ronny Bakowskie¹, Ansgar Mette¹, Max Hendrichs¹, Enrico Jarzembowski¹, Robert Bauer¹, Fabian Fertig¹

¹ Hanwha Q CELLS, Bitterfeld-Wolfen, Germany

CP.2.3 Total Cost of Ownership, LCA and LCOE Analysis of Perovskite-Silicon Tandems Compared to Single Junction Crystalline Silicon PV Technologies

Baljeet Singh Goraya¹, Dilara Maria Subasi¹, Peter Henri Brailovsky¹, Henning Nagel¹, Patricia S.C. Schulze¹, Martin C. Schubert¹, Jochen Rentsch¹, Sebastian Nold¹

¹ Fraunhofer ISE, Freiburg, Germany

CP.3.4 Outdoor Performance and Reliability of Perovskite-Silicon Tandems: Fifteen Months of Monitoring in the NEXUS Project

Atse Louwen¹, Jordi Veirman¹, Alexander Astigarraga¹, Juan José Stivanello¹, David Moser¹, Perrine Carroy², Vincent Barth², Delfina Muñoz², Anika Sidler³, Markus Lenz³, Jorge Ferrando⁴, Maximiliano Alejandro Senno⁴, Henk J. Bolink⁴, Talat Özden⁵, Hisham Nasser⁵, Shuaifeng Hu⁶, Xinyi Shen⁶, Henry Snaith⁶

¹ Eurac Research, Bolzano, Italy; ² CEA/INES, Le Bourget-du-Lac, France; ³ School of Life Sciences FHNW, Muttentz, Switzerland; ⁴ University of Valencia, Paterna, Spain; ⁵ ODTÜ-GÜNAM, Ankara, Türkiye; ⁶ University of Oxford, Oxford, United Kingdom

CP.3.5 Understanding the Root Cause of UV-Induced Degradation in TOPCon and PERC Solar Cells

Muhammad Umair Khan¹, Phillip Hamer¹, Aeron Johns¹, Chandany Sen¹, Ting Huang², Munan Gao², Ruirui Lv², Yuanjie Yu², Haoran Wang¹, Xinyuan Wu¹, Xutao Wang¹, Bram Hoex¹

¹ UNSW, Sydney, Australia; ² Canadian Solar, Suzhou, China



CP.3.6 Can We Make Solar Photovoltaic Modules That Last 30+ Years? Is the Industry Doing It?

Alessandro Virtuani¹, Hugo Quest², Ebrar Ozkalay³, Anika Gassner⁴, Gabriele Eder⁴, Gianluca Cattaneo¹, Matthieu Despeisse¹, Christophe Ballif²
¹ CSEM, Neuchâtel, Switzerland; ² EPFL, Neuchâtel, Switzerland; ³ SUPSI, Mendrisio, Switzerland; ⁴ OFI, Vienna, Austria

ORAL PRESENTATIONS 2CO.1

13:30 - 15:00 Perovskite-based Tandems Interfaces and Characterization

Chairpersons: Jan Christoph Goldschmidt
Marburg University, Germany
Lili Wang
Technology Innovation Institute, Abu Dhabi, United Arab Emirates

2CO.1.1 Industrial Production of Perovskite-Silicon Tandem Solar Cells: The Characterization Challenge

Martin C. Schubert¹, Christoph Messmer², Alexander J. Bett¹, Oliver Fischer¹, Johannes Greulich¹, Jonas Haunschild¹, David Chojniak¹, S. Kasimir Reichmuth², Florian Schindler¹, Jonas Schön², Jochen Hohl-Ebinger¹, Stefan Rein¹, Stefan W. Glunz², David Sperber³, Gregor Zimmermann⁴, Henry Weber⁴, Nadine Schüler⁵, Viktoriia Nikonova⁵, Christopher Berge⁶, Marc Hemsendorf⁶, Bernhard Mitchell⁷, Lukas Ziegler⁷, Klaus Ramspeck⁸, Jonas Horn⁸, Ivanol Djeukeu⁸
¹ Fraunhofer ISE, Freiburg, Germany; ² University of Freiburg, Freiburg, Germany; ³ Oxford PV Germany, Brandenburg an der Havel, Germany; ⁴ Hanwha QCells, Bitterfeld-Wolfen, Germany; ⁵ Freiberg Instruments, Freiberg, Germany; ⁶ ISRA Vision, Konstanz, Germany; ⁷ Wavelabs Solar Metrology, Münster, Germany; ⁸ halm elektronik, Frankfurt/Main, Germany

2CO.1.2 Continuous-Time Photoluminescence Imaging for Quantification of Degradation Processes in Perovskite-Silicon Tandems

Miha Kikelj¹, Gašper Matič¹, Žan Ajdič¹, Fernando Solorio Soto¹, Lisa Champault², Quentin Jeangros², Christophe Ballif², Benjamin Lipovšek¹, Kristijan Brecl¹, Marko Jošt¹, Marko Topič¹
¹ University of Ljubljana, Ljubljana, Slovenia; ² CSEM, Neuchâtel, Switzerland

2CO.1.3 Comprehensive Energy Yield Simulations for Bifacial All-Perovskite Tandem Modules

Urs Aeberhard¹, Vasileios Georgakopoulos-Paltidis¹, Andreas Schiller¹, Roger Häusermann¹, Roman Hiestand¹, Balthasar Bluele¹, Markus Kohlstädt², Mehrdad Najafi³, Sjoerd Veenstra³, Beat Ruhstaller⁴
¹ Fluxim, Winterthur, Switzerland; ² Fraunhofer ISE, Freiburg, Germany; ³ TNO, Eindhoven, The Netherlands; ⁴ ZHAW, Winterthur, Switzerland

2CO.1.4 Perovskite and Interface Development for Efficient Fully-Textured Perovskite Silicon Tandem Solar Cells

Patricia S. C. Schulze¹, Oussama Er-Raji¹, Christian Schwarz¹, Bhushan P. Kore¹, Yashika Gupta¹, Mohamed Mahmoud¹, Johanna Modes¹, Christoph Messmer¹, Oliver Fischer¹, Martin Bivour¹, Jonas Schön¹, Florian Schindler¹, Martin Hermle¹, Martin C. Schubert¹, Stefan W. Glunz¹, Juliane Borchert¹
¹ Fraunhofer ISE, Freiburg, Germany

2CO.1.5 Scalable, Non-Fullerene Electron Transport Layer for Perovskite/Silicon Tandem Solar Cells

Lea Zimmermann¹, Wander Max Bernardes de Araujo¹, Maxim Simmonds¹, Arman Mahboubi Soufiani¹, Julius Petrulėvicius², Dorothee Menzel¹, Florian Scheler¹, Tadas Malinauskas², Eike Köhnen¹, Lars Korte¹, Bernd Stannowski¹, Vytautas Getautis², Steve Albrecht¹
¹ HZB, Berlin, Germany; ² Kaunas University of Technology, Kaunas, Lithuania

2CO.1.6 Investigation of Interlayers Electronic Properties for Shunt Reduction in Pk/Si Tandem Solar Cells

Julci Ditsougou¹, Thibaut Desrues¹, Anne Kaminski²
¹ CEA / INES, Le Bourget-du-Lac, France; ² Grenoble Alps University, Grenoble, France

ORAL PRESENTATIONS 5CO.4

13:30 - 15:00 Life Cycle Assessment of Silicon and Perovskite-based Cells and Modules

Chairpersons: Carmen Alonso-García
CIEMAT, Madrid, Spain
Keiichi Komoto
Mizuho Research & Technologies, Tokyo, Japan

5CO.4.1 Towards Low-Impact Triple-Junction Perovskite/Silicon Tandem Modules: LCA of Precursor Materials to Describe the Influence of Background Data Sources

Alejandra Galarza¹, Sebastian Nold², Lars Oberbeck³
¹ IPVF, Palaiseau, France; ² Fraunhofer ISE, Freiburg, France; ³ TotalEnergies OneTech, Paris, France

5CO.4.2 Life Cycle Assessment of Perovskite Single Junction and Perovskite-Crystalline Silicon Tandem PV Modules. A Quick Scan of Preliminary Designs in the LAPERITIVO Project

Mariska de Wild-Scholten¹, Paul de Wild¹, Yinghuan Kuang²
¹ SmartGreenScans, Groet, The Netherlands; ² IMEC, Genk, Belgium

5CO.4.3 Sustainability Assessment of Perovskite/Silicon Tandem Solar Modules: from Laboratory Scale to Industrial Implementation

Elisabetta Brivio¹, Andrea Danelli¹, Sofia Spagnolo¹, Pierpaolo Girardi¹
¹ RSE, Milan, Italy

5CO.4.4 LCA Learning Curve for Crystalline Silicon Solar Technologies based on Technology Improvements

Julian Reichle¹, Moritz Fath¹, Sraisth Sraisth¹, Gourab Das¹, Mehul Raval¹, Wolfgang Jooss¹, Peter Fath¹
¹ RCT Solutions, Konstanz, Germany

5CO.4.5 PV Module Energy Payback Time Analysis for Silicon Solar Cell Technologies

Dilara Subasi¹, Peter Brailovsky¹, Baljeet Goraya¹, Sebastian Nold¹
¹ Fraunhofer ISE, Freiburg, Germany



5CO.4.6 Sustainability Outlook for Leading Silicon Photovoltaic Technologies from 2023-2034

Bethany L. Willis¹, Oliver M. Rigby¹, Sophie L. Pain², Nicholas E. Grant², John D. Murphy², Ruy S. Bonilla³, Neil S. Beattie¹

¹ Northumbria University, Newcastle, United Kingdom; ² Warwick University, Coventry, United Kingdom; ³ Oxford University, Oxford, United Kingdom

VISUAL PRESENTATIONS 4CV.1

13:30 - 15:00 Advances in Operation, Performance and Maintenance of PV Systems

Chairpersons: Gisele A. dos Reis Benatto
DTU, Roskilde, Denmark
Ioannis (John) Tsanakas
CEA, Le Bourget-du-Lac, France
David Moser
Becquerel Institute Italia, Trento, Italy
Claudia Buerhop-Lutz
HI ERN, Erlangen, Germany

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

PANEL DISCUSSION

13:30 - 15:00 CO.7: Challenges and Opportunities of PV up to 2030

Moderators: Marion Perrin
Energy Pool, Le Bourget-du-Lac, France
Carlos del Cañizo
UPM, Madrid, Spain

This panel will explore the key challenges and opportunities for photovoltaic (PV) solar energy up to 2030, with a focus on technologies and societal aspects. Topics will include the role of artificial intelligence in optimizing PV systems, the importance of energy storage for grid stability and flexibility, and the need for infrastructure upgrades and updates on protocols to support high PV penetration. Panelists will also address social benefit sharing, cybersecurity risks, and the increasing urgency of climate action.

- 1 Panelist 1 - Christian Breyer, LUT University, Finland
- 2 Panelist 2 - David Moser, Becquerel Institute, Italy
- 3 Panelist 3 - Pierre-Jean Alet, CSEM, Switzerland
- 4 Panelist 4 - Raffaele Rossi, SolarPower Europe, Belgium
- 5 Panelist 5 - John McKiernan, ESB, Ireland
- 6 Panelist 6 - Grazia Barchi, EURAC, Italy

ORAL PRESENTATIONS 2CO.2

15:15 - 16:45 High-Performance and Scalable Perovskite-based Multi-Junction Devices

Chairpersons: Ed Crossland
Oxford PV, Begbroke, United Kingdom
Laura Lancellotti
ENEA, Portici, Italy

2CO.2.1 Potassium Salt Modulated Perovskite Layer for Perovskite/TOPCon Tandem Solar Cells with Efficiency Exceeding 33.65%

Menglei Xu¹, Jungan Wang¹, Xunlei Yan¹, Chengjun Gu¹, Ying Xu¹, Yong Yu¹, Qin Zou¹, Chenchao Song¹, Jie Yang¹, Xinyu Zhang¹, Hao Jin¹
¹ Jinko Solar, Haining, China

2CO.2.2 Lab to Industry: Optimizing Industrial Deposition Methods for Perovskite based Multijunction Solar Cells

Juliane Borchert¹, Yashika Gupta¹, Minasadat Heydarian², Maryamsadat Heydarian¹, Oussama Er-Raji², Bhushan P. Kore², Raphael Effinger¹, Christian Schwarz², Johanna Modes¹, Martin Bivour¹, Florian Schindler¹, Martin Hermle¹, Martin C. Schubert¹, Patricia S.C. Schulze¹, Stefan W. Glunz¹

¹ Fraunhofer ISE, Freiburg, Germany; ² University of Freiburg, Freiburg, Germany

2CO.2.3 Perovskite-Silicon-Based Triple Junction Solar Cells with Enhanced Optoelectronic Design

Kerem Artuk¹, Austin Kuba¹, Deniz Turkay¹, Michele De Bastiani², Mostafa Othman¹, Julian Steele³, Julien Hurni¹, Huagui Lai⁴, Mounir D. Mensi¹, Felipe Saenz², Mohammadreza Golobostanfard¹, Fan Fu⁴, Aicha Hessler-Wyser¹, Quentin Jeangros², Christophe Ballif¹, Christian M. Wolff¹

¹ EPFL, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland; ³ University of Queensland, Brisbane, Australia; ⁴ Empa, Dübendorf, Switzerland

2CO.2.4 Developing a Two-Step Sequential Deposition Approach for Wide-Bandgap Perovskite Thin Films and Efficient Tandem Solar Cells

Qian Cui¹, Zhongshu Yang¹, Rabin Basnet¹, Heping Shen¹, Klaus Weber¹, The Duong¹

¹ ANU, Canberra, Australia

2CO.2.5 Optimized Solution-Based Two-Step Process for Perovskite-Based Tandem Photovoltaics

Ronja Pappenberger¹, Roja Singh¹, Alexander Diercks², Tonghan Zhao¹, Ulrich Wilhelm Paetzold¹

¹ IMT, KIT, Eggenstein-Leopoldshafen, Germany; ² LTI, KIT, Karlsruhe, Germany

2CO.2.6 Improving the Quality of Perovskite/Charge Transport Layer Interfaces for Highly Efficient Perovskite/Silicon Tandem Solar Cells

Jann Landgraf¹, Yashika Gupta², Adi Prasetyo³, Stefan Lange⁴, Christoph Messmer², Christian Schwarz², Oliver Fischer², Sithisak Chanthavong¹, Oussama Er-raji², Maria Camarada¹, Stefaan de Wolf³, Patricia Schulze², Anna Fischer¹, Stefan Glunz², Juliane Borchert²

¹ University of Freiburg, Freiburg, Germany; ² Fraunhofer ISE, Freiburg, Germany; ³ KAUST, Thuwal, Saudi Arabia; ⁴ Fraunhofer CSP, Halle, Germany



ORAL PRESENTATIONS 5CO.5

15:15 - 16:45 Life Cycle Assessment of New PV Applications and Recycling

Chairpersons: Vasilis Fthenakis
Columbia University, New York, United States of America
Nieves Espinosa
Universidad de Murcia, Spain

5CO.5.1 Optimizing Agrivoltaics: a Comprehensive Assessment Framework for Sustainable Energy and Agriculture

Ana Patrícia Lopes¹, Bruno Barrionuevo², Daniel P. Albuquerque³, Diogo Cordeiro⁴, Cláudia Fernandes³, Athanasios T. Balafoutis², Rui Castro¹
¹ University of Lisbon, Lisbon, Portugal; ² CERTH, Athens, Greece; ³ EDP NEW, Sacavém, Portugal; ⁴ EDP NEW, Lisbon, Portugal

5CO.5.2 Environmental Sustainability Assessment of Agrivoltaic Systems: a Life Cycle Approach

Maria Anna Cusenza¹, Andrea Danelli¹, Pierpaolo Girardi¹, Sofia Spagnolo¹
¹ RSE, Milan, Italy

5CO.5.3 LCA of Off-Shore Floating PV System in the North Sea

Ashish Binani¹, Minne M. de Jong²
¹ TNO, Petten, The Netherlands; ² TNO, Eindhoven, The Netherlands

5CO.5.4 Closing the Circle: Integrating the Circular Footprint Formula into Photovoltaic System Life Cycle Assessment

Alexis Barrou¹, Selin Kandiyoti-Eskenazi¹, Christophe Ballif¹, Bertrand Paviet-Salomon¹
¹ CSEM, Neuchâtel, Switzerland

5CO.5.5 Stepwise Pathways to Decarbonize Emissions of PV Deployment via Green Mounting Systems and Recycled Materials

Sisi Wang¹, Moonyong Kim¹, Li Wang¹, Yuchao Zhang¹, Nathan Chang¹, Catherine Chan¹, Brett Hallam¹
¹ UNSW, Sydney, Australia

5CO.5.6 ICARUS Project – Environmental Benefits of Silicon Kerf Secondary Products in Pilot Processes Over Conventional Production of Equivalent Products with Primary Raw Materials in China and Europe

Rene Peche¹, Matthias Seitz¹, Markus Schönheits¹, Karsten Wambach¹
¹ bifa Umweltinstitut, Augsburg, Germany

ORAL PRESENTATIONS 4CO.8

15:15 - 16:45 Soiling and Snow Effects in PV Systems

Chairpersons: Claudia Buerhop-Lutz
HI ERN, Erlangen, Germany
Peter Hacke
NREL, Golden, United States of America

4CO.8.1 Maps of Long-Term Soiling Losses in Europe Considering a Partial Cleaning Effect by Rain

Elena Ruiz Donoso¹, Fernanda Norde Santos¹, Álvaro Fernández Solas¹, Natalie Hanrieder¹, Leonardo Micheli², Joaquín Alonso-Montesinos³, Jesús Polo⁴, Luis Zarzalejo⁴, Stefan Wilbert¹
¹ DLR, Almería, Spain; ² Sapienza University of Rome, Rome, Italy; ³ University of Almería, Almería, Spain; ⁴ CIEMAT, Madrid, Spain

4CO.8.2 Microbiota Present in Soiling Deposited on Photovoltaic Modules in the Atacama Desert

Douglas Olivares¹, Ricardo Ortíz¹, Carlos Portillo¹, Luis Rojas², María Teresa Mata¹, Edward Fuentealba¹, Jaime Llanos², Aitor Marzo³
¹ University of Antofagasta, Antofagasta, Chile; ² Catholic University of the North, Antofagasta, Chile; ³ University of Granada, Granada, Spain

4CO.8.3 Mapping and Analysis of Soiling Losses in Morocco for PV Performance Optimization

Mounir Abraim¹, Fatima Zahra Ouchani¹, Abdellatif Ghennoui¹, Leonardo Micheli²
¹ Green Energy Park, Ben Guerir, Morocco; ² Sapienza University of Rome, Rome, Italy

4CO.8.4 A Tale of Two Dusts: Mimicking Site-Specific Soiling Dynamics and Cleaning Approaches for PV Plants

Josefa Montoya¹, Douglas Olivares¹, Eric Pilat², Jean Patrice Rakotoniaina², Aitor Marzo³, Valeria Del Campo⁴, Edward Fuentealba¹, Martin Gaete¹, Jérémie Aimé², Romain Couderc², Delfina Muñoz², Ioannis (John) Tsanakas²
¹ University of Antofagasta, Antofagasta, Chile; ² CEA, Le Bourget-du-Lac, France; ³ University of Granada, Granada, Spain; ⁴ Federico Santa María Technical University, Valparaíso, Chile

4CO.8.5 Snow Losses in Four Solar Power Systems of FMI in Finland During 2015 - 2025

Juha A. Karhu¹, Anders V. Lindfors¹, Timo Salola¹, William Wandji Nyamsi¹, Lauri Karttunen², Väinö Anttalainen², Hugo Huerta Medina³, Shuo Wang³, Kati Miettunen²
¹ Finnish Meteorological Institute, Helsinki, Finland; ² University of Turku, Turku, Finland; ³ TUAS, Turku, Finland

4CO.8.6 Analyzing and Modeling Snow Loss in Ground-Mounted PV Systems

Mari B. Øgaard¹, Erling W. Eriksen¹, Sigrid Rønneberg¹, Heine N. Riise¹
¹ IFE, Kjeller, Norway



ORAL PRESENTATIONS 3CO.10

15:15 - 16:45 Advanced Interconnection Technology

Chairpersons: Hamed Hanifi
AE Alternative Energy, Königsbrunn, Germany
Sonja Feldbacher
PCCL, Leoben, Austria

3CO.10.1 Ultrasonic Tinning of Aluminum for a Silver-Free Cell

Interconnection on the Front Side of Si Solar Cells

Malte Brinkmann¹, Henning Schulte-Huxel¹, Christina Hollemann¹,
Byungsul Min¹, Sebastian Junge¹, Rolf Brendel¹
¹ ISFH, Emmerthal, Germany

3CO.10.2 Silver Reduction through Direct Wire Bonding for Silicon Heterojunction Solar Cells

Yanxin Liu¹, Ian Marius Peters¹, Kaining Ding¹, Bart Pieters¹, Karsten Bittkau¹, Uwe Rau¹, Mohamed Issifi Yacouba¹, Henrike Gattermann¹,
Volker Lauterbach¹, Andreas Lambert¹
¹ FZJ, Jülich, Germany

3CO.10.3 Silicon Heterojunction Interconnection using Pb-free & Bi-free Solder: Materials, Process and Equipment Development and Validation

Germain Rey¹, Hugo Forest¹, Remi Monna¹, Jules Clerjon¹, Igor Herrarte²,
Gorka Garcia², Xavier Hernandez³, Jean-Philippe Aguerre³
¹ CEA, Le Bourget-du-Lac, France; ² Mondragon Assembly, Orange, France; ³ Mondragon Assembly, Aretxabaleta, Spain

3CO.10.4 Towards Enhanced Reliability of Busbar-Free IBC Solar Cell Interconnections by Non-Conductive Adhesive Reinforcement

Tudor Timofte¹, Tobias Messmer¹, Karl Wienands¹, Stephan Grosser²,
Giuseppe Galbiati³, Tobias Nitsche³, Daniel Buckland³, Nils Kopp⁴,
Andreas Halm¹
¹ ISC Konstanz, Konstanz, Germany; ² Fraunhofer CSP, Halle, Germany; ³ Henkel, Duesseldorf, Germany; ⁴ Tamura Elsold, Ilsenburg, Germany

3CO.10.5 Matrix Shingle Solar Modules: Pilot Production for Building-Integrated PV Applications

Torsten Rößler¹, Najwa Abdel Latif¹, Elmar Lohmüller¹, Daniel von Kutzleben¹, Norbert Kohn¹, Jale Schneider¹, Sebastian Birnkammer¹,
Martin Wiese¹, Marco Ernst¹, Felix Basler¹, Jacob Forster¹, Laura Stevens¹, John Morello², Gaetan Carrière², Achim Kraft¹, Holger Neuhaus¹
¹ Fraunhofer ISE, Freiburg, Germany; ² Fresuns Solar Roofs, Colombier, Switzerland

3CO.10.6 Contact Resistance Limitations in Conductive Adhesive and Solder Paste Modules

Daniel Tune¹, M. Ignacia Acevedo Devoto¹, Raphael Shanmugam¹, Karl Wienands¹, Nils Kopp², Carina Hallensleben², Rihoko Kizukuri², Matthias Helbig¹, Andreas Halm¹
¹ ISC Konstanz, Konstanz, Germany; ² TAMURA-ELSOLD, Ilsenburg, Germany

VISUAL PRESENTATIONS 1CV.2

15:15 - 16:45 Si Solar Cells | Characterisation & Modelling of Silicon Cells and Their Building Blocks

Chairpersons: Aloña Otaegi
UPV/EHU, Bilbao, Spain
Audrey Morisset
CSEM, Neuchâtel, Switzerland
Delfina Muñoz
CEA, Le Bourget-du-Lac, France

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4CO.3

17:00 - 18:30 Floating PV

Chairpersons: Thomas Reindl
SERIS, Singapore, Singapore
Wilfried G.J.H.M. van Sark
Utrecht University, The Netherlands

4CO.3.1 Satellite Analysis of Floating PV Construction and Extreme Weather Resilience

Erlend Hustad Honningdalsnes¹, Harsha Walpita¹, Vilde Stueland Nysted¹,
Erik Stensrud Marstein¹, Josefine Selj¹, Heine Nygard Riise¹
¹ IFE, Kjeller, Norway

4CO.3.2 Hydrological and Ecological Effects of Floating PV

Konstantin Ilgen¹, Camila B. Goulart², Stephan Hilgert³, Dirk Schindler⁴,
Klaus van de Weyer⁵, Raffaello Lastrico¹, Jens Lange⁴
¹ Fraunhofer ISE, Freiburg, Germany; ² University of Paraná, Paraná, Brazil; ³ Imknow, Karlsruhe, Germany; ⁴ University of Freiburg, Freiburg, Germany; ⁵ lanaplan, Nettetal, Germany

4CO.3.3 Assessing the Sustainability of Floating Solar: a Conceptual Framework and Case Study

Josefine Helene Krogh Selj¹, Ingrid Nesheim², Francois Clayer²
¹ IFE, Kjeller, Norway; ² NIVA, Oslo, Norway

4CO.3.4 Explaining the Measured Performance of an Offshore Floating Solar Pilot System at the North Sea

Mirza Khalid Baig¹, Maarten Dörenkämper¹, Danzl Pi², Minne de Jong¹
¹ TNO, Eindhoven, The Netherlands; ² TNO, Petten, The Netherlands

4CO.3.5 Wave-Induced Losses in Offshore Floating Photovoltaic Systems: Modeling Framework, Sensitivity Analysis, and Optimization

Sathya Shanka Vasuki¹, Jack Levell², Rudi Santbergen¹, Olindo Isabella¹
¹ TU Delft, Delft, The Netherlands; ² Shell Global Solutions International, Amsterdam, The Netherlands



4CO.3.6 4W Perovskite/SI Tandem System for Combined Underwater Energy Harvesting and Depth Sensing

Nicola Trivellini¹, Noah Tormena¹, Giacomo Peruzzi¹, Jessica Jazmine Nicole Barrantes¹, Matteo Bertocco¹, Tommaso Michelin¹, Marco Migliorini², Francesco Rigo³, Matteo Meneghini¹, Alessandro Pozzebon¹, Jessica Barichello⁴, Fabio Matteocci⁵

¹ University of Padova, Padova, Italy; ² University of Siena, Siena, Italy; ³ University of Florence, Florence, Italy; ⁴ University of Rome 'Tor Vergata', Rome, Italy; ⁵ C.H.O.S.E, Rome, Italy

ORAL PRESENTATIONS 5CO.6

17:00 - 18:30 PV Recycling and Circularity

Chairpersons: Claire Agraffail
CEA, Le Bourget-du-Lac, France
Garvin Heath
NREL, Golden, United States of America

5CO.6.1 Photovoltaics Recycling: EU Capacities and Policy Implications

Nieves Espinosa¹, Silvia Bobba², Cynthia Latunussa², Enrica Leccisi²

¹ University of Murcia, Murcia, Spain; ² European Commission JRC, Ispra, Italy

5CO.6.2 Development of a Digital Product Passport for Recycling in the Solar Industry

Ässia Boukhatmi¹, Cedric Antenen¹, Stefan N. Grösser¹, Tadas Radavičius²

¹ BFH, Biel/Bienne, Switzerland; ² SoliTek, Vilnius, Lithuania

5CO.6.3 A Recyclability Index for Photovoltaic Modules: Methodology and Policy Implications

Davide Polverini¹, Felice Alfieri², Nieves Espinosa³, Jaione Bengoechea⁴, Cristina Pinto⁴

¹ European Commission DG, Brussels, Belgium; ² Viegand Maagøe, Copenhagen, Denmark; ³ Murcia University, Murcia, Spain; ⁴ CENER, Pamplona, Spain

5CO.6.4 Quantification of Technical Recyclability of PV Modules for Different Recycling Scenarios

Matthias Hämmer¹, Kerstin Baumann¹, Karsten Wambach¹, Markus Schönheits¹

¹ bifa Umweltinstitut, Augsburg, Germany

5CO.6.5 IEC Technical Report 63525 on the Reuse of PV Modules: Final Result

Arvid van der Heide¹, Serge Noels², Jan Clyncké², Rich Strömberg³

¹ imec, Genk, Belgium; ² PV CYCLE, Brussels, Belgium; ³ University of Alaska, Fairbanks, United States of America

5CO.6.6 Student Awards Finalist Presentation: Water and Wastewater Streams and Reuse Opportunities in TOPCon Solar Cell Production

Jascha Reich¹, Peter Brailovsky², Dilara Subasi², Tobias Dannenberg³, Martin Zimmer², Sebastian Nold², Sven-Uwe Geißen¹

¹ TU Berlin, Berlin, Germany; ² Fraunhofer ISE, Freiburg, Germany; ³ Rena Technologies, Gütenbach, Germany

ORAL PRESENTATIONS 4CO.9

17:00 - 18:30 Data-driven and AI-based O&M of PV Systems

Chairpersons: Sascha Lindig
Univers SAS, Courbevoie, France
Gerhard Mütter
Gerhard Mütter e.U., Waldneukirchen, Austria

4CO.9.1 AI Methods for the Operation and Maintenance of PV Parks with Bifacial Photovoltaic Modules

Dirk Stellbogen¹, Jonas Petzschmann¹, Timo Freund², Jann Wannenwetsch², Elena Pabst¹, Ajka Ockert², Roland Einhaus¹

¹ ZSW, Stuttgart, Germany; ² EnBW, Karlsruhe, Germany

4CO.9.2 A Comprehensive Framework for Accurate Power Degradation Estimation in Large Photovoltaic Systems using Machine Learning

Kak Pong Cheung¹, Stephanie Malik², David Daßler², Carsten Hennig³, Hauke Nissen⁴, Patrick Hennig¹

¹ Kiel University of Applied Sciences, Kiel, Germany; ² Fraunhofer IMWS, Halle, Germany; ³ saferay, Berlin, Germany; ⁴ Wattmanufactur, Galmsbüll, Germany

4CO.9.3 Student Awards Finalist Presentation: Use of a Digital Twin to Detect Stalling Tracker Events in Photovoltaic Power Plant with Horizontal Single-Axis Tracking Systems

Riccardo Adinolfi Borea¹, Matthew Muller², Silvana Ovaite², Vincenzo Cirimele¹, Francesco Melino¹

¹ University of Bologna, Bologna, Italy; ² NREL, Denver, United States of America

4CO.9.4 Autonomous Multi-AI Agent System for PV Health Monitoring: a Fully Automated O&M Pipeline with Field Robotics Integration

Mousa Sondoqah¹, Atse Louwen¹, David Moser¹

¹ Eurac Research, Bolzano, Italy

4CO.9.5 Predictive Modelling and Analysis of Soiling Losses in PV Plants through a Hybrid Data-Driven Approach

Ioannis (John) Tsanakas¹, Eric Pilat¹, Sebastien Arbaretaz¹, Minh Thong Doi¹, Filipa Monteiro Martins², Jorge Veludo²

¹ CEA INES, Le Bourget-du-Lac, France; ² Galp Energia, Lisbon, Portugal

4CO.9.6 Adaptive Maintenance Strategies for PV Fleets: Enhancing Profitability and Efficiency Through Optimized Cleaning

Hind Abdulla¹, Andrei Sleptchenkoa¹, Ammar Nayfeh¹

¹ Khalifa University, Abu Dhabi, United Arab Emirates



ORAL PRESENTATIONS 3CO.11

17:00 - 18:30 Innovative Module Design and Characterisation

Chairpersons: Eszter Voroshazi
CEA, Le Bourget-du-Lac, France
Miguel-Ángel Muñoz-García
UPM, Madrid, Spain

3CO.11.2 Process and Design Freedom Enabled by Back-contact Solar Cells Minimizing the Inactive Module Area

Andreas Halm¹, Tudor Timofte¹, Karl Wienands¹, Daniel Tune¹, Tobias Messmer¹
¹ ISC Konstanz, Konstanz, Germany

3CO.11.3 Techno-Economic Analysis of Suitable Module BOM for Different Climatic Conditions

Sraisth Sraisth¹, Julian Reichle¹, Mehul Raval¹, Hardik Gohil¹, Gourab Das¹, Wolfgang Jooß¹
¹ RCT Solutions, Konstanz, Germany

3CO.11.4 Screening of Commercially Available Layers for Diffusive & Transparent Overhead Agrivoltaics: from Layer Characterization to Prototyping

Jordi Veirman¹, Alessandro Minini¹, Marco Memminger¹, Giovanni Borz¹, Martina Pelle¹, Lukas Koester¹, Alexander Astigarraga¹, David Moser¹
¹ Eurac research, Bolzano, Italy

3CO.11.5 Indoor Characterization and Analysis of Reverse Breakdown Behavior of Solar Cells with Different Cell Architectures

Bengt Jaeckel¹, Jens Froebel¹, Matthias Pander¹, Andreas Maixner², Pouya Pourshafi², Afshin Bakhtiari², Hamed Hanifi²
¹ Fraunhofer CSP, Halle (Saale), Germany; ² AESOLAR, Koenigsbrunn, Germany

3CO.11.6 Technologies for Interconnection of 3 Terminal Tandem Solar Cells in Standard 2 Terminal Modules

Juan Carlos Jimeno¹, Vanesa Fano¹, Rubén Gutiérrez¹, Eneko Cereceda¹, Aloña Otaegi¹, Nekane Azkona¹, Fernando Hernando¹, Aitor Apraiz², Xabier Hernández², Jean Philippe Aguerre³
¹ UPV/EHU, Bilbao, Spain; ² Koniker S. Coop., Arrasate, Spain; ³ Mondragon Assembly, Aretxabaleta, Spain

VISUAL PRESENTATIONS 2CV.3

17:00 - 18:30 Perovskite-based Tandems and Multijunctions

Chairpersons: Lili Wang
Technology Innovation Institute, Abu Dhabi, United Arab Emirates
Tom Aernouts
imec, Genk, Belgium
Fabian Fertig
Hanwha Q CELLS, Bitterfeld-Wolfen, Germany

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4DO.1

08:30 - 10:00 PV Tracking and Simulation

Chairpersons: João M. Almeida Serra
University of Lisbon, Portugal
Mari Øgaard
IFE, Kjeller, Norway

4DO.1.1 Student Awards Finalist Presentation: PV Tracking Optimization via Machine Learned Dynamic Tracking

Daniel Burkhardt¹, Maddalena Bruno¹, Leslie Lydia Kurumundayil¹, Matthew Berwind¹, Matthias Demant¹
¹ Fraunhofer ISE, Freiburg, Germany

4DO.1.2 Bridging the Gap: Insights into Backtracking-Angle Related Discrepancies between Estimates and Actual Performance in Large-Scale Photovoltaic Plants

Juan Santamaría-Sancho¹, Javier Martín-Rueda¹, Eduardo Lorenzo Pigueiras¹, Javier R. Ledesma¹
¹ UPM, Madrid, Spain

4DO.1.3 Experimental Validation of Horizontal Single-Axis Solar Tracker Algorithms in Terms of Energy Production and Operational Performance

Ildefonso Muñoz¹, Gregorio Olivares¹, Sara Díaz¹, Aritz Legarrea¹, Ana Gracia¹
¹ CENER, Sarriguren, Spain

4DO.1.4 Development and Evaluation of New Backtracking Strategies (N-BT and IRR-BT) for Horizontal Single-Axis Solar Trackers

Gregorio Olivares¹, Ildefonso Muñoz¹, Sara Díaz¹, Ana Gracia¹
¹ CENER, Sarriguren, Spain

4DO.1.5 Terrain-Following Single-Axis Tracking PV Systems: Civil Work Reduction, Performance Impact, and Lifetime Financial Analysis

Abhinav Ratnagiri¹, Shrey Bhatnagar¹, Angel Velasco¹, Viktor Kapetanovic¹, Claire Puttock¹, Amir Shishavan¹
¹ Nextracker, Fremont, United States of America

4DO.1.6 Standardised Assessment of PV Array Simulators

Theo Zwahlen¹, Luciano Borgna¹, David Joss¹, Christof Bucher¹, Christian Messner², Roland Bründlinger²
¹ BFH, Burgdorf, Switzerland; ² AIT, Vienna, Austria



ORAL PRESENTATIONS 2DO.6

08:30 - 10:00 Industrially Scalable Processes to Manufacture Perovskite Solar Cells and Modules

Chairpersons: Tom Aernouts
imec, Genk, Belgium
Shuzi Hayase
The University of Electro-Communications, Chofu, Japan

2DO.6.1 Spatially Regulated Drying Technique for Homogeneous Perovskite Thin Films within Large Area Slot-Die-Coated Perovskite/Silicon Tandem Devices

Kristina Geistert¹, Ronja Pappenberger¹, Philip Scharfer², Philipp Cavadini², Wilhelm Schabel², Faranak Sadegh¹, David B. Ritzer¹, Ulrich W. Paetzold¹
¹ KIT, Karlsruhe, Germany; ² KIT, Eggenstein-Leopoldshafen, Germany

2DO.6.2 Student Awards Finalist Presentation: Novel Laser Scribing Strategy for Perovskite Solar Modules without P2 Scribes Enabling High Performance under Indoor Light Illumination

Bahri Eren Uzuner¹, Konstantin Tsoi¹, Gorkem Gunbas¹, Selcuk Yerci¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye

2DO.6.3 Industrialization of Perovskite Solar Cell Fabrication: Strategies towards High-Throughput PVD Processes

Julian Petry¹, Viktor Škorjanc², Alexander Diercks¹, Thomas Feeney¹, Amedeo Morsa³, Sara Rose Kimmig¹, Jens Baumann⁴, Stefan Auschill⁵, Joshua Damm¹, Daniel Baumann¹, Felix Laufer¹, Jona Kurpiers², Michael Müller³, Lars Korte², Steve Albrecht², Marcel Roß², Ulrich Wilhelm Paetzold¹, Paul Fassi¹

¹ KIT, Karlsruhe, Germany; ² HZB, Berlin, Germany; ³ FZJ, Jülich, Germany; ⁴ von Ardenne, Dresden, Germany; ⁵ M. Braun Inertgas-Systeme, Dresden, Germany

2DO.6.4 Progress in the Research on the Performance, Processing and Reliability of Lightweight and Flexible Thin-Film PV Foils at TU Delft

Govind Padmakumar¹, Federica Saitta¹, Peer Sluijs¹, Reinder Boekhof¹, Lara van der Poll¹, Niels van Silfhout¹, K.P. Sreejith¹, Paula Perez Rodriguez¹, Luana Mazzarella¹, Tom Savenije¹, Hesam Ziar¹, Rudi Santbergen¹, David van Nijen², Ravi Vasudevan², Mohammed El Makkaoui², Herbert Lifka², Edward Hamers², Thierry de Vrijer², Arno H. M. Smets¹

¹ TU Delft, Delft, The Netherlands; ² HyET Solar NL, Arnhem, The Netherlands

2DO.6.5 Evaporated Self-Assembled Monolayer (SAM) Hole-Transport Layers for Scalable Perovskite Solar Cells

Joachim Vollbrecht¹, Roland Clausing¹, Johannes Löhr¹, Larissa Mettner¹, Adam Neuba², Annika Raugewitz¹, Jessica Strej¹, Robby Peibst¹

¹ ISFH, Emmerthal, Germany; ² Paderborn University, Paderborn, Germany

2DO.6.6 Advancing Perovskite Solar Module Performance and Stability Through a Novel Protective Strategy for Laser-Scribed Interfacial Regions

Young Yun Kim¹

¹ KRICT, Daejeon, South Korea

ORAL PRESENTATIONS 5DO.11

08:30 - 10:00 The Road to Massive PV Deployment

Chairpersons: Maria Getsiou
European Commission DG RTD, Brussels, Belgium
Stefan Nowak
NET Nowak Energy & Technology, St. Ursen, Switzerland

5DO.11.1 Integration of Solar PV in the Norwegian Energy System, Navigating the Trade-offs between Land Use and Solar Power Production

Petry Kristine Nøttum Haaland¹, Ole-Morten Midtgård¹
¹ NTNU, Trondheim, Norway

5DO.11.2 Legal Aspects of Local Community based PV-Concepts

Michael Frey¹, Rahel Alia Müller¹
¹ University of Applied Sciences Kehl, Kehl, Germany

5DO.11.3 Evaluating the Impact of Photovoltaics for Lifecycle Global Warming Potential of Buildings According to EN 15978 - a Danish Case Study

Sune Thorsteinsson¹, Nanna L. Andersen¹, Markus Babin¹, Gisele A. D. Reis Benatto¹
¹ DTU, Roskilde, Denmark

5DO.11.4 Unveiling the Evolutionary Energy Performance of Solar Photovoltaic Systems through Systemwide EROI Perspective

Hasret Sahin¹, A.A. Solomon², Christian Breyer¹
¹ LUT University, Lappeenranta, Finland; ² University of Vaasa, Vaasa, Finland

5DO.11.5 Projections of PV Power Potential Worldwide: an Update using CMIP6 Global Climate Models

Pau Mercade Ruiz¹, Gerardo Guerra¹, Gaetana Anamati¹, Lars Landberg²
¹ GreenPowerMonitor a DNV company, Barcelona, Spain; ² DNV Denmark, Hellerup, Spain

5DO.11.6 The Cost of Ownership and Minimum Sustainable Price of POLO BJ Cells Produced in Germany

Juan Camilo Gomez Trillos¹, Viswa Harinath Buddana¹, Urte Brand-Daniels¹, Thomas Vogt¹, Byungsul Min², Jan-Dirk Kähler³, Friedrich Schneider⁴

¹ DLR, Oldenburg, Germany; ² ISFH, Hamelin, Germany; ³ Centrotherm International, Hannover, Germany; ⁴ LPKF SolarQuipment, Suhl, Germany



ORAL PRESENTATIONS 3DO.16

08:30 - 10:00 Failure Modes and Degradation in PV Modules

Chairpersons: Ralph Gottschalg
Fraunhofer CSP, Halle (Saale), Germany
Gernot Oreski
PCCL, Leoben, Austria

3DO.16.1 Reliability Forecasting for New Modules with New Technology and New Problems. How Can You Know If It Will Last?

Dennice M. Roberts¹, Michael Owen-Bellini¹, Clifford W. Hansen², Anubhav Jain³, David C. Miller¹, Martin Springer¹, Jennifer L. Braid², Teresa M. Barnes¹
¹ NREL, Golden, United States of America; ² Sandia National Lab, Albuquerque, United States of America; ³ Berkeley Lab, Berkeley, United States of America

3DO.16.2 Hidden Traces: Insights into How Solar Cell Handling Drives Damp-Heat Failures in HJT and TOPCon Modules

Chandany Sen¹, Haoran Wang¹, Muhammad Umair Khan¹, Xinyuan Wu¹, Xutao Wang¹, Jiaxin Yang¹, Ziruo Zhu¹, Anjie Li¹, Jiexi Fu², Bram Hoex¹
¹ UNSW, Sydney, Australia; ² UNSW, Kensington, Australia

3DO.16.3 Degradation Modes of Low Temperature Soldered Wire Interconnects in PV Modules

Peter Hacke¹, Nick Bosco¹, James Y. Hartley², David C. Miller¹, Soňa Uličná¹
¹ NREL, Golden, United States of America; ² Sandia National Laboratories, Albuquerque, United States of America

3DO.16.4 UV-Induced Degradation: Comparative Analysis of Module Testing and Stabilization Procedures against Outdoor Behavior

Paul Gebhardt¹, Mariella Rivera¹, Esther Fokuhl¹, Christian Reise¹, Erdmut Schnabel¹, Matthias Pander², Ingrid Hädrich¹
¹ Fraunhofer ISE, Freiburg, Germany; ² Fraunhofer CSP, Halle (Saale), Germany

3DO.16.5 Investigating the Recovery Mechanism of Bifacial PV Modules Affected by Polarization-type Potential-Induced Degradation in the Field

Cecile Molto¹, Dylan J Colvin¹, Ryan Smith², Peter Hacke³, Fang Li⁴, Govindasamy Tamizhmani⁴, Jaewon Oh⁵, Halima Jahan⁵, Hubert Seigneur¹
¹ University of Central Florida, Cocoa, United States of America; ² Pordis, Austin, United States of America; ³ NREL, Golden, United States of America; ⁴ Arizona State University, Mesa, United States of America; ⁵ University of North Carolina at Charlotte, Charlotte, United States of America

3DO.16.6 TOPCON PV Modules UV Exposure: Uncovering Hidden Instabilities

Baloji Adothu¹, Shahzada Pamiir Aly¹, Bengt Jaeckel², Matthias Pandar², Ralph Gottschalg², Vivian Alberts¹
¹ DEWA, Dubai, United Arab Emirates; ² Fraunhofer CSP, Halle, Germany

VISUAL PRESENTATIONS 4DV.1

08:30 - 10:00 Agrivoltaics Approaches, Experiences, Results | Integrated and Innovative PV Applications

Chairpersons: Ignacio Antón Hernández
UPM, Madrid, Spain
Tsvetelina Merdzhanova
Forschungszentrum Jülich, Germany
Marc Andre Schüller
Next2Sun Technology GmbH, Dillingen, Germany

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4DO.2

10:30 - 12:00 Agrivoltaic Technologies

Chairpersons: Heine Nygard Riise
IFE, Kjeller, Norway
Etienne Drahi
TotalEnergies OneTech, Palaiseau, France

4DO.2.1 Design and Testing of an Innovative Closed Agrivoltaic System: "Algaeoltaics"

Alessandra Scognamiglio¹, Aniello Borriello¹, Carmine Cancro², Paola Delli Veneri², Marcello Diano³, Stefano Mazzoleni⁴, Fabrizio Carteni⁴
¹ ENEA, Portici, Italy; ² ENEA, Naples, Italy; ³ M2M Engineering, Naples, Italy; ⁴ University of Naples Federico II, Naples, Italy

4DO.2.2 Experimental Investigation of an Agrivoltaic Collector with Planar Spectral Beam Splitting

Inga Krasilnikov¹, Abraham Kribus¹, Gur Mittelman², Liad Reshef³, Shay Ozer³, Lavi Rosenfeld³, Helena Vitoshkin³
¹ Tel Aviv University, Tel Aviv, Israel; ² Afeka Tel-Aviv Academic College of Engineering, Tel Aviv, Israel; ³ ARO, Volcani Center, Rishon LeZion, Israel

4DO.2.3 Agri-PV Potential in Northern Climates: an Experimental Study on Panel Transparency, and Leafy Vegetable Productivity

Matas Rudzikas¹, Giedrė Samuolienė², Justinas Raginskis³, Piotr Dubravskij⁴, Algirdas Baležentis¹, Skirmantė Baležentienė¹
¹ The Applied Research Institute for Prospective Technologies, Vilnius, Lithuania; ² The Lithuanian Research Centre for Agriculture and Forestry, Kaunas, Lithuania; ³ Kaunas University of Technology, Kaunas, Lithuania; ⁴ Modern E-Technologies, Vilnius, Lithuania

4DO.2.4 Optimizing Light Transmission for Crop Growth: The Innovative Voltiris Agrivoltaic System

Jacques Levrat¹, Delphine Petri¹, Matthieu Despeisse¹, Christophe Ballif¹, Jonas Roch², Dominik Blaser², Lauriane Gugnot²
¹ CSEM, Neuchâtel, Switzerland; ² Voltiris, Epalinges, Switzerland

4DO.2.5 Coloured Semi-Transparent CdTe PV Modules in Agrivoltaics: a 2-Year Study on Broccoli Growth and System Potential

Silvia Ma Lu¹, Xiaolin Wang¹, Arash Khosravi¹, Pietro Campana¹
¹ Mälardalen University, Västerås, Sweden



4DO.2.6 Advanced Encapsulant for Agrivoltaic Modules: Enhancing Crop Growth by Means of Stabilized Down-Conversion Dyes

Fabio Silva¹, Anna Karamysheva¹, Kristof Proost¹

¹ IP FAB, Mechelen, Belgium

ORAL PRESENTATIONS 2DO.7

10:30 - 12:00 Insights Into the Stability of Perovskite Solar Cells and Modules

Chairpersons: Nikoleta Kyranaki

Hasselt University, Genk, Belgium

Patricia Schulze

Fraunhofer ISE, Freiburg, Germany

2DO.7.1 Outdoor Performance and Degradation Analysis of Perovskite Solar Cells: A Three-Year Study

Makoto Konagai¹, Hayato Okawa¹, Ryosuke Ishikawa¹, Masatoshi

Yanagida², Yasuhiro Shirai²

¹ Tokyo City University, Tokyo, Japan; ² NIMS, Tsukuba, Japan

2DO.7.2 ALD ZnO Films for Improved Stability of Perovskites Solar Cells

Fernando Solorio¹, Marko Topič¹, Marko Jošt¹

¹ University of Ljubljana, Ljubljana, Slovenia

2DO.7.3 Seasonality in Single-Junction Perovskite Solar Cells: Insights from 4 Years of Outdoor Data

Marko Remec¹, Mark Khenkin¹, Ulas Erdil¹, Quiterie Emery¹, Rutger

Schlatmann¹, Steve Albrecht¹, Marko Topič², Carolin Ulbrich¹

¹ HZB, Berlin, Germany; ² University of Ljubljana, Ljubljana, Slovenia

2DO.7.4 Carbon Based Electrode Perovskite Solar Cells: Comparison of Predicted and Measured Performance for Cells Operating in Different Modes, Indoors and Outdoors

Maximilien Var¹, Johan Parra², Anne Migan-Dubois³, Stéphanie Narbey⁴, Yvan Bonnassieux⁵, Frédéric Oswald¹

¹ CEA, Gif-sur-Yvette, France; ² LMD / IPSL, Palaiseau, France; ³ CentraleSupélec, Gif-sur-Yvette, France; ⁴ Solaronix, Aubonne, Switzerland; ⁵ Polytechnic School, Palaiseau, France

2DO.7.5 Unlocking Precursor Interdiffusion: a Key to Stable, Efficient Thermally Evaporated Perovskite Photovoltaics

Ioanna Vareli¹, Huangui Lai¹, Federico De Giorgi¹, Nada Mrkyvkova², Peter Siffalovic², Fan Fu¹

¹ Empa, Dübendorf, Switzerland; ² Slovak Academy of Sciences, Bratislava, Slovakia

2DO.7.6 Advanced Additives for Space Missions: PVDF-HFP's Impact on Perovskite Solar Cell Reliability

Kun-Mu Lee¹, Seoungjun Ahn¹, Wei-Hao Chiu¹

¹ Chang Gung University, Taoyuan City, Taiwan

ORAL PRESENTATIONS 3DO.12

10:30 - 12:00

Innovative Encapsulation Materials

Chairpersons:

Marc Köntges

ISFH, Emmerthal, Germany

Andreas Halm

ISC Konstanz, Germany

3DO.12.1 Evaluation of Polyolefin Encapsulants for Roll-to-Roll Lamination Applications

Petra Christöfl¹, Casper G.M. van Kessel², Marc M. Koetse², Dorrit

Roosen², Gernot Oreski¹

¹ PCCL, Leoben, Austria; ² TNO, Eindhoven, The Netherlands

3DO.12.2 Pre-Laminates: Enhancing Flexibility in Integrated-Photovoltaic (IPV) Manufacturing Lines

Lison Marthey¹, Hengyu Li¹, Loann Baume¹, Letizia Perla¹, Xavier Denys¹,

Matthieu Despeisse¹, Alessandro Virtuani¹, Christophe Ballif¹

¹ CSEM, Neuchâtel, Switzerland

3DO.12.3 Liquid PV Module Encapsulation to Enable Circular Design

Urvashi Bothra¹, Alberto Poli², Siemen Brinksma², Olindo Isabella¹, Malte

Ruben Vogt¹

¹ TU Delft, Delft, The Netherlands; ² Biosphere Solar, Rotterdam, The Netherlands

3DO.12.4 Student Awards Finalist Presentation: Towards Recyclable PV: High-Efficiency Encapsulant-Free Modules with Nanostructured Solar Cells and Glass

Asier Murillo¹, Cristina Leyre Pinto¹, Iñaki Cornago¹, Alicia Buceta¹

¹ CENER, Sarriguren, Spain

3DO.12.5 Effect of Glass Beads on the Solar Optical Properties of Thermoplastic Encapsulants for Colored PV Modules

Martin Huemer¹, Gernot M. Wallner¹, Andreas Brandstätter²

¹ University of Linz, Linz, Austria; ² Lenzing Plastics, Lenzing, Austria

3DO.12.6 Near Infrared Spectroscopy for Rapid, Inline Quantification of Encapsulant Crosslinking in PV Modules

Gernot Oreski¹, Marton Bredacs¹, Sonja Feldbacher¹, Petra Christöfl¹,

Nikolina Pervan¹, Chiara Barretta¹, Christian Camus², Enno Malguth²,

Adrian Adrian²

¹ PCCL, Leoben, Austria; ² Laytec, Berlin, Germany



ORAL PRESENTATIONS 4DO.17

10:30 - 12:00 Advanced Inspections and Robotic Solutions for PV O&M

Chairpersons: Cristina Cornaro
University of Rome II, Italy
David Daßler
Fraunhofer CSP, Halle (Saale), Germany

4DO.17.1 Towards a Cost-Priority Number for Module Replacements Informed by Energy Yield Time Series and Infrared Thermography Data

Bjørn Lupton Aarseth¹, Magnus Moe Nygård¹, Gaute Otnes¹, Marie Syre Wiig¹, Erik Stensrud Marstein¹
¹ IFE, Kjeller, Norway

4DO.17.2 Model Optimization for Multi-Class Real Time UAV Thermal Anomaly Detection in Solar Energy Systems

Ghaem Taghipour Kani¹, Sayyed Majid Esmailifar¹, Amirreza Ghahremani¹, Mohammadreza Aghaei²
¹ Amirkabir University of Technology, Tehran, Iran; ² NTNU, Ålesund, Norway

4DO.17.3 Optimizing Autonomous Aerial Monitoring of Photovoltaic Power Plants via an Integrated Software Package and a Digital Twin Based Simulation Environment

Mohammad Kolahi¹, Sayyed Majid Esmailifar², Amirmohammad Moradi Sizkouhi³, Mohammadreza Aghaei⁴
¹ University of Isfahan, Isfahan, Iran; ² Amirkabir University of Technology, Tehran, Iran; ³ Concordia University, Montreal, Canada; ⁴ NTNU, Ålesund, Norway

4DO.17.4 Influence of Irradiance and Drone Altitude in Infrared Thermography Inspections of Photovoltaic Plants

Rodrigo del Prado Santamaría¹, Rizal Friansyah¹, Gisele A. dos Reis Benatto¹, Mahmoud Dhimish¹, Thøger Kari¹, Aysha Mahmood¹, Peter B. Poulsen¹, Sergiu V. Spataru¹
¹ DTU, Roskilde, Denmark

4DO.17.5 Advanced Detection of Anomalies: Synergy between Monitoring Data and Aerial Inspections

Julien Deckx¹, Maitheli Nikam¹, Karel De Brabandere¹, Giuliano Luchetta Martins², Gofran Chowdhury¹
¹ 3E, Brussels, Belgium; ² Statkraft UK, London, United Kingdom

4DO.17.6 Strategy for Simple, On-Site Failure Analysis: Investigating Bubbles and Burn Marks in Backsheets of PV Modules

Claudia Buerhop-Lutz¹, Aline Vidal de Oliveira², Oleksandr Mashkov¹, Lucas Nascimento², Ricardo Rütther², Ian Marius Peters¹
¹ HI ERN, Erlangen, Germany; ² Solar Energy Research Laboratory Fotovoltaica/ UFSC, Florianópolis, Brazil

VISUAL PRESENTATIONS 5DV.2

10:30 - 12:00 Life Cycle Analysis and PV Recycling | Citizens Participation and Awareness

Chairpersons: Claire Agraffail
CEA, Le Bourget-du-Lac, France
Silvia Caneva
WIP Renewable Energies, Munich, Germany

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4DO.3

13:30 - 15:00 PV System Design and Assessment

Chairpersons: Kari Lappalainen
Tampere University, Finland
Sara Bouguerra
imo-imomec, Diepenbeek, Belgium

4DO.3.1 A Case Study: Quantifying the Impact of Minor Design Changes on Large-Scale Solar PV Plants

Ayesha Jacobs¹, Paul Nel², Keanu Damon²
¹ Zutari, Cape Town, South Africa; ² 7SecondSolar, Cape Town, South Africa

4DO.3.2 Durable Bonding of Lightweight Crystalline Silicon PV Modules

Guy Beaucarne¹, Tobias Hopp², Dominique Culot¹, Jonathan Curon¹
¹ Dow Silicones Belgium, Seneffe, Belgium; ² Sunman Energy EU, Frankfurt, Germany

4DO.3.3 Measures to adapt the Power Output on Demand by System Design on Rooftop Systems

Hartmut Nussbaumer¹, Lona Tulinski¹, Markus Klenk¹
¹ ZHAW, Winterthur, Switzerland

4DO.3.4 Prospects and Competitiveness of Vertical Solar Photovoltaics in Global Arctic and Sub-Arctic Regions

Geethike V. Arachchi¹, Dominik Keiner¹, Christian Breyer¹
¹ LUT University, Lappeenranta, Finland

4DO.3.5 Site Suitability Assessment of Ground-Mounted Photovoltaic Systems through Combining Techno-Economic and Environmental Dimensions

Poomisub Manonukul¹, Victor Arturo Martinez Lopez¹, Miro Zeman¹, Olindo Isabella¹, Hesam Ziar¹
¹ TU Delft, Delft, The Netherlands

4DO.3.6 Assessment of Personal Safety Concerns of Plug and Play Photovoltaic Inverters using a Black Box Approach and Laboratory Measurements

Alexander Erber¹, David Joss¹, Christof Bucher¹
¹ BFH, Burgdorf, Switzerland



ORAL PRESENTATIONS 2DO.8

13:30 - 15:00 Multiple Aspects of Perovskite PV Research

Chairpersons: Sjoerd Veenstra
TNO Energy Transition, Eindhoven, The Netherlands
Kristina Geistert
Karlsruhe Institute of Technology, Germany

2DO.8.1 Augmenting In Situ Monitoring of Perovskite Thin-Film Formation Using Deep Learning

Felix Laufer¹, Ulrich Wilhelm Paetzold¹
¹ KIT, Karlsruhe, Germany

2DO.8.2 Strategies for Quasi-2D Perovskite Integration in p-i-n Solar Cells

Anna Capitaine¹, Iwan Zimmermann¹, Marion Provost¹, Anyssa Derj¹,
Alexandra Levchenko¹, Mirella Al Katrib¹, Daniel Ory², Jean Rousset²
¹ IPVF, Palaiseau, France; ² EDF, Palaiseau, France

2DO.8.3 Innovative Approach to Bismuth-Antimony-Iodide Double Perovskite PV Absorbers via Anion Exchange and Solide-State Reactions

Oleksandr Stroyuk¹, Oleksandra Raievska¹, Sachin Kinge², Jens Hauch¹,
Christoph Brabec³
¹ HI ERN, Erlangen, Germany; ² Toyota Motors Europe, Brussel, Belgium; ³ FAU, Erlangen, Germany

2DO.8.4 High-Throughput Combinatorial Synthesis and Characterization of Halide Perovskites

Alessia Romio¹, Huagui Lai¹, Damien Terebenec¹, Fan Fu¹
¹ EMPA, Dübendorf, Switzerland

2DO.8.5 Co-Evaporated Perovskite Absorbers for Textured Monolithic Silicon Tandem Solar Cells: Composition Analysis and Process Optimization

Marcel Roß¹, Stefanie Severin¹, Aleksandra Miaskiewicz¹, Viktor Škorjanc¹,
Angelika Harter¹, Jona Kurpiers¹, Bernd Stannowski¹, Lars Korte¹, Steve Albrecht¹
¹ HZB, Berlin, Germany

2DO.8.6 Ab-Initio Approach to Guide the Optimization of Inorganic Halide Perovskites

Antoine Gissler¹, Philip Schulz², Philippe Baranek¹
¹ EDF R&D, Palaiseau, France; ² IPVF, Palaiseau, France

ORAL PRESENTATIONS 5DO.18

13:30 - 15:00 PV Recycling and Material Demand

Chairpersons: Paula Sanchez-Friera
Solkeys, Gijón, Spain
Karsten WAMBACH
Wambach-Consulting, Petersdorf, Germany

5DO.18.1 Final Results from the H2020 ICARUS Project – Innovative Eco-Efficient Processing and Refining Routes for Secondary Raw Materials from Silicon Ingot and Wafer Manufacturing for Accelerated Utilization in High-End Markets

Martin P. Bellmann¹, Anne-Karin Sjøiland², Arne Kristian Dahle³, Christian Landaas⁴, Victorien Iwaszko⁵, Rene Peche⁶, Wolfram Palitzsch⁷, Philippe Lenain⁸, Iratxe Meatza⁹, Theodora Kyratsi¹⁰, Huiping Liu¹¹, Emanuele Milani¹², Guy Chichignoud¹³, Stefan Fischer¹⁴, Almut Schwenke¹⁵, Eirik Nordboe¹⁶, Marco Pieterse¹⁷, Roland Riva¹⁸, Berhane Darsene Dimd¹
¹ SINTEF, Trondheim, Norway; ² ReSiTec, Kristiansand, Norway; ³ NorSun, Oslo, Norway; ⁴ Northern Silicon, Meråker, Norway; ⁵ ROSI Solar, Saint-Martin-d'Hères, France; ⁶ bifa Umweltinstitut, Augsburg, Germany; ⁷ LuxChemtech, Freiberg, Germany; ⁸ benkei, Lyon, France; ⁹ CIDETEC, San Sebastián, Spain; ¹⁰ University of Cyprus, Nicosia, Cyprus; ¹¹ GRANGES, Finspång, Sweden; ¹² Marelli Europe, Venaria Reale, Italy; ¹³ Grenoble Institute of Technology, Grenoble, France; ¹⁴ SGL Carbon, Meitingen, Germany; ¹⁵ SGL Battery Solutions, Meitingen, Germany; ¹⁶ Fiven Norge, Lillesand, Norway; ¹⁷ Chemconserve, Bussum, The Netherlands; ¹⁸ CEA, Le Bourget-du-Lac, France

5DO.18.2 New Thermomechanical Test Developed to Assess the Recyclability Index of PV Modules

Cristina Leyre Pinto¹, Asier Murillo¹, Ana María Gracia¹, Felice Alfieri², Nieves Espinosa³, Davide Polverini⁴
¹ CENER, Sarriguren-Navarra, Spain; ² Viegand Maagøe, Copenhagen, Denmark; ³ University of Murcia, Murcia, Spain; ⁴ European Commission DG, Brussels, Belgium

5DO.18.3 LARS: Laser-Assisted Recycling of Silicon Solar Modules

Mirjam Theelen¹, Remi Aninat¹, Toon IJzermans¹, Joao Morais Gomes¹, Monique van den Nieuwenhof¹, Maarten Dörenkämper¹, Fallon Colberts², Anne Biezemans¹, Bas Raaijmakers³, Johan Bosman¹, Henri Fledderus¹, Bart Geerligs³, Ando Kuypers¹, Maarten Van der Vleuten¹
¹ TNO, Eindhoven, The Netherlands; ² Zuyd University of Applied Sciences, Heerlen, The Netherlands; ³ TNO, Petten, The Netherlands

5DO.18.4 Mechanical Glass-Backsheet PV Modules Delamination towards Materials Recycling

Fabrice Coustier¹, Roland Riva¹, Xavier Mackré Delannoy¹, Jérémie Aime¹, Romain Duwald², Youcef Karar²
¹ CEA / INES, Le Bourget-du-Lac, France; ² CEA, Grenoble, France

5DO.18.5 Evaluation of Polymer Encapsulants as Feedstock for Advanced Recycling

Caroline Grand¹, Adriana Ferreira², Guy Beaucarne³, Wolfram Palitzsch⁴
¹ Dow Iberia, Tarragona, Spain; ² Dow Benelux, Terneuzen, The Netherlands; ³ Dow Silicones Belgium, Seneffe, Belgium; ⁴ LuxChemtech, Freiberg, Germany



5DO.18.6 Assessing III-V Material Availability: Can Supply meet Future Multi-GW Photovoltaics Demand?

Jessica Yajie Jiang¹, Ausrine Bukauskaite¹, Ned Ekins-Daukes¹

¹ UNSW, Sydney, Australia

VISUAL PRESENTATIONS 5DV.3

13:30 - 15:00 Grid Integration and Flexibility Enablers | Global, Country- and Application-Specific Analysis of PV Deployment Aspects | Costs, Economics, Finance and Markets

Chairpersons: Heinz Ossenbrink
Band Gap, Bad Feilnbach, Germany
Ammar Nayfeh
Khalifa University, Abu Dhabi, United Arab Emirates
Fatima-Zahra Ouchani
Green Energy Park, Benguerir, Morocco

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

PANEL DISCUSSION

13:30 - 15:00 DO.13: Scalability and Manufacturability Prospects in Europe for New Technologies

Chairpersons: Kaining Ding
FZ Jülich, Germany
Delfina Muñoz
CEA, Le Bourget-du-Lac, France

This panel of experts from industry, policy and research will explore and analyse the landscape of PV manufacturing in Europe and globally, focusing on the scalability and industrial viability of emerging technologies. Participants can expect a dynamic exchange on Europe's strategic positioning in the global PV market, with particular attention to China's current dominance and the potential pathways for European nations to challenge or complement this status.

Key themes will include whether Europe should prioritize utility scale production or concentrate on specialized, high value segments; or the economic rationale for targeting only domestic versus global markets. The discussion will also address the implications of betting on breakthrough technologies like perovskites, as well as the resilience of the silicon value chain in supporting Europe's ambitions.

Further attention will be given to the political and economic bottlenecks facing European manufacturers, such as high production costs, support mechanisms or the need for a long-term industrial strategy. The panel will examine lessons learned from past initiatives (such as the CIGS experience) and current industrial decisions like 3SUN's shift towards HJT instead of the market dominant TOPCon.

Finally, the conversation will assess whether the European Commission's technology-neutral stance remains viable in a world where industrial policy is increasingly shaped by geopolitical and strategic considerations.

1 Panelist 1 - Molly Morgan, CRU

2 Panelist 2 - Jens Holm, ESMC, Belgium

3 Panelist 3 - Veronica Bermudez, BERBETIN, France

4 Panelist 4 - Maria Getsiou, European Commission DG RTD, Belgium

5 Panelist 5 - Marina Foti, 3Sun, Italy

6 Panelist 6 - Max Ma, Phoenixolar, China

ORAL PRESENTATIONS 4DO.4

15:15 - 16:45 Agrivoltaics, PV Noise Barriers and Floating PV

Chairpersons: Anatoli Chatzipanagi
European Commission JRC, Ispra, Italy
Alessandra Scognamiglio
ENEA, Portici, Italy

4DO.4.1 Boosting Profitability: The Power of Vertical Bifacial PV in Modern Agrivoltaics

Marc Andre Schüller¹, Peter Bendix¹, Simon Lahr¹, Aysim Schäfer¹, Anna Morales Vilches¹

¹ Next2Sun Technology, Dillingen, Germany

4DO.4.2 Benefits of an Agrivoltaic Installation in an Ecological Vineyard in Southern Spain

Álvaro Fernández Solas¹, Natalie Hanrieder¹, Anna Kujawa¹, Sergio González Rodríguez¹, Marleen Landes¹, Aitor Castillo², Estefanía Sánchez Vizcaíno³, Stefan Wilbert¹

¹ DLR, Almería, Spain; ² Bettergy, Málaga, Spain; ³ Cortijo El Cura Eco-Bodega, Laujar de Andarax, Spain

4DO.4.3 Case Study of Bifacial PV based Noise Barriers in Lithuania

Paulius Laurikėnas¹, Julius Denafas¹, Povilas Lukinskas¹, Tadas Radavičius¹, Saulius Rudys², Rimvydas Aleksiejūnas²

¹ SoliTek, Vilnius, Lithuania; ² Vilnius University, Vilnius, Lithuania

4DO.4.4 Energy Yield Analysis and Performance Monitoring of Three Photovoltaic Noise Barriers in Belgium and the Netherlands

Sara Bouguerra¹, Richard de Jong², Santhosh Ramesh², Tine Engelen¹, Marta Casasola Paesa¹, Jan Mertens², Fallon Colberts³, Ismail Kaaya², Patrizio Manganiello¹, Arnaud Morlier², Michael Daenen¹

¹ Hasselt University, Diepenbeek, Belgium; ² imec, Genk, Belgium; ³ Zuyd University, Heerlen, The Netherlands

4DO.4.5 Model Tests on Waterlily Shaped Offshore PV System

Linda Kemp¹, Naman Baderiya¹, Patrick Schrijvers¹, William Otto¹

¹ MARIN, Wageningen, The Netherlands

4DO.4.6 Modelling Yearly Wave-Induced Loss for Floating Photovoltaics Using Realistic Weather Conditions

Nils E. C. Taugbøl¹, Vilde Stueland Nysted², Josefine Selj²

¹ University of Oslo, Oslo, Norway; ² IFE, Kjeller, Norway



ORAL PRESENTATIONS 1-2DO.9

15:15 - 16:45 Late News: Silicon, Perovskites and Tandems

Chairpersons: Stefan W. Glunz
Fraunhofer ISE, Freiburg, Germany
Giso Hahn
University of Konstanz, Germany

1DO.9.1 Hybrid Interdigitated Back Contact Silicon Solar Cells with Superior Efficiency

Hua Wu¹, Lei Xie¹, Junzhe Wei¹, Mingzhe Yu¹, Fei Luo¹, Yong Liu¹, Xiyan Tang¹, Zhipeng Huang¹, Shi Yin¹, Qing Tang¹, Fuguo Peng¹, Jun Duan¹, Feng Ye¹, Yunpeng Li¹, Yunlai Yuan¹, Jiansheng Chen¹, Xiaoning Ru¹, Minghao Qu¹, Jianbo Wang¹, Miao Yang¹, Junxiong Lu¹, Chaowei Xue¹, Liang Fang¹, Xixiang Xu¹, Zhenguo Li¹

¹ LONGi Clean Energy, Xi'an, China

2DO.9.2 High Yield Production of Perovskite Solar Module and Applications

Buyi Yan¹

¹ Microquanta Semiconductor, Hangzhou, China

1DO.9.3 Silicon Solar Cells – From High Efficiency Single-junction to Bottom Cells in Two-Terminal Perovskite-Silicon Tandem Devices

Jana-Isabelle Polzin¹, Mario Hanser¹, Anna Damm¹, Sadaf Ghasemi², Jan Benick¹, Martin Bivour¹, Armin Richter¹, Oussama Er-Raji³, Yashika Gupta¹, Patricia Schulze¹, Juliane Borchert¹, Stefan Glunz¹

¹ Fraunhofer ISE, Freiburg, Germany; ² Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany; ³ Fraunhofer ISE, Freiburg im Breisgau, Germany

2DO.9.4 From Development to Deployment: The Field Debut of Perovskite Tandem Photovoltaics

Ed Crossland¹

¹ Oxford PV, Begbroke, United Kingdom

2DO.9.5 Consensus Statement Regarding Reliability Testing of Perovskite-Based Tandems

Daniel Tune¹, Ivona Kafedjiska², Erkan Aydin³, Delfina Muñoz⁴, Mark Khenkin², Ulrich Paetzold⁵, Quentin Jeangross⁶, Solenn Berson⁴, Carolin Ulbrich², Kaining Ding⁷, Ivan Gordon⁸, Juliane Borchet⁹, Stefan Glunz⁹, Michael Saliba¹⁰

¹ ISC Konstanz, Konstanz, Germany; ² HZB, Berlin, Germany; ³ LMU, Munich, Germany; ⁴ CEA, Le Bourget-du-Lac, France; ⁵ KIT, Karlsruhe, Germany; ⁶ CSEM, Neuchâtel, Switzerland; ⁷ FZJ, Jülich, Germany; ⁸ imec, Leuven, Belgium; ⁹ Fraunhofer ISE, Freiburg, Germany; ¹⁰ IPV, Stuttgart, Germany

ORAL PRESENTATIONS 5DO.14

15:15 - 16:45 PV Forecasting and Grid Planning

Chairpersons: Pierre-Jean Alet
CSEM, Neuchâtel, Switzerland
Marion Perrin
Energy Pool, Le Bourget-du-Lac, France

5DO.14.1 Pan-European Climate Database v4.2: Recent Advancements in Regional PV Modelling and Data

Rodrigo Amaro e Silva¹, Yves-Marie Saint-Drenan², Giovanni Aldrigo³, Riccardo Bortolami³, Stefano Cordeddu³, Letizia Lusito³, Andrea Perbellini³, Elena Restivo³, Susanna Strada³, Alberto Troccoli³, Nube Gonzalez-Reviriego⁴, Aron Zuker⁵, Laurent Dubus⁶, Augustin Tournon⁶, Laurens Stoop⁷

¹ University of Lisbon, Lisbon, Portugal; ² PSL Research University, Sophia Antipolis, France; ³ Inside Climate Service, Padua, Italy; ⁴ ECMWF, Bonn, Germany; ⁵ ENTSE-E, Brussels, Belgium; ⁶ RTE, Paris, France; ⁷ TenneT TSO, Arnhem, The Netherlands

5DO.14.2 Regional PV Modelling 101: the Devil is in the Details

Rodrigo Amaro e Silva¹, Yves-Marie Saint-Drenan², Elke Lorenz³, Tobias Zech³, Matthias Zech⁴, Wilfried van Sark⁵, Guadalupe Sanchéz-Hernández⁶, David Pozo-Vazquez⁶, Marco Pierro⁷, Cristina Cornaro⁸, Elena Collino⁹, Dario Ronzio⁹, Laurent Dubus¹⁰, Augustin Tournon¹⁰

¹ University of Lisbon, Lisbon, Portugal; ² PSL Research University, Sophia Antipolis, France; ³ Fraunhofer ISE, Freiburg, Germany; ⁴ DLR, Oldenburg, Germany; ⁵ Utrecht University, Utrecht, The Netherlands; ⁶ University of Jaen, Jaen, Spain; ⁷ Eurac Research, Bolzano, Italy; ⁸ University of Rome Tor Vergata, Rome, Italy; ⁹ RSE, Milan, Italy; ¹⁰ Réseau de Transport d'Électricité, Paris, France

5DO.14.3 Empirical Analysis of Zero-Shot Cross-Frequency Forecasting for Missing Data Prediction in Real-time PV Management

Issei Suemitsu¹, Toru Kono¹, Ryo Wakabayashi¹, Jun Tsunoda¹, Yosuke Yamaguchi¹, Wenpeng Wei¹

¹ Hitachi, Kokubunji, Japan

5DO.14.4 From PV Potential to Grid Impact: an Estimation of the Future PV Penetration in the South Tyrolean Electricity Grid

Azim Heydari¹, Enrico Dalla Maria¹, David Moser¹, Davide Prando², Alessandro Donadello², Grazia Barchi¹

¹ Eurac Research, Bolzano, Italy; ² Edyna, Bolzano, Italy

5DO.14.5 Assessing the Economic Value for Grid Operators of Quantified Smoothing Effects from PV Systems with Varying Orientations

Johan Lindahl¹

¹ Becquerel Sweden, Knivsta, Sweden

5DO.14.6 Cost and Reliability of 24/7 Carbon Free Electricity from PV – Evaluation of Overnight Solar-plus-storage in Abu Dhabi

Harry Apostoleris¹, Kareem Younes², Matteo Chiesa²

¹ EPRI, Dubai, United Arab Emirates; ² Khalifa University, Abu Dhabi, United Arab Emirates



ORAL PRESENTATIONS 3DO.19

15:15 - 16:45 Mechanical Load Testing and Insights into Glass Breakage

Chairpersons: Guy Beaucarne
Dow Silicones Belgium, Seneffe, Belgium
Veronica Bermudez Benito
BERBETIN, Antibes, France

3DO.19.1 Key Parameters Influencing Hail Impact Resilience in Photovoltaic Modules: Experimental Insights for Robust Module Design and Certification

Dominika Chudy¹, Daniele Forni¹, Mattia Ceretti¹, Ezio Cadoni¹, Mauro Cacciavio¹

¹ SUPSI, Mendrisio, Switzerland

3DO.19.2 Recent Insights into Glass Breakage: Findings from Factory Production Oversight, On-Site Inspections, and Laboratory Testing

Thomas Weber¹, Abdullah Abu Sayed¹, Roman Joziak¹, Eduardo Tellez Rodriguez¹, Nattapark Pongthanacharoenkul¹, Sören Rindert¹, Benjamin Lippke¹, Craig Wong¹, Steven Xuereb¹, Claudia Buerhop-Lutz²

¹ Kiwa PI Berlin, Berlin, Germany; ² HI ERN, Erlangen, Germany

3DO.19.3 Understanding Glass Breakage in Field-Operated PV Modules: Learnings from Inhomogeneous Mechanical Load Tests

Jochen Markert¹, Aditya Girish Belawadi¹, Pascal Romer¹, Enzo Job¹, Ingrid Hädrich¹, Daniel Philipp¹

¹ Fraunhofer ISE, Freiburg, Germany

3DO.19.4 Determining the Glass Strength of Solar Glass - Test and Evaluation Methods

Hannah Reichart¹, Matthias Pander², Ruth Kasper¹

¹ University of Applied Sciences Cologne, Cologne, Germany; ² Fraunhofer CSP, Halle, Germany

3DO.19.5 Enhanced Mechanical Load Testing of PV Modules for Cold and Snowy Climates

Anika Gassner¹, Gabriele C. Eder¹, Ebrar Özkalay², Gabi Friesen², Markus Feichtner³, Vasiliki-Maria Archodoulaki⁴

¹ OFI, Vienna, Austria; ² SUPSI, Mendrisio, Switzerland; ³ Sonnenkraft, St Veit an der Glan, Austria; ⁴ TU Wien, Vienna, Austria

3DO.19.6 Assessing The Reliability of Commercial Lightweight Photovoltaic Modules

Olatz Arriaga Arruti¹, Bénédicte Bonnet-Eymard¹, Matthieu Despeisse¹, Christophe Ballif¹

¹ CSEM, Neuchâtel, Switzerland

VISUAL PRESENTATIONS 4DV.4

15:15 - 16:45 PV System Engineering

Chairpersons: Kari Lappalainen
Tampere University, Finland
João M. Almeida Serra
University of Lisbon, Portugal

Detailed information on this session is presented in the section entitled 'EU PVSEC 2025 Visual Presentations'.

ORAL PRESENTATIONS 4DO.5

17:00 - 18:30 Modelling and Optimisation of Agrivoltaic Systems

Chairpersons: Ioannis (John) Tsanakas
CEA, Le Bourget-du-Lac, France
Giovanni Borz
Eurac Research, Bolzano, Italy

4DO.5.1 Special Introductory Presentation: Assessing and Applying Light Modelling Tools for Agrivoltaics: Validation, Benchmarking, and Practical Use from SYMBIOSYST

S Prithivi Rajan¹, Shu-Ngwa Asaa², Alexandros Katsikogiannis³, Jesus Robledo¹, Jonathan Leloux¹, Ismail Kaaya², Yingyu Zhang⁴, Maarten Hertog⁴, Pieter Verboven⁴, Giacomo Bosco⁵, Giovanni Borz⁶, David Moser⁶

¹ LuciSun, Brussels, Belgium; ² Imec, Leuven, Belgium; ³ TU Delft, Delft, The Netherlands;

⁴ KU Leuven, Leuven, Belgium; ⁵ Fotoniq, Delft, The Netherlands; ⁶ EURAC, Bolzano, Italy

4DO.5.2 Optimizing Crop Irradiance Distributions in AgriPV Systems: PV Cell Layouts and Materials Diffusivity Influence on AgriPV Systems using BSDF and Ray Tracing Simulations

Alvaro de Gruijter¹, Laura Maturi¹, Giovanni Borz¹, Jordi Veirman¹, David Moser¹

¹ Eurac Research, Bolzano, Italy

4DO.5.3 Modelling the Micro-Climate Cooling Effect of Open Agri-PV: Impact on Performance, Reliability, and Environment

Ismail Kaaya¹, Zoe Scheerlinck², Yingyu Zhang², Bram Van de Poel², Pieter Verboven², Arnaud Morlier¹

¹ Imec, Genk, Belgium; ² KU Leuven, Leuven, Belgium

4DO.5.4 Development and Evaluation of an Agrivoltaic System in Olive Groves based on a Novel Smart Tracking Algorithm

Iñaki Cornago¹, Irati Amatriain¹, Gregorio Olivares¹, Gillen Abrego², Eusebio Gainza², Ildefonso Muñoz¹

¹ CENER, Sarriena, Spain; ² ALLOTARRA, Allo, Spain

4DO.5.5 Adoption and Optimisation Analysis of Agri-Voltaic Systems for Horticultural Production and Energy Autonomy in Lubumbashi

Eddie Bilitu¹, Shu-Ngwa Asaa², Sara Bouguerra¹, Nikoleta Kyranaki¹, Ismail Kaaya³, Yannick Useni⁴, Michael Daenen¹

¹ Hasselt University, Hasselt, Belgium; ² Hasselt University, Genk, Belgium; ³ imec, Genk, Belgium; ⁴ University of Lubumbashi, Lubumbashi, Congo (DRC)



ORAL PRESENTATIONS 4DO.10

17:00 - 18:30 PV O&M Insights, Direct Uses of PV Electricity and Batteries

Chairpersons: Dirk Stellbogen
ZSW, Stuttgart, Germany
Tsvetelina Merdzhanova
Forschungszentrum Jülich, Germany

4DO.10.1 Developing a Novel Sensor Health KPI for Evaluating Irradiance Sensor Performance

Sascha Lindig¹, Spyros Theocharides¹, Julián Ascencio-Vásquez¹
¹ Univers, Courbevoie, France

4DO.10.2 Measurement and Analysis of Bifacial Gain for Commercial & Industrial PV Systems: Impact of Building Structure and Environmental Factors

Pierre Besson¹, Jean-Francois Lelievre¹, Antoine Dizier¹, Ismael Lokhat², Benoit Lelong³

¹ INES, Le Bourget-du-Lac, France; ² Trace Software, Saint-Romain-de-Colbosc, France;
³ Cythelia Energy, La Motte-Servolex, France

4DO.10.3 Assessing Tracker Availability in Solar PV Power Plants: Methods & Insights

Giuliano Luchetta Martins¹, Lucas Z. Sergio¹, Maitheli Nikam², Gofran Chowdhury², Elena Koumpli¹, Jan Muller¹

¹ Statkraft UK, London, United Kingdom; ² 3E, Brussels, Belgium

4DO.10.4 Beyond Solar-To-Hydrogen Efficiency Limit with Batteries

Uchechi Chibuko¹, Tsvetelina Merdzhanova¹, Uwe Rau¹, Ursula Würstbauer², Oleksandr Astakhov¹

¹ FZJ, Jülich, Germany; ² University of Münster, Münster, Germany

4DO.10.5 Degradation of Lithium-Ion Batteries: a Meta-Analysis

Matteo Ligorati¹, Jerome Geyer-Klingenberg¹, Andreas Rathgeber¹

¹ University of Augsburg, Augsburg, Germany

4DO.10.6 From Adoption to Over-Extraction: Evaluation of the Trade-offs of Solar Irrigation in Rajasthan

Vanshika Gupta¹, S.P. Singh¹

¹ Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India

ORAL PRESENTATIONS 5DO.15

17:00 - 18:30 Aggregation, Hybridisation, and Storage

Chairpersons: Johannes Stierstorfer
WIP Renewable Energies, Munich, Germany
Gerd Heilscher
Technische Hochschule Ulm, Germany

5DO.15.1 Mitigating Grid Impact of Distributed Solar Generation through a VPP-Based firm PV Strategy

Marco Pierro¹, Alessandro Donadello², Davide Prando², David Moser¹, Grazia Barchi¹

¹ Eurac Research, Bolzano, Italy; ² Edyna, Bolzano, Italy

5DO.15.2 Quantifying the Gap: Rule-based vs. Smart Energy Management of Residential PV Self-Consumption with Storage

Carolina Crespo¹, Rodrigo Amaro e Silva¹, Miguel Centeno Brito¹

¹ University of Lisbon, Lisbon, Portugal

5DO.15.3 Solutions for Optimizing Shared PV Installations at Rural Energy Communities Driven by Citizens: the case of CERCA Energy Community

Laura Palomino¹, Daniel Sierra¹, Sergio Morales¹, Rita Hogan¹, Luis Miguel Carrasco¹, Luis Narvarte¹, Ana Belén Cristóbal¹

¹ UPM, Madrid, Spain

5DO.15.4 Enhanced Value of Grid-connected PV with Battery Storage in a Negative Price Environment

Djaber Berrian¹, Gaurang Chhaphia¹, Rene van Baal¹, Johannes Linder¹

¹ Belectric, Kollitzheim, Germany

5DO.15.5 Infinity, a Small-Scale Prototype for Firm-PV Generation

Federico Andreozzi¹, Gianluigi Bovesecchi¹, Richard Perez², Marco Pierro³, Cristina Cornaro¹

¹ University of Rome Tor Vergata, Rome, Italy; ² University at Albany, Albany, United States of America; ³ EURAC, Bolzano, Italy

5DO.15.6 State of Health Estimation of PV and BESS in the Spanish Power System

Felipe Salinas¹, Biel Roig², Gofran Chowdhury¹, Joan Vinaixa²

¹ 3E, Brussels, Belgium; ² 3E, Barcelona, Spain



ORAL PRESENTATIONS 3DO.20

17:00 - 18:30 Performance of Polymeric Materials
 Chairpersons: Christian Camus
 LayTec, Berlin, Germany
 Ulrike Jahn
 Fraunhofer CSP, Halle (Saale), Germany

3DO.20.1 Reliable Backsheet / Encapsulant Combinations – Comparative Testing of Mini Modules

Jonathan Kriening¹, Roland Einhaus¹, Maximilian Engel¹, Bengt Jaeckel², Matthias Pander², Anton Mordvinkin², Ralph Gottschalg³, Claudia Buerhop-Lutz⁴, Peter Clawin⁵, Max Köntopp⁵
¹ ZSW, Stuttgart, Germany; ² Fraunhofer CSP, Halle, Germany; ³ Hochschule Anhalt, Köthen, Germany; ⁴ FZJ, Erlangen, Germany; ⁵ Hanwha Q CELLS, Thalheim, Germany

3DO.20.2 Outdoor Backsheet Exposure in Tropical and Desert Climates and Its Correlation to Accelerated Laboratory Testing

Stefan Mitterhofer¹, Zelin Li¹, Karissa Jensen¹, Ashlee Aiello¹, Song Syun Jhang¹, Xiaohong Gu¹
¹ NIST, Gaithersburg, United States of America

3DO.20.3 Environmental Delamination of Colored PV Encapsulants from Glass Substrates

Martin Huemer¹, Gernot M. Wallner¹, Gabriel Riedl¹, Andreas Brandstätter²
¹ University of Linz, Linz, Austria; ² Lenzing Plastics, Lenzing, Austria

3DO.20.4 Unveiling Wavelength Converting Encapsulant Specific Features

Lison Marthey¹, Hengyu Li¹, Matthieu Despeisse¹, Maxime Roten¹, Maeva Thiévent², Jonas Geissbühler¹, Hugo Quest¹, Delphine Petri¹, Jonathan Champlaud¹, Christophe Ballif¹
¹ CSEM, Neuchâtel, Switzerland; ² EPFL, Lausanne, Switzerland

3DO.20.5 Reliability Studies of UV Downshifting Encapsulants after Damp-Heat and UV Weathering

Jishnu Ramachandran Nair¹, Marius Lüdemann², Paul-Tiberiu Miclea¹, Kai Zhang³, Kaining Ding³, Andreas Lambert³, Ralph Gottschalg¹, Robert Heidrich¹, Anton Mordvinkin¹
¹ Fraunhofer CSP, Halle, Germany; ² Anhalt University of Applied Sciences, Köthen, Germany; ³ FZJ, Jülich, Germany

3DO.20.6 Student Awards Finalist Presentation: Festina Lente! The Impact of Lamination Duration on Encapsulant Stability

Nikolina Pervan¹, Jutta Geier¹, Christian Veas¹, Gernot Oreski¹
¹ PCCL, Leoben, Austria

ORAL PRESENTATIONS 5EO.1

08:30 - 10:00 Citizens Participation and Awareness
 Chairpersons: Silvia Caneva
 WIP Renewable Energies, Munich, Germany
 Ana Belen Cristóbal
 UPM, Madrid, Spain

5EO.1.1 Social Housing and Energy Communities: Balancing Affordability and Profitability in Multi-Apartment Buildings

Elina Bosch¹, Caroline Plaza², Melodie De L'Epine², Gaëtan Masson¹
¹ Becquerel Institute, Brussels, Belgium; ² Becquerel Institute France, Lyon, France

5EO.1.2 Study for an Agrivoltaic Based Rural Energy Community in Alentejo Portugal

José Almeida Silva¹, Vasco Cabecinha¹, Dorivaldo Duarte¹, Afonso Cavaco¹, Luís Fialho¹, Pedro Horta¹
¹ University of Évora, Évora, Portugal

5EO.1.3 Innovative Governance Models for Agri-PV in Rural Desert Regions: a Scalable Framework for Sustainable Energy Transitions

Nikita Shah¹, Sofia Saavedra Bruno¹, Myriam El Khoury¹, Geert Palmers², Gofran Chowdhury²
¹ ORG Architecture & Urbanism, Brussels, Belgium; ² 3E, Brussels, Belgium

5EO.1.4 Challenges and Lessons Learned in the Implementation of Regional-Scale PV Energy Community in Spain

Luis Miguel Carrasco¹, Rita Hogan Almeida¹, Kiane Alves e Silva¹, Luis Narvarte¹
¹ UPM, Madrid, Spain

5EO.1.5 Model for Renewable Energy Education and Career Development

Jayaprasad Arumughan¹, Monika Sarkadi¹, Radovan Kopecek¹, Kristian Peter¹
¹ ISC Konstanz, Konstanz, Germany

5EO.1.6 The Jülich Photovoltaic Research and Education Mobile Laboratory (JuPREMe Lab)

Georgette Udo¹, Timon Sebastian Vaas¹, Maurice Nuys¹, Stefan Haas¹, Uwe Rau¹, Buğra Turan¹
¹ FZJ, Jülich, Germany

VISUAL PRESENTATIONS

17:00 – 18:30 POSTER AWARDS WINNERS SESSION



ORAL PRESENTATIONS 4EO.2

08:30 - 10:00 Vehicle Integrated PV

Chairpersons: Roland M. E. Valckenborg
TNO, Eindhoven, The Netherlands
Lenneke H. Slooff
TNO Energy Transition, Petten, The Netherlands

4EO.2.1 VIPV Parameter Optimization under Dynamic Shading

Ricardo Moruno¹, Luis Javier San José¹, Rubén Núñez¹, Rebeca Herrero¹, Ignacio Antón¹
¹ UPM, Madrid, Spain

4EO.2.2 Influence of Different Driving Patterns and Electrical Design on VIPV Performance

Judy Jalkh¹, Christian Doppler¹, Philip Caluori¹, Manuel Ruf²
¹ Virtual Vehicle, Graz, Austria; ² Robert Bosch, Stuttgart, Germany

4EO.2.3 Modeling Temperature Dynamics in VIPV Systems using the Extended Faiman Model

Bart E. Pieters¹, Neel Patel¹, Goodfriend Whyte¹, Evgenii Sovetkin¹, Karsten Bittkau¹, Angèle Reinders², Andreas Gerber¹
¹ IMD-3 Photovoltaics, FZJ, Jülich, Germany; ² TU Eindhoven, Eindhoven, The Netherlands

4EO.2.4 Curved Glass-Free PV Module Characterization and Fabrication for Electric Vehicles

Kléber Nicolet-dit-Félix¹, Mert Turan¹, Leonardo Panattoni¹, Umang Desai¹, Martín Pérez Chuecos², Gianluca Cattaneo², Bénédicte Bonnet-Eymard², Andreas Hutter², Antonin Faes², Christophe Ballif¹
¹ EPFL PV-LAB, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland

4EO.2.5 Dynamic GIS-Based 3D Solar Simulation Framework for Assessing VIPV in Urban Public Transport using GTFS and Driving Cycles

David Pera¹, Christian Braun¹, Philippe Pinheiro¹, Miguel Brito², Ulrich Leopold¹
¹ Luxembourg Institute of Science and Technology, Esch-sur-Alzette, Luxembourg; ² University of Lisbon, Lisbon, Portugal

4EO.2.6 Optimizing Angular Performance of Curved VIPV Modules

Francisco José Martín¹, Rebeca Herrero¹, Ignacio Antón¹
¹ UPM, Madrid, Spain

ORAL PRESENTATIONS 5EO.3

08:30 - 10:00 Markets, Costs and Economics

Chairpersons: Christian Breyer
LUT University, Lappeenranta, Finland
Izumi Kaizuka
RTS Corporation, Chuo-ku, Japan

5EO.3.1 A Snapshot of the global PV Market - 2024

Gaëtan Masson¹, Melodie de l'Epine², Arnulf Jäger-Waldau³, Izumi Kaizuka⁴, Johan Lindahl⁵, José Donoso⁶
¹ IEA PVPS Task 1, Brussels, Belgium; ² IEA PVPS Task 1, Lyon, France; ³ European Commission, Rome, Italy; ⁴ RTS Corporation, Tokyo, Japan; ⁵ Becquerel Sweden, Knivsta, Sweden; ⁶ UNEF, Madrid, Spain

5EO.3.2 Exploring the Revenue Potential of Photovoltaic Systems Participating in Frequency Containment Reserve

Emil Petkovski¹, Theo Bosma¹, Marcel Eijgelaar¹, Ravi Singh¹
¹ DNV, Arnhem, The Netherlands

5EO.3.3 Revenues at Risk and Mitigation Strategies for Solar PV Plants in Times of Negative Electricity Prices

Philippe Macé¹, Elina Bosch¹, Caroline Plaza², David Moser³, Gaëtan Masson¹
¹ Becquerel Institute, Brussels, Belgium; ² Becquerel Institute France, Lyon, France; ³ Becquerel Institute Italia, Trento, Italy

5EO.3.4 Techno-Economic Analysis of Triple-Junction Perovskite/Silicon Cells and Modules

Lian Duan¹, Sebastian Nold², Lars Oberbeck³
¹ IPVF, Palaiseau, France; ² Fraunhofer ISE, Freiburg, Germany; ³ TotalEnergies OneTech, Paris, France

5EO.3.5 Differences between Economical and Societal Optimal Designs of Solar Parks due to Feed-in Restrictions

Bas B. Van Aken¹, Ilkay Cesar¹
¹ TNO, Petten, The Netherlands

5EO.3.6 PV-made-in-Europe: are Proposed Policy Measures Sufficient for Competitive LCOE?

Mohammad Dehghanimadvar¹, Nathan Chang¹, Philippe Macé², Ian Kenchington², David Moser³, Atse Louwen³, Sandra Gallmetzer³, Renate Egan¹
¹ UNSW, Sydney, Australia; ² Becquerel Institute, Brussels, Belgium; ³ Eurac Research, Bolzano, Italy



PLENARY PRESENTATIONS EP.1

10:30 - 12:10

Flexibility and Sustainability

Chairpersons:

Cara Libby

EPRI, Palo Alto, United States of America

Ignacio Antón Hernández

UPM, Madrid, Spain

EP.1.1 Invited Presentation: PV Plus Storage as a Flexibility Enabler of the Energy System

Gerd Heilscher¹

¹ THU, Ulm, Germany

EP.1.2 Quantifying the Benefits of Hybrid PV-wind Power Plants

Erik Stensrud Marstein¹, Øyvind Sommer Klyve², Magnus Moe Nygård¹, Ville

Olkkonen¹, Heine Nygard Riise¹

¹ IFE, Kjeller, Norway; ² Statkraft, Düsseldorf, Germany

EP.1.3 A Commodity Today, Incompatible Tomorrow: the Paradox of PV?

Bert Herteleer¹, Gernot Oreski², Ian Marius Peters³, Ulrike Jahn⁴, Ralph Gottschalg⁴, Gabriele Friesen⁵

¹ KU Leuven, Gent, Belgium; ² PCCL, Leoben, Austria; ³ HI ERN, Erlangen, Germany; ⁴ Fraunhofer CSP, Halle, Germany; ⁵ SUPSI, Mendrisio, Switzerland

EP.1.4 Integrated System for High-Value Recycling of Photovoltaic EoL Panels

Claire Agraffei¹, Kerstin Baumann², Wim Merket³, Wolfram Palitzsch⁴, Danny Timmers³, Matthias Seitz², Ingo Rover⁴, Nicolas Defrenne⁵, Juan Alzate⁵, Fabrice Coustier¹, Roland Riva¹, Karsten Wambach²

¹ CEA / INES, Le Bourget-du-Lac, France; ² bifa Umweltinstitut, Augsburg, Germany; ³ Maltha, Lommel, Belgium; ⁴ LuxChemtech, Freiberg, Germany; ⁵ Soren, Paris, France

EP.1.5 Student Awards Finalist Presentation: Renewable Energy Communities and Citizen Participation in Technological and Social Innovations

Cristina Sanz-Cuadrado¹, Kiane Alves e Silva¹, Luis Narvarte¹, Ana B. Cristóbal¹

¹ UPM, Madrid, Spain

12:00 – 13:00

CONFERENCE CLOSING

Welcome to the Closing Session

Highlights of the Conference

Ceremony of the Student Awards

Ceremony of the Poster Awards

Announcement upcoming PV events

EU PVSEC 2025 VISUAL PRESENTATIONS

Monday, 22. September 2025

VISUAL PRESENTATIONS 3AV.1

13:30 - 15:00

PV Module Design and Manufacturing

Chairpersons:

Ralf Preu

Fraunhofer ISE, Freiburg, Germany

Tudor Timofte

ISC Konstanz, Germany

Veronica Bermudez Benito

BERBETIN, Antibes, France

3AV.1.1 Investigating the 3-Dimensional Structure of Metallic Filler Particles in Electrically Conductive Adhesives

Stephan Großer¹, Alexander Müller¹, Robert Göckeritz¹, Tobias Nitsche², Daniel Buckland², Giuseppe Galbiati², Bengt Jaeckel¹

¹ Fraunhofer CSP, Halle (Saale), Germany; ² Henkel, Dusseldorf, Germany

3AV.1.2 New PV Module Circuit Designs for Improved Shading Tolerance

Kevin Meyer¹, Léo Bourdon², Julian Mattheis³, Thomas Daschinger¹, Iris Kunze¹, Susanne Blankemeyer¹, Carolin Römer¹, Henning Schulte-Huxel¹

¹ ISFH, Emmerthal, Germany; ² Polytechnic School, Palaiseau, France; ³ Independent Researcher, Frankfurt, Germany

3AV.1.5 Bio-Epoxy Composites Material for Lightweight Solar Module

Seohee Hwang¹, Yohan Noh¹, Seungah Ur¹, Jaehyeong Lee¹

¹ University of Sungkyunkwan, Suwon, South Korea

3AV.1.6 Investigation on Different Bypass Diodes for Shade Resistant PV-Modules

Jens Froebel¹, Matthias Pander¹, Bengt Jaeckel¹, Andreas Maixner², Pouya Pourshafi², Afshin Bakhtiari², Hamed Hanifi²

¹ Fraunhofer CSP, Halle (Saale), Germany; ² AESOLAR, Koenigsbrunn, Germany

3AV.1.7 Optimized Infrared Soldering Process for Silicon Solar Cells to Improve the Temperature Homogeneity using Finite Element Methods

Daniel Christopher Joseph¹, Angela De Rose¹, Christian Reichel¹, Andreas J. Beinert¹, Holger Neuhaus¹

¹ Fraunhofer ISE, Freiburg, Germany

3AV.1.9 Design and Manufacture of Lightweight Hybrid Photovoltaic Thermal Module

Yijiang Xu¹, Paulius Laurikėnas², Pål Tettei¹, Martin Bellmann¹

¹ SINTEF Industry, Trondheim, Norway; ² SoliTEK, Vilnius, Lithuania

3AV.1.10 Performance Analysis of a Novel Photovoltaic Module Design for Vertical Applications: Mitigate Self-Shading of Bifacial Modules

Pouya Pourshafi¹, Hamed Hanifi¹

¹ AESOLAR, Königsbrunn, Germany



3AV.1.11 Materials Assessment for PV-T Modules Thermal Performance Improvement

Lucía Cano¹, Raquel Simón-Allué¹, Raúl Villén¹, Yolanda Lara¹, Isabel Guede¹

¹ ENDEF, Zaragoza, Spain

3AV.1.12 Evaluating Repair Techniques for c-Si PV Modules: Spot-Welding and Backsheet Patching

Jorge Rabanal-Arabach¹, Sonia Beltran-Condori¹, Ricardo Guzman-Gonzalez¹, Katalina Rojas-Henriquez¹, Andreas Schneider², Edward Fuentealba-Vidal¹

¹ University of Antofagasta, Antofagasta, Chile; ² University of Applied Sciences Gelsenkirchen, Gelsenkirchen, Germany

3AV.1.13 Thermally Conductive Filler Particle Mixed Silicone Layer to Provide Heat Dissipation Functionality to c-Si Solar Cell Modules without Encapsulants

Yasushi Sobajima¹, Kouzen Wakazono¹, Keisuke Ohdaira²

¹ Gifu University, Gifu, Japan; ² JAIST, Ishikawa, Japan

3AV.1.14 Development of Transparent Protective Barrier Layers via PECVD for Flexible Thin Film Solar Cells

Paula Perez-Rodriguez¹, Shreyasi Maitra¹, Arno H. M. Smets¹

¹ TU Delft, Delft, The Netherlands

3AV.1.15 Curing Conditions Effects on the Volume and Contact Resistivity of Interconnects based on Electrically Conductive Adhesives for PV Modules: Fast versus Slow Curing

Maria Ignacia Devoto Acevedo¹, Stephan Großer², Daniel Buckland³, Tobias Nitsche³, Giuseppe Galbiati³, Matthias Helbig¹, Tobias Meßmer¹, Andreas Halm¹, Daniel Tune¹

¹ ISC Konstanz, Constance, Germany; ² Fraunhofer CSP, Halle, Germany; ³ Henkel, Düsseldorf, Germany

3AV.1.16 Ultrasonic Characterization of Ethylene-Vinyl Acetate Crosslinking in Glass-Glass-Modules

Rico Meier¹, Christopher Bruce Konu¹

¹ HTW Berlin, Berlin, Germany

3AV.1.17 Study of the Compatibility of Various Electrically Conductive Adhesives (ECA) for the Interconnection of PK-Si Tandem Solar Cells

Felicia Mouhoubi¹, Vincent Barth¹, Solenn Berson¹

¹ CEA / INES, Le Bourget-du-Lac, France

3AV.1.18 Optimization of Soxhlet Extraction Parameters for Gel Content Determination of Co-Extruded EPE

Aksel Kaan Öz¹, Aaron Trefzer¹, Christine Wellens¹, Meric Caliskan², Cansel Düz², Jacob Forster¹

¹ Fraunhofer ISE, Freiburg, Germany; ² Kalyon PV, Ankara, Türkiye

3AV.1.19 Perovskite Module Development on Glass and Flexible Substrates: Important Steps towards Industrially Relevant Processes

Erik Ahlswede¹, Jonas Hanisch¹, Oliver Salomon¹, Cordula Wessendorf¹, Tina Wahl¹, Roland Wuerz¹, Stefan Paetel¹, Michael Powalla¹, Eva-Maria Hammer¹

¹ ZSW, Stuttgart, Germany

3AV.1.20 Transforming Industrial Facades with Integrated Photovoltaics

Nikolina Pervan¹, Sonja Feldbacher¹, Lukas Geymayer², Gregor Kitzberger², Martin Fleischanderl², Hannes Kurz², Friedrich Füreder-Kitzmüller², Gernot Oreski¹

¹ PCCL, Leoben, Austria; ² voestalpine Stahl, Linz, Austria

3AV.1.21 Evaluation of BASF Lumogen Violet 570 and BASF Lumogen Red 305 as Downshifting Layers for Photovoltaic Applications

Leonardo Sollazzo¹, Giulio Mangherini¹, Valentina Diolaiti¹, Donato Vincenzi¹

¹ University of Ferrara, Ferrara, Italy

3AV.1.22 Development of Junction Boxes Regarding Modern Wiring Concepts for Future PV Modules

Sadaf Ghasemi¹, Marc Andre Schüler¹, Luis Eduardo Alanis¹, Felix Basler¹, Li Carlos Rendler¹, Martin Heinrich¹

¹ Fraunhofer ISE, Freiburg, Germany

3AV.1.23 Development, Evaluation and Comparison of Different Innovative Shade-Resistant PV Modules Designs

Jens Froebel¹, Sophia Jahreis¹, Matthias Pander¹, Bengt Jaeckel¹, Andreas Maixner², Pouya Pourshafi², Afshin Bakhtiari², Hamed Hanifi²

¹ Fraunhofer CSP, Halle (Saale), Germany; ² AESOLAR, Königsbrunn, Germany

3AV.1.27 Development of an Optimal Hybrid Technology for Recycling End-of-Life PV Modules

Seunghwan Ryu¹, Hyukgeun Song¹, Ji-Hyun Yoo², Ji-Seob Ahn², Gyeong-Jun Min², Su-Mi Yang²

¹ HS Solar Energy, Cheongju-Si, South Korea; ² Far East University, Eumseong-gun, South Korea

3AV.1.28 High-Efficiency Microwave-Assisted Delamination of End-of-Life Photovoltaic Modules for Sustainable Materials Recovery

Hyukgeun Song¹, Seunghwan Ryu², Jeong-eun Jeon³, Yoon-Sung Lee³, Soo-Rim Choi³, Su-Mi Yang³

¹ HS Solar Energy, Cheongju-Si, South Korea; ² HS Solar Energy, Cheong-Si, South Korea; ³ Far East University, Eumseong-gun, South Korea

3AV.1.29 Flexible, Lab-Scale Soldering and Curing Tool for a Research-Focused Module Assembly Robot

Raphael Shanmugam¹, Karl Wienands¹, Matthias Helbig¹, Andreas Halm¹, Daniel Tune¹

¹ ISC Konstanz, Constance, Germany

3AV.1.30 Isotropic Conductive Adhesives for R2R Lamination of Flexible PV Modules

Joris de Riet¹, Aldo Kingma¹, Casper van Kessel¹, Marc Koestse¹, Monique van den Nieuwenhof¹, Jochen Schuermans², Piero Spinelli¹, Mirjam Theelen¹, Dorrit Roosen¹

¹ TNO, Eindhoven, The Netherlands; ² Roartis, Genk, Belgium

3AV.1.31 Light-Weight Optimization of Large-area Photovoltaic Module Frames via Structural Analysis and Non-dominated Sorting Genetic Algorithm-II

Yohan Noh¹, Jaehyeong Lee¹

¹ University of Sungkyunkwan, Suwon, South Korea



3AV.1.32 Indoor Characterization and Cell-to-Module CTM Evaluation of Photovoltaics Modules made from Glasses with Different Colors of Cell Spacing Colors on the Rear Side Glass

Hamed Hanifi¹, Andreas Maixner¹, Christian Reichel², Max Mittag²
¹ AESOLAR, Königsbrunn, Germany; ² Fraunhofer ISE, Freiburg, Germany

3AV.1.33 Optics for Photovoltaics on Terawatt-Scale – a Perspective

Klaus Jäger¹, Urs Aeberhard², Esther Alarcon Llado³, Benedikt Bläsi⁴, Sven Burger⁵, Bruno Ehrler⁶, Wilfried Favre⁷, Antonin Fejfar⁸, Tristan Gageot⁷, Ivan Gordon⁹, Henning Helmers⁴, Oliver Hohn¹⁰, Olindo Isabella¹¹, Marko Jošt¹², Martin Ledinsky¹³, Jyotirmoy Mandal¹⁴, Philipp Manley¹, Delfina Muñoz¹⁵, Z. Omair¹⁶, Juan Camilo Ortiz Lizcano¹⁷, Ulrich Wilhelm Paetzold¹⁸, A.P. Raman¹⁶, Hitoshi Sai¹⁹, Rebecca Saive²⁰, Martina Schmid²¹, E. Yablonovitch¹⁶, Christiane Becker¹
¹ HZB, Berlin, Germany; ² Fluxim, Winterthur, Switzerland; ³ EPFL, Lausanne, Switzerland; ⁴ Fraunhofer ISE, Freiburg, Germany; ⁵ Zuse Institute Berlin, Berlin, Germany; ⁶ AMOLF, Amsterdam, The Netherlands; ⁷ CEA, Grenoble, France; ⁸ ASCR, Prague, Czech Republic; ⁹ imec, Genk, Belgium; ¹⁰ Singulus Technologies, Kahl am Main, Germany; ¹¹ TU Delft, Delft, The Netherlands; ¹² University of Ljubljana, Ljubljana, Slovenia; ¹³ ASCR, Prague 6, Czech Republic; ¹⁴ Princeton University, Princeton, United States of America; ¹⁵ CEA, Le Bourget-du-Lac, France; ¹⁶ University of California, Berkeley, United States of America; ¹⁷ Delft University of Technology, Delft, The Netherlands; ¹⁸ KIT, Karlsruhe, Germany; ¹⁹ AIST, Tsukuba, Japan; ²⁰ University of Twente, Enschede, The Netherlands; ²¹ University of Duisburg-Essen, Duisburg, Germany

3AV.1.34 Thermal and Mechanical Reliability of Lightweight Photovoltaic Modules with Advanced Polymeric and Composite Materials

Algirdas Baležentis¹, Piotr Dubravskij¹, Juras Ulbikas¹, Jolanta Doneliene¹, Matas Rudzikas¹, Skirmantė Baležentienė¹
¹ Protech, Vilnius, Lithuania

3AV.1.35 Debonding-on-Demand Strategies for Photovoltaic Encapsulants

Arthur Maufort¹, Fabio Silva², Wouter Marchal³, Jan D'Haen³, Arvid van der Heide³, Kristof Proost¹
¹ IP FAB, Mechelen, Belgium; ² IP Fab, Mechelen, Belgium; ³ Hasselt University, Hasselt, Belgium

3AV.1.36 Scenario-Based Thermal and Optical Analysis of CdSe/CdS Quantum Dot Downshifting Layers for Enhanced Efficiency in Silicon Photovoltaic Modules Using ANSYS

Maoz Maoz¹, Syed Abdul Basit Shah¹, Vanni Lughì¹
¹ University of Trieste, Trieste, Italy

3AV.1.37 Fiber Reinforced Composite Photovoltaic Modules by HP-RTM Manufacturing Process

Jon Aizpurua¹, Igor Arrizabalaga¹, Leire Herrero¹, Unai Iglesias¹, Oihane Echeverría¹, Eduard Bellvert¹, Sonia García¹, Olatz Ollo¹, Maikel Mugica¹, Werther Cambarau², Francisco J. Cano¹, Eduardo Román Medina¹, Oihana Zubillaga¹
¹ Tecnalia, Donostia - San Sebastián, Spain; ² Tecnalia, Donostia-San Sebastián, Spain

3AV.1.38 Optical Characterisation of PV Glasses with Varying Antimony Contents

Oliver Pfeiffer¹, Alexander Protti², Christian Reichel², Bengt Jaeckel³, Thomas C. Sauer⁴, Holger Neuhaus², Ulf Blieske¹
¹ TH Köln, Cologne, Germany; ² Fraunhofer ISE, Freiburg, Germany; ³ Fraunhofer CSP, Halle (Saale), Germany; ⁴ EXXERGY, Gräfelfing, Germany

3AV.1.39 Towards Circular Solar Technologies: Novel Bio-based Polymers as Next Generation Encapsulants?

Kristina Maliutina¹, Oliver Pfeiffer¹, Matthias Eisenacher¹, Martin Bonnet¹, Ulf Blieske¹
¹ TH Köln, Cologne, Germany

VISUAL PRESENTATIONS 3AV.2

15:15 - 16:45 PV Module Durability and Reliability

Chairpersons: Arnaud Morlier
 imo-imomec, Diepenbeek, Belgium
 Olatz Arriaga Arruti
 CSEM, Neuchâtel, Switzerland
 Paul Gebhardt
 Fraunhofer ISE, Freiburg, Germany

3AV.2.1 Reliability of Electrically Conductive Adhesive Joints for PERC and HJT-Based Building-Integrated Photovoltaic Facade Elements

Ringo Koepge¹, Sophia Jahreis¹, Jens Froebel¹, Nick Schröter¹, Matthias Pander¹, Stephan Großer¹, Bengt Jaeckel¹
¹ Fraunhofer CSP, Halle (Saale), Germany

3AV.2.2 Durability and Reliability: A Cross-Technological Stability Analysis of Silicon Photovoltaics

Mengdi Liu¹, Wenhao Xu¹, Yating Zhang¹, Giorgio Bardizza², Christos Monokroussos¹
¹ TÜV Rheinland, Shanghai, China; ² TÜV Rheinland, Cologne, China

3AV.2.4 Silica Coating with Optimized Optical and Mechanical Properties for Anti-Reflection and Dust Resistance in Harsh Desert Environments

Brahim Aissa¹, Mohammad Hossain¹, Atef Zekri¹, Amir Abdullah¹, Veronica Bermudez Benito¹
¹ QEERI, Doha, Qatar

3AV.2.5 Plasmonic-Decorated TiO₂ Thin Films as Photocatalytic Anti-Soiling Coatings

Brahim Aissa¹, Mohammad Hossain¹, Adnan Ali¹
¹ QEERI, Doha, Qatar

3AV.2.6 Do We Really Need UV Absorbers in the Encapsulant for Reliable PV Production in the Long Run ?

Hugo Lajoie¹, Frédéric Jay¹, Maxime Babics², Sandrine Therias³
¹ CEA Liten, Le Bourget-du-Lac, France; ² CEA Liten, Le Bourget-du-Lac, France; ³ CNRS, Clermont-Ferrand, France

3AV.2.7 Investigating the Effect of Solar Panel Frame Sizes and Thickness on Maximum External Mechanical Load Bearing by FEA Analysis

Afshin Bakhtiari¹, Sagarika Kumar², Mauro Pravettoni², Hamed Hanifi¹
¹ AESOLAR, Königsbrunn, Germany; ² TII, Abu Dhabi, Germany

3AV.2.8 The Effect of Photovoltaic Cell Sizes and Cell Quantities on the External Mechanical Load Bearing of Solar Panels by Finite Element Analysis FEA

Afshin Bakhtiari¹, Sagarika Kumar², Mauro Pravettoni², Hamed Hanifi¹
¹ AESOLAR, Königsbrunn, Germany; ² TII, Abu Dhabi, Germany



3AV.2.9 Evaluating Climate-Specific Degradation of PV Modules by Spectral UV-Fluorescence Mapping

Oleksandr Stroyuk¹, Oleksandra Raievska¹, Oleksandr Mashkov¹, Carlos D. Rodríguez-Gallegos², Claudia Buerhop¹, Jens Hauch¹, Ian Marius Peters¹

¹ HI ERN, Erlangen, Germany; ² SERIS, Singapore, Singapore

3AV.2.10 Identification of Spectral Indicators of Degradation in Tedlar-Type Backsheets: a Case Study of PV Modules Aged in Tropical Climate

Oleksandr Stroyuk¹, Oleksandr Mashkov¹, Carlos D. Rodríguez-Gallegos², Claudia Buerhop¹, Jens Hauch¹, Ian Marius Peters¹

¹ HI ERN, Erlangen, Germany; ² SERIS, Singapore, Singapore

3AV.2.12 Polyvinylidene Fluoride-Based Solution for Use as a Dielectric Layer in Backsheet Crackings

Carlos González Montes¹, Luis Manuel Ocaña González¹, Benjamín González Díaz², Sara González Pérez², María Elena Llerena García¹

¹ ITER, Granadilla de Abona, Spain; ² ULL, San Cristóbal de La Laguna, Spain

3AV.2.13 Combining Physical- and Scenario-based Modelling to Identify Tolerable Degradation Rates for Perovskite Cells in Perovskite/Silicon Tandem Modules

Youri Blom¹, Rudi Santbergen¹, Olindo Isabella¹, Malte Ruben Vogt¹

¹ TU Delft, Delft, The Netherlands

3AV.2.14 Restoring the Functionality of Damaged PV-Backsheets

Yuliya Voronko¹, Gabriele C. Eder¹, Raffael Schifferegger¹, Anika Gassner¹, Sonja Feldbacher², Gernot Oreski²

¹ OFI, Vienna, Austria; ² PCCL, Leoben, Austria

3AV.2.15 UV Stability of Lightweight Silicon Heterojunction Solar Modules with Downshifting Encapsulation Materials

Kai Zhang¹, Rongda Zhang¹, Andreas Lambert¹, Binbin Xu¹, Alexander Eberst¹, Karsten Bittkau¹, Xinjun Li², Henrike Gattermann¹, Uwe Rau¹, Kaining Ding¹

¹ FZJ, Juelich, Germany; ² Cybrid Technologies, Suzhou, China

3AV.2.16 FEM Simulation of Influence of Different Polymeric Module Materials and Layouts in Strings of Shingled Solar Cells under Mechanical and Thermal Loads

Margit Lang¹, Gernot Oreski¹, Peter Fuchs¹

¹ PCCL, Leoben, Austria

3AV.2.17 Critical Analysis of the Protection offered by Bypass Diodes in Current Modules

Eneko Cereceda¹, Nekane Azkona¹, Aloña Otaegi¹, Vanesa Fano¹, Eneko Ortega¹, José Rubén Gutiérrez¹, Juan Carlos Jimeno¹

¹ UPV/EHU, Bilbao, Spain

3AV.2.18 Breakage in Bifacial PV Modules

Rodrigo P. Maruyama¹, Roberto Zilles¹, Adnei Melges de Andrade¹

¹ USP, São Paulo, Brazil

3AV.2.19 Damp Heat Test on TOPCon Modules Made with Glass/Backsheets

Alessandro Anderlini¹

¹ Coveme, Gorizia, Italy

3AV.2.20 Variational Autoencoder for Electroluminescence Solar Cell Image Power Loss Prediction

Norman Jost¹, Ojas Sanghi¹, Rodrigo del Prado Santamaría², Brandon Byford¹, Isaiah H. Deane¹, Sergiu Viorel Spataru², Jennifer L. Braid¹

¹ Sandia National Laboratories, Albuquerque, United States of America; ² DTU, Roskilde, Denmark

3AV.2.21 What Reduction in Degradation can be Expected due to Lower Operating Temperature in Floating PV Systems?

Marit S. Ulset¹, Torunn Kjeldstad¹, Josefine Selj¹, Dag Lindholm¹, Gaute Otnes¹

¹ IFE, Kjeller, Norway

3AV.2.22 Impact of Tilt Angle on PV Module Reliability: Lessons Learned from an Indoor UV Irradiation Study

Nikoleta Kyranaki¹, Ismail Kaaya¹, Mohammed Adnan Hameed², Arnaud Morlier¹, Michael Daenen¹

¹ Hasselt University, Genk, Belgium; ² Martin-Luther-University Halle-Wittenberg, Halle, Germany

3AV.2.23 Detection of Transformations in Encapsulants after Module Lamination Process

Vaidvilė Ulbikaitė¹, Jolanta Donėlienė¹, Piotr Dubravskij¹, Algirdas Galdikas¹, Jan Devenson², Viktoras Vaicikauskas², Viktorija Nargelienė², Arūnas Šetkus²

¹ Protech, Vilnius, Lithuania; ² Center for Physical Sciences and Technology (FTMC), Vilnius, Lithuania

3AV.2.24 Improving Ultraviolet Fluorescence Analysis for Photovoltaic Encapsulant Assessment

Zonghan Jiang¹, Hugo Sanchez¹, Leila Mortazavifar¹, Ralph Gottschalg¹

¹ Anhalt University of Applied Sciences, Köthen, Germany

3AV.2.25 Are New PV Modules More Reliable than Old Ones? a Comparison of 13 Years Old vs. 30 Years Old PV Plants

Chiara Barretta¹, Brahim Anis Belferkous¹, Guillermo Oviedo Hernandez², Daniela Maria Godino Ariolli², André Augusto³, Emmanouil Psimopoulos³, Lukas Koester⁴, David Moser⁴, Gernot Oreski¹

¹ PCCL, Leoben, Austria; ² BayWa, Rome, Italy; ³ Dalarna University, Falun, Sweden; ⁴ Eurac Research, Bolzano, Italy

3AV.2.26 Non-Destructive and Quantitative Monitoring of Water Ingress in PV Modules by Combination of Karl-Fischer Titration and Near-Infrared Spectroscopy

Daniel Schüsler¹, Oleksandr Mashkov², Michael Wendt¹, Oleksandr Stroyuk², Jishnu Ramachandran Nair³, Bengt Jäckel¹, Ian Marius Peters², Claudia Buerhop-Lutz², Anton Mordvinkin¹

¹ Fraunhofer CSP, Halle, Germany; ² FZJ-HI ERN, Erlangen, Germany; ³ Fraunhofer CSP, Halle, Germany

3AV.2.27 Novel Encapsulants based on Highly UV-Transparent Polyolefins Tested on PV Mini-Device

Valeria Fiandra¹, Lucio Sannino¹, Concetta Andreozzi¹, Giovanni Flaminio¹, Antonella De Maria¹, Antonio Romano¹, Paola Delli Veneri¹, Lucia V. Mercaldo¹

¹ ENEA, Portici, Italy



3AV.2.29 Naturally Induced Aging of Different C-Si Solar Cell Technologies and Encapsulation Materials by Harsh Environment with High UV Radiation Doses

Valentina Arias Reyes¹, Maria Ignacia Devoto Acevedo², Tudor Timofte², Valentina Navarro³, Felipe Larrain³, Andreas Halm², Rodrigo Barraza³
¹ Federico Santa Maria Technical University, Santiago, Chile; ² ISC Konstanz, Constance, Germany; ³ Adolfo Ibáñez University, Santiago, Chile

3AV.2.30 Evaluating Hot-Spot Testing Duration for PV Modules in Shaded Residential Environments: Insights from Real-World and Laboratory Data

Ebrar Özkalay¹, Anika Gassner², Gabriele C. Eder², Gabi Friesen¹, Markus Feichtner³
¹ SUPSI, Mendrisio, Switzerland; ² OFI, Vienna, Austria; ³ Sonnenkraft Energy, St. Veit a.d. Glan, Austria

3AV.2.31 A Hotspot Related Defect Screening Approach in Flexible Amorphous Silicon Solar Foils using Electroluminescence Imaging

Sreejith Koorthedath Pullayikody¹, Peer Sluijs¹, Niklas Zeiher¹, Vijay Venkatesh¹, Gayathri Mathiazhagan², Ravi Vasudevan², Hesam Ziar¹, Arno H. M. Smets¹
¹ TU Delft, Delft, The Netherlands; ² HyET Solar, Arnhem, The Netherlands

3AV.2.34 Salt Spray Corrosion Resistance Testing and Reliability Evaluation of Large-size Solar Modules and Metal Components

San-Yu Ting¹, Kuan-Wu Lu¹, Sih-Hong Chen¹, Min-An Tsai¹, Cho Fan Hsieh¹
¹ ITRI, Hsinchu, Taiwan

3AV.2.35 Analysis of Performance Loss in PV Systems due to Cracked Backsheets and Insulation Problems

Raffael Schifferegger¹, Anika Gassner¹, Gabriele C. Eder¹
¹ OFI, Vienna, Austria

3AV.2.36 Research on the Impact of Outdoor Dust Accumulation and Copper-Accelerated Acetic Acid Salt Spray on Solar Photovoltaic Modules

San-Yu Ting¹, Yung-Jen Shyong¹, Min-An Tsai¹, Cho Fan Hsieh¹
¹ ITRI, Hsinchu, Taiwan

3AV.2.37 Text-to-Image and Image-to-Image Augmentation and Classification of Defects in Photovoltaic Modules

M. Waqar Akram¹, Jianbo Bai¹, Anees ur Rehman¹
¹ Hohai University, Changzhou, China

3AV.2.39 Degradation Mechanisms at the Au/Perovskite Interface under Illumination in Large-Area Perovskite Modules

Jiyeon Nam¹, Wonkyu Lee¹, Da Seul Lee², Youngho Choe¹, Donghwan Kim¹, Hae-Seok Lee¹, Yoonmook Kang¹
¹ Korea University, Seoul, South Korea; ² Sunkyunwan University, Suwon, South Korea

3AV.2.40 Performance Evaluation and Environmental Degradation Assessment of GaAs, Perovskite, and Silicon Solar Cells under Terrestrial and Space Conditions

Abdullah Alsubaihi¹, Ahmad Albakri¹, Meteb Ali¹
¹ KACST, Riyadh, Saudi Arabia

3AV.2.41 UV Fluorescence Imaging of Defects and Bill of Materials Variations in Bifacial Solar Panels

Andrew Gabor¹, Maulid M. Kivambe², Mohamed Abdelrahim², Mohamed Elgaili², Amir A. Abdallah²
¹ BrightSpot Automation, Boulder, United States of America; ² QEERI, Doha, Qatar

3AV.2.42 Determining the Reliability of Solar Modules in Analogy to Glass in Buildings

Ruth Kasper¹, Hannah Reichart¹
¹ TH Köln, Köln, Germany

3AV.2.43 A Visual Inspection Data Collection Tool for Floating Photovoltaic Systems

Nathan Roosloot¹, Harsha Walpita², Christoph Seiffert¹, Jean Thomas³, Maarten Dörenkämper⁴, Minne M. de Jong⁴, Josefine H. Selj¹, Gaute Otnes¹
¹ IFE, Kjeller, Norway; ² University of Oslo, Kjeller, Norway; ³ Ciel et Terre, Lille, France; ⁴ TNO, Eindhoven, The Netherlands

VISUAL PRESENTATIONS 3AV.3

17:00 - 18:30 PV Modules Characterisation and Performances Assessment

Chairpersons: Giorgio Bardizza
TÜV Rheinland Solar, Milan, Italy
Jaione Bengoechea
CENER, Sarriguren, Spain

3AV.3.1 A New Method for Comprehensive Power Rating and Performance Analysis of PERC Modules based on Half-Cut Cell Technology

Khadija El Ainaoui¹, Mhammed Zaimi², Imane Flouchi¹, Said Elhamaoui¹, Yasmine El mrabet¹, Abdellatif Ghennoui¹, El Mahdi Assaid²
¹ Green Energy Park, Benguerir, Morocco; ² University of Chouaib Doukkali, El Jadida, Morocco

3AV.3.2 Energy Rating Analysis of Heterojunction PV Modules

Teodora Stoyanova Lyubenova¹, Ewan D. Dunlop¹
¹ European Commission JRC, Ispra, Italy

3AV.3.3 Trend of Temperature Coefficients of c-Si Module Technologies from the Past 15 Years

Bengt Jaeckel¹, Matthias Pander¹
¹ Fraunhofer CSP, Halle (Saale), Germany

3AV.3.4 Overcoming Challenges of Current-Voltage Scans of High-Efficiency Photovoltaic Modules

Jonas Aleksander Oražem¹, Marko Topič¹, Marko Jankovec¹
¹ University of Ljubljana, Ljubljana, Slovenia

3AV.3.5 Challenges and Solutions for Measuring Tandem Modules

Michael Fuß¹, Dieter Lorenz¹, Matti Fuchs¹
¹ MJB Solutions, Ahrensburg, Germany

3AV.3.6 Angle of Incidence Measurements on Bifacial PV Modules

Frank Weinrich¹, Stefan Riechelmann¹, Stefan Winter¹
¹ PTB, Braunschweig, Germany



- 3AV.3.7 Outdoor IV Curve Measurements for Bifacial Solar Modules: A Reverse Methodology Based on IEC 60904-1-2 for Enhanced Accuracy**
Sergio Suarez Sanchez¹, Mario Martinez Gonzalez¹, Sofia Rodríguez-Conde¹
¹ Enerdis Applus+, Madrid, Spain
- 3AV.3.8 Plug & Play IV-Curve Tracer**
Adrian Jäggi¹, Matthias Burri¹, Christof Bucher¹
¹ BFH, Burgdorf, Switzerland
- 3AV.3.9 Seasonal and Location-Dependent Temperature Coefficients for Thin-Film PV Modules: Enhancing Yield Prediction Accuracy**
Thomas Weber¹, Abdullah Abu Sayed¹, Benjamin Lippke¹, Steven Xuereb¹, Marcus Rennhofer², Bart E. Pieters³
¹ Kiwa PI Berlin, Berlin, Germany; ² AIT, Vienna, Austria; ³ Forschungszentrum Jülich, Jülich, Germany
- 3AV.3.10 Standardisation Methods for Bifacial Energy Yield Estimation and PV Module Long-Term Performance Degradation Estimation: Potential Policy Implications**
Jaione Bengoechea¹, Ana María Gracia¹, Stefan Riechelmann², Stefan Winter², Giorgio Bardizza³, Christos Monokroussos⁴, Davide Polverini⁵, Pablo Vicente-Laiglesia⁶, Maria Getsiou⁷
¹ CENER, Sarriguren, Spain; ² PTB, Braunschweig, Germany; ³ TÜV Rheinland Italia, Milan, Italy; ⁴ TÜV Rheinland Shanghai, Shanghai, China; ⁵ Directorate General for Internal Market, Industry, Entrepreneurship and SMEs, Brussels, Belgium; ⁶ CINEA, Brussels, Belgium; ⁷ Directorate General for Research and Innovation, Brussels, Belgium
- 3AV.3.11 Shaalke: Development of a MATLAB Software Tool for Advanced Statistical Outdoor Data Evaluation**
Andreas Schneider¹, Jorge Rabanal Arabach²
¹ University of Applied Sciences Gelsenkirchen, Gelsenkirchen, Germany; ² Universidad de Antofagasta, Antofagasta, Chile
- 3AV.3.12 Degradation and Defect Characterisation of Field-Deployed Silicon PV Modules**
Roelof Roodt¹, Ernest van Dyk¹, Jacqueline Crozier McClelland¹, Monphas Vumbugwa¹, Frederik Vorster¹, Oleksander Stroyuk², Claudia Buerhop-Lutz²
¹ Nelson Mandela University, Port Elizabeth, South Africa; ² HI ERN, Erlangen, Germany
- 3AV.3.13 Architecture for Monitoring PV Degradation in Real Time from EL Images**
Tohru Kohno¹, Jun Tsunoda¹
¹ Hitachi, R&D Group, Tokyo, Japan
- 3AV.3.14 Simple Cell Segmentation Routine for Quantitative Electroluminescence Analysis of c-Si Solar Modules**
João Victor Oliveira Santos¹, Julien Dupuis¹, Christine Abdel Nour¹, Daniel Ory², Olivier Palais³
¹ EDF R&D, Moret Loing Orvanne, France; ² EDF R&D, Palaiseau, France; ³ IM2NP, Marseille, France
- 3AV.3.16 Development of a LED-based Gantry Scanning System for Photoluminescence Imaging Inspection of PV Modules**
Carl Emil Elling¹, Peter Poulsen¹, Ole Bjarlin Jensen¹, Sergiu V. Spataru¹, Gisele A. dos Reis Benatto¹
¹ DTU, Roskilde, Denmark

- 3AV.3.17 Comprehensive Degradation Analysis of Si Solar Cells: I-V, Thermal Imaging, and SEM-Based Investigation**
Jae-yeong Jang¹, Jeong-eun Jeon¹, Hyun Namgoong¹, Yoon-Sung Lee¹, Ja-young Gi¹, Su-Mi Yang¹
¹ Far East University, Eumseong-gun, South Korea
- 3AV.3.18 Electroluminescence-Based Degradation Analysis of Reused and Bifacial PV Modules after one Year of Operation**
Jeong-eun Jeon¹, Soo-Rim Choi¹, Jae-yeong Jang¹, Ji-Hyun Yoo¹, Minji Yang¹, Jae-Hyeok Hur², Su-Mi Yang¹
¹ Far East University, Eumseong-gun, South Korea; ² Chungbuk Technopark, Cheongju-Si, South Korea
- 3AV.3.19 Quality Analysis of Reused and Bifacial PV Modules After One Year of Operation Based on I-V and Thermal Imaging Analysis**
Ji-Hyun Yoo¹, Ji-Seob Ahn¹, Jae-Hyeok Hur², Gyeong-Jun Min¹, Hyun Namgoong¹, Ja-young Gi¹, Sang-Hyun Jeong³, Su-Mi Yang¹
¹ Far East University, Eumseong-gun, South Korea; ² Chungbuk Technopark, Cheongju-Si, South Korea; ³ University Convergence, Eumseong-gun, South Korea
- 3AV.3.21 Limits of Standardised Insulation Measurement Methods for finding the Causes of Insulation Failures on Field Aged PV Modules**
Maximilian Engel¹, Jonathan Kriening¹, Roland Einhaus¹, Bernhard Weinreich², Peter Lechner², Ludger Wahlers³, Eckard Tikwinski³, Martin Wilke⁴, Christine Klos⁵
¹ ZSW, Stuttgart, Germany; ² HaWe Engineering, Gauting-Hausen, Germany; ³ ELMED, Heiligenhaus, Germany; ⁴ Buhck Re.Energy, Hamburg, Germany; ⁵ Buhck ReEnergy, Reinbek, Germany
- 3AV.3.22 Numerical Simulation of Output Characteristics of Photovoltaic Module with Short- and Open-Circuited Bypass Diodes**
Ibuki Kitamura¹, Toshiyuki Hamada¹, Ikuo Nanno²
¹ Osaka Electro-Communication University, Osaka, Japan; ² Yamaguchi Gakugei University, Yamaguchi, Japan
- 3AV.3.23 Evaluating the Efficacy of Neutral Density Filters and Camera Lens Aperture for Reducing Sensor Saturation and Image Quality in Daylight EL Imaging**
Kabir Paúl Sulca Buitrón¹, Rodrigo del Prado Santamaria², Thøger Kari², Julian Anaya Calvo¹, Gisele Alves dos Reis Benatto², Sergiu Viorel Spataru², Oscar Martinez Sacristan¹
¹ University of Valladolid, Valladolid, Spain; ² DTU, Roskilde, Denmark
- 3AV.3.24 Design, Manufacturing and Analysis of Aluminium-backed BIPV Facade Modules: Electrical Performance and Outdoor Tests**
Sophia Jahreis¹, Bengt Jäkel¹, Ringo Köpge¹, Jens Fröbel¹, Paul Schenk¹, Matthias Pander¹
¹ Fraunhofer CSP, Halle (Saale), Germany
- 3AV.3.27 Performance Monitoring and Stability Analysis of PV Modules with Coloured Encapsulants: a 5-Months Study**
Meriç Çalışkan¹, Hatice Duman¹, Ahmet Aksoy², Gernot Oreski³, Gabriele C. Eder⁴
¹ KalyonPV, Ankara, Türkiye; ² METU, Ankara, Türkiye; ³ PCCL, Leoben, Austria; ⁴ OFI, Vienna, Austria



3AV.3.28 Analysis of the Effects of Partial Shading on Cell Performance in a Half-Cut Cell Photovoltaic Module

Poland Michael¹, Monphas Vumbugwa¹, Ernest E. van Dyk¹, Frederik J. Vorster¹, Petja Dobrev²

¹ Nelson Mandela University, Port Elizabeth, South Africa; ² University of Namibia, Windhoek, Namibia

3AV.3.29 Performance and Degradation Analysis of OPV Panels under Different Shadowing Conditions

Mirco Riganti¹, Michele Manca¹, Aleix Alva²

¹ Leitat Technological Center, Terrassa, Barcelona, Spain; ² School of Architecture of Barcelona, Barcelona, Spain

3AV.3.30 Dependence of Photovoltaic Module Performance Indicators on the Operating Temperature

Heidi Kalliojärvi¹, Kari Lappalainen¹

¹ Tampere University, Tampere, Finland

3AV.3.31 Evaluating the Impact of Soiling on Agri-Photovoltaic Systems

Paul Gebhardt¹, Tannaz Katouli¹, Thomas Kaltenbach¹, Tamara Bretzel¹, Lisa-Marie Bieber¹, Ingrid Haedrich¹

¹ Fraunhofer ISE, Freiburg, Germany

3AV.3.32 A General Approach to Model High-Performance PV Modules for Accurate Energy Yield Simulations

André Mermoud¹, Auriane Canesse¹, Bruno Wittmer¹, Luca Antognini¹, Michele Oliosi¹, Robin Vincent¹

¹ PVsyst, Satigny, Switzerland

3AV.3.35 Keeping PV Modules Cooler by Thermal Management - Effects on the Energy Yield

Klaus Jäger¹, Jyotirmoy Mandal², Barry P. Rand², Forrest Meggers², Christiane Becker¹

¹ HZB für Materialien und Energie, Berlin, Germany; ² Princeton University, Princeton, United States of America

3AV.3.36 A Photovoltaic Performance Dataset for the Benchmarking of Failure Detection and Diagnosis Algorithms

Jose Domingo Santos¹, Sandra Riaño¹, Aingeru Lucea¹, Marko Jankovec², Alberto Del Pozo¹, Ricardo Alonso¹, Asier Sanz Martinez¹

¹ TECNALIA, Derio, Spain; ² University of Ljubljana, Ljubljana, Slovenia

3AV.3.37 Reliability of Quantitative Analysis of Lock-in Electroluminescence Images of PV Modules Based on Histogram Statistical Parameters

Jose Domingo Santos¹, Eneko Setien¹, Alberto Del Pozo¹, Liviu Stoicescu², Aritz Villodas¹, Aingeru Lucea¹, Ainhoa Pereda¹, Ricardo Alonso¹

¹ TECNALIA, Derio, Spain; ² Solarzentrum Stuttgart, Stuttgart, Germany

3AV.3.38 Development of a Rooftop Mock-up Covered with PV Panels for Temperature Flux Measurements

Michael Schrempf¹, Stefan Riechelmann¹

¹ PTB, Braunschweig, Germany

VISUAL PRESENTATIONS 2BV.1

08:30 - 10:00 New Materials, Devices and Conversion Concepts | New Modelling and Characterisation Techniques

Chairpersons: (Jef) Poortmans

imec, Leuven, Belgium

Iñigo Ramiro

UPM, Madrid, Spain

2BV.1.1 Evaluation of SnO₂ Thin Film as In-Free Transparent Conductive Oxide Deposited by Low-Temperature ALD

Masaki Ando¹, Yoshio Ohshita², Toshinori Numata², Hyunju Lee³, Hideaki Machida⁴, Takuya Minowa¹, Atsushi Ogura¹

¹ Meiji University, Kawasaki, Japan; ² Toyota Technological Institute, Nagoya, Japan; ³ MREL, Kawasaki, Japan; ⁴ Gas-Phase Growth, Koganei, Japan

2BV.1.2 Analysis of the Influence of Cu₂O Top Cell Transmittance on the Efficiency of Si Bottom Cell

Soichiro Shibasaki¹, Takashi Yamamoto¹, Kanta Sugimoto¹, Naoyuki Nakagawa¹, Yukitami Mizuno¹, Atsushi Wada¹, Sara Yoshio¹, Motohiro Toyota¹, Junji Sano¹, Yuya Honishi¹, Yasutaka Nishida¹, Kazushige Yamamoto¹

¹ Toshiba Corporation, Kawasaki, Japan

2BV.1.3 Zinc-Doped Indium Oxide by Radio-Frequency Magnetron Sputtering: Sheet Resistance and Infrared Characterization

Paolo Strazzullo¹, Daniela De Luca², Marilena Musto¹, Roberto Russo³, Annalisa Bruno²

¹ University of Naples Federico II, Naples, Italy; ² Nanyang Technological University Singapore, Singapore, Singapore; ³ National Research Council of Italy, Naples, Italy

2BV.1.4 Low-Energy Electron Multiplication on Nanostructured Solar Cells (LEEMONS): A Novel Route to Overcome Si-PV Efficiency Limits

Mikaël Hosatte¹, Brice Rouffie¹, Zbigniew T. Kuznicki¹

¹ SEGTON Advanced Technology, Versailles, France

2BV.1.5 Tailoring CBTSSe Solar Cells for Indoor Photovoltaic Applications

Hitarth Narsi Patel¹, Bindu Pamula¹, Deepak Joshi¹, Vivek Garg¹

¹ SVNIT, Surat, India

2BV.1.6 Theoretical Insights through DFT into AgBiS₂ Thin Films Absorber for Photovoltaic Applications

Dhruv Singh Thakur¹, Rajesh Kumar Sharma¹, Nithin Chatterji¹, Vivek Garg¹, Shivendra Yadav¹

¹ SVNIT, Surat, India

2BV.1.8 Numerical Simulation and Performance Optimization of Barium Zirconium Sulfide (BaZrS₃) Chalcogenide-based Perovskite Solar Cell

Chinedu Ahia¹, Nicholas Rono¹, Edson Leroy Meyer¹

¹ University of Fort Hare, Alice, South Africa



- 2BV.1.9 Graphene Oxide Thin Layer for Silicon Surface Passivation Characterized by Kelvin Probe**
Stepan Staf¹, Branislav Dzurnak¹, Tom Markvart²
¹ CTU FEE, Prague, Czech Republic; ² University of Southampton, Southampton, United Kingdom
- 2BV.1.10 Optimization of Luminescent Solar Concentrators based on Peripherally-Doped Polymer Optical Fibers**
Jagoba Barata¹, Jon Arrue¹, Nekane Guarrotxena², Joseba Zubia¹, María Asunción Illarramendi¹
¹ UPV/EHU, Bilbao, Spain; ² Institute of Polymer Science and Technology, Madrid, Spain
- 2BV.1.11 Novel Encapsulant Materials: Radiation Test and Results**
David Lansade¹, Simon Lewandowski¹, Sophie Duzellier¹, Hugues Gasse¹
¹ University of Toulouse, Toulouse, France
- 2BV.1.12 Correlated Disordered Nanostructures for Light Trapping in Ultrathin Solar Cells**
Laura De Almeida¹, Inès Revol¹, Jean-Baptiste Doucet¹, Mathieu Arribat¹, Guilhem Almuneau¹, Stéphane Collin²
¹ LAAS-CNRS, Toulouse, France; ² C2N, Palaiseau, France
- 2BV.1.13 Optimization of Water-based Synthesis of CIGSe Nanoparticles for Solar Textiles**
João Rodrigues¹, Pedro Sousa¹, Neslihan Akcay¹, Neha Kumari¹, Sascha Sadewasser¹, Pedro Anacleto¹, Juliana P. S. Sousa¹
¹ INL, Braga, Portugal
- 2BV.1.15 Enhanced PEDOT:PSS Electrical Conductivity by Graphene Doping**
Wafa Alnaqbi¹, Wisnu Hadmojo¹, Ayman Rezk¹, Shanavas Shajahan¹, Yarjan Abdul Samad¹, Ammar Nayfeh¹
¹ Khalifa University, Abu Dhabi, United Arab Emirates
- 2BV.1.16 Optical and Electrical Properties of TCO Layers based on Doped ZnO Films Deposited by ALD Technique**
Pau Estarlich¹, Gustavo Alvarez-Suarez¹, Jose Miguel Asensi², Cristobal Voz¹, Joaquim Puigdollers¹, Gerard Masmitjà¹
¹ UPC, Barcelona, Spain; ² University of Barcelona, Barcelona, Spain
- 2BV.1.17 Selective Ablation of WO_x, VO_x, and MoO_x Films using Femtosecond Laser Pulses**
David Canteli¹, David Munoz-Martin², Cristina Garcia-Munoz¹, Eloi Ros², Juan Miguel Lopez-Gonzalez², Cristobal Voz², Miguel Morales¹, Carlos Molpeceres¹
¹ UPM, Madrid, Spain; ² UPC, Barcelona, Spain
- 2BV.1.18 Iron Alloyed SnWO₄ for Si-Based Tandem Solar Cells**
Ingvild Bergsbak¹, Vegard S. Olsen¹, Holger von Wenckstern¹, Kristin Bergum¹
¹ University of Oslo, Oslo, Norway
- 2BV.1.19 Lightweight Photonic Cooler with Multi-Layered Thin Film IR Filters and Anti-Dust Properties for PV Applications in Desert Environments**
Brahim Aissa¹, Mohammad Hossain¹
¹ QEERI, Doha, Qatar

- 2BV.1.20 Optimizing Dye-Sensitized Solar Cells for Indoor Applications: Enhancing Efficiency through Dye-Lamp Matching and Co-Sensitization**
Giorgia Salerno¹, Manfredi Norberto¹, Ottavia Bettucci¹, Alessandro Abbotto¹
¹ University of Milano-Bicocca, Milan, Italy
- 2BV.1.21 Carbon Substrates as a Promising Component of Organic/Inorganic Hybrids for Photovoltaic Applications**
Sergii Mamykin¹, Nina Roshchina¹, Gennadiy Olkhovik¹, Daria Kuznetsova¹, Volodymyr Romanyuk¹, Petro Smertenko¹, Volodymyr Khomenko², Yaroslav Kuryptia³, Viacheslav Barsukov³
¹ National Academy of Sciences of Ukraine, Kyiv, Ukraine; ² Kyiv National University of Technologies and Design, Kyiv, Ukraine; ³ Institute for Sorption and Problems of Endoecology, Kyiv, Ukraine
- 2BV.1.22 SiC Recrystallization by UV Nanopulsed Laser Annealing**
Daniele Arduino¹, Luciano Scaltrito², Sergio Ferrero², Andrea Ancillao²
¹ Polytechnic University of Turin, Torino, Italy; ² Polytechnic University of Turin, Turin, Italy
- 2BV.1.35 Computational Multi-Objective Grey Box Optimization of the Contact Design for Tandem Solar Cells**
Noor Titan Putri Hartono¹, Dmitry Bogachuk¹, Zhifeng Teng¹, Peter Tillmann¹, Bhaskar Singh¹, Fan Guo¹, Yewei Zhang², Ye Tian², Delin Lu², Haocheng Wang², Christian Peter¹
¹ Solarlab Aiko Europe, Freiburg, Germany; ² Zhejiang Aiko Solar Technology, Yiwu, China
- 2BV.1.36 Inhomogeneities in Tandem PK-Si Solar Cells: A TCAD Simulation Study**
Pierre Lottigier¹, Renaud Varache¹, Amanda Merino Leiva²
¹ CEA LITEN, Le Bourget-du-Lac, France; ² CEA, Le Bourget-du-Lac, France
- 2BV.1.37 Requirements for the I-V Characterization of Perovskite-Based Tandem PV Modules**
Giorgio Bardizza¹, Johannes Stang², Mehdi Azmani², Chayma Jermouni², Torsten Wyssada², Wenhao Xu³, Yating Zhang³, Qi Gao³, Christos Monokroussos³, Werner Herrmann²
¹ TÜV Rheinland, Milan, Italy; ² TÜV Rheinland Solar, Cologne, Germany; ³ TÜV Rheinland, Shanghai, China
- 2BV.1.38 Accelerating Next-Gen Materials Discovery for Photovoltaic Applications using AI-Driven Synthesis and Characterization**
Joseph Chakar¹, Yvan Bonnassieux², Stefania Cacovich¹, James P. Connolly³, Jean-Baptiste Puel⁴, Philip Schulz¹
¹ IPVF, Palaiseau, France; ² LPICM, Palaiseau, France; ³ CNRS, Gif-sur-Yvette, France; ⁴ EDF, Palaiseau, France
- 2BV.1.39 Towards a Fully Differentiable Digital Twin for Solar Cells: Machine Learning and Optimization**
Houssam Metni¹, Marie Louise Schubert¹, Jan David Fischbach¹, Benedikt Zerulla¹, Marjan Krstić¹, Ulrich W. Paetzold¹, Seyedamir Orooji¹, Olivier J.J. Ronsin², Kai Segadlo², Yasin Ameslon², Jens Harting², Sandheep Ravishankar³, Thomas Kirchartz³, Christian Sprau¹, Mohamed Hussein¹, Alexander Colsmann¹, Karen Forberich², Pascal Friederich¹, Carsten Rockstuhl¹
¹ KIT, Karlsruhe, Germany; ² HI ERN, Erlangen, Germany; ³ FZJ, Jülich, Germany



2BV.1.40 Towards a Fully Differentiable Digital Twin for Solar Cells: Simulation Steps

Marie Louise Schubert¹, Houssam Metni¹, Jan David Fischbach¹, Benedikt Zerulla¹, Marjan Krstic¹, Ulrich Wilhelm Paetzold¹, Seyedamir Orooji¹, Olivier J. J. Ronsin², Kai Segadlo³, Yasin Ameslon³, Jens Harting³, Sandheep Ravishankar⁴, Thomas Kirchartz⁴, Christian Sprau¹, Mohamed Hussein¹, Alexander Colsmann¹, Karen Forberich², Pascal Friederich¹, Carsten Rockstuhl¹

¹ KIT, Karlsruhe, Germany; ² HI ERN, Erlangen, Germany; ³ Friedrich-Alexander-Universität Erlangen-Nuremberg, Erlangen, Germany; ⁴ FZJ, Jülich, Germany

2BV.1.42 Characterization of Carrier Dynamics in Perovskite Solar Cells using Impedance and Transient Measurements

Ana Kanevce¹, Hendrik Leutz¹, Tina Wahl¹, Theresa Magorian Friedlmeier¹

¹ ZSW, Stuttgart, Germany

2BV.1.43 Role of Random Textures on the Scattering Absorptance Enhancement in Halide Perovskite Layers

Jakub Holovsky¹, Meng-Hsueh Kuo¹, Branislav Dzurňák¹, Lucie Landová¹, Ivana Beshajová Pelikánová¹, Neda Neykova¹

¹ Czech Technical University, Prague, Czech Republic

2BV.1.44 Coupled Optoelectronic Frequency Domain Spectroscopy for Thin Film Device Characterization

Daniel McDermott¹, Baptiste Berenguier¹, Jean-François Guillemoles¹, Frédérique Ducroquet², Daniel Suchet¹

¹ IPVF, Palaiseau, France; ² CROMA, Grenoble, France

2BV.1.45 Phase Segregation Mapping in Perovskite Solar Cells Using Hyperspectral Photoluminescence Imaging

Ivar Loland Råheim¹, Håkon Holte¹, Ingunn Burud¹, Espen Olsen¹

¹ Norwegian University of Life Sciences, Ås, Norway

2BV.1.46 A Digital Projection System for Combined Spectral, Spatial, Angular and Linearity Response Measurements of PV Devices

George Koutsourakis¹, Daniel E. Parsons¹, Lavanya Malarkannan¹, James C. Blakesley¹

¹ NPL, Teddington, United Kingdom

2BV.1.47 Exploring the Characteristics Addition Method for Estimating Bifacial Efficiency in Cs3Sb2I9-Based Indoor Perovskite Solar Cells

Rajesh Kumar Sharma¹, Dhruv Singh Thakur¹, Deepak Joshi¹, Vivek Garg¹, Shivendra Yadav¹

¹ SVNIT, Surat, India

2BV.1.48 Certainly I-V Measurement of the Perovskite Device under Dim Light Intensity

Yean-San (Mickey) Long¹, Yung-Tsung Liu¹, Min-An Tsai¹, Cho-Fan Hsieh¹

¹ ITRI, Hsinchu, Taiwan

2BV.1.49 Thermal and Electrical Characterization of Photovoltaic Cells Designed for High Vacuum Photovoltaic-Thermal Collectors

Eliana Gaudino¹, Annalisa Di Napoli¹, Paolo Strazzullo¹, Laura Lancellotti², Eugenia Bobeico², Iurie Usatii², Antonio Caldarelli³, Emiliano Di Gennaro¹, Umberto Scotti Di Uccio¹, Musto Marilena¹, Roberto Russo⁴

¹ University of Naples Federico II, Naples, Italy; ² ENEA, Naples, Italy; ³ CNR-SPIN, Naples, Italy; ⁴ National Research Council of Italy, Naples, Italy

2BV.1.50 Improving the Investigation of Defects Properties through Temperature Dependent Modulated Photoluminescence

Hiba Haddara¹, Baptiste Béranguier², Sylvain Le Gall¹, Jean-François Guillemoles², Jean-Paul Kleider¹

¹ GeePs, Gif-sur-Yvette, France; ² IPVF, Palaiseau, France

VISUAL PRESENTATIONS 2BV.2

10:30 - 12:00 Compound and Organic Semiconductors

Chairpersons: Mirjam Theelen
TNO/Solliance, Eindhoven, The Netherlands
Alessandro Romeo
University of Verona, Italy

2BV.2.1 Investigation of Cd-free Sb2Se3 Thin-Film Solar Cells by ALD-ZnSnO Electron Transport Layer

Victor Bonal¹, Yudania Sánchez², David Payno¹, Umair Razi², Alejandro Pérez-Rodríguez², José Manuel Merino¹, Raquel Caballero³

¹ UAM, Madrid, Spain; ² IREC, Barcelona, Spain; ³ IO-CSIC, Madrid, Spain

2BV.2.2 Numerical Simulation of Cadmium-Free Buffer Layers for Copper-Doped Antimony Selenide Solar Cells

Fabio Butrichi¹, Maurizio Acciarri¹, Giorgio Tseberlidis¹, Vanira Trifiletti¹, Michele Casappa², Stefano Rampino², Simona Binetti¹

¹ University of Milan, Milan, Italy; ² National Research Council, Parma, Italy

2BV.2.3 The Effect of Thickness on the Sb2Se3 Superstrate Solar Cells

Narges Torabi¹, Jose Maria Delgado-Sanchez², Elisa Artegiani¹, Paola Jakuza³, Matteo Meneghini³, Alessandro Romeo¹

¹ University of Verona, Verona, Italy; ² University of Seville, Seville, Spain; ³ University of Padova, Padova, Italy

2BV.2.4 Transfer of GaAs Solar Cells to Unprecedented Flexible Polymeric Bases of PVC:PMMA:DOP Modified with EG

Graciana Dos Santos De Sousa¹, Luciana D. Pinto², Fabiele C. Tavares³, Guillermo J. N. Soares³, Rudy M. S. Kawabata⁴, Rogério Valaski⁵, Maurício P. Pires², Roberto Jakomin³, Patrícia L. Souza², Guilherme Torelly⁶

¹ Federal University of Rio de Janeiro, Livramento, Brazil; ² Federal University of Rio de Janeiro, Rio de Janeiro, Brazil; ³ Federal University of Rio de Janeiro, Duque de Caxias, Brazil; ⁴ Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil; ⁵ National Institute of Metrology Quality and Technology, Rio de Janeiro, Brazil; ⁶ PUC-Rio, Rio de Janeiro, Brazil

2BV.2.5 Photovoltaic Application of GaAsGe Ternary Alloys

Pablo Caño¹, Miguel Ángel Sevillano-Bendezú², Enrique Navarro², Aitana Cano¹, Iván García¹, Raghavendra Juluri³, Ana M. Sánchez³, Alicia Gonzalo Martín⁴, Jerónimo Buencuerpo², Yolanda Gonzalez², José María Ripalda²

¹ UPM, Madrid, Spain; ² IMN-CNM, Madrid, Spain; ³ University of Warwick, Coventry, United Kingdom; ⁴ University Carlos III of Madrid, Madrid, Spain



2BV.2.6 Development and Characterization of a Glued GaAs/Si Tandem Solar Cell in a Four-Terminal Configuration

Willian Machado¹, Rudy Kawabata¹, Luciana Pinto², Daniel Micha³, Guilherme Torelly¹, Patricia Lustoza de Souza²

¹ PUC-Rio, Rio de Janeiro, Brazil; ² UFRJ, Rio de Janeiro, Brazil; ³ III-V Lab, Paris, France

2BV.2.7 Monolithic 15.7% Efficient InGaP/GaAs/Si Triple-Junction Solar Cell with 1.55 eV n-Al_{0.10}Ga_{0.90}As Buffer

Hyun-Beom Shin¹, Yeonhwa Kim², Eukyo Ju², Tsimafei Laryn², In-Hwan Lee³, Jae-Hyung Jang⁴, Won Jun Choi², Ho Kwan Kang¹, Daehwan Jung²

¹ KANC, Suwon, South Korea; ² KIST, Seoul, South Korea; ³ Korea University, Seoul, South Korea; ⁴ KENTECH, Naju, South Korea

2BV.2.8 Inkjet-Printed Indium Sulfide Buffer Layer for CZTSe Solar Cells

Alessandro Magon¹, Francesco Lodola¹, Jacob Andrade-Arvizu², Pedro Vidal-Fuentes², Michele Melchiorre¹, Victor Izquierdo-Roca², Phillip J. Dale¹, Hasan A. Yetkin¹

¹ University of Luxembourg, Belvaux, Luxembourg; ² IREC, Barcelona, Spain

2BV.2.9 Detailed Characterization of ZnSn_xGe_{1-x}N₂ Thin Films for Top-Cell Absorbers in Tandem Solar Cells

Snorre Braathen Kjeldby¹, Vegard Standeren Olsen¹, Dina Marie Nielsen¹, Ymir Kalmann Frodason¹, Simon Phillip Cooil¹, Lasse Vines¹, Eduard Monakhov¹, Kristin Bergum¹

¹ University of Oslo, Oslo, Norway

2BV.2.10 Comparison of Flexible Molybdenum Foil and Sputtered Molybdenum Back Contacts for CZTSSe Solar Cells

Ikram Anefnaf¹, Giorgio Tseberlidis², Simona Binetti², Alessandro Veneri¹, Elisa Artegiani¹, Alessandro Romeo¹

¹ University of Verona, Verona, Italy; ² University of Milano Bicocca, Milan, Italy

2BV.2.11 Impact of Vapor Phase Ge Incorporation and Reaction Pathway on the Performance and Long-Term Stability of Cu₂Zn(Ge, Sn)Se₄ Solar Cells

Talat Khonsor¹, David Nowak², Robert Fonoll-Rubio¹, Maxim Guc¹, Pedro Vidal-Fuentes¹, Levent Güta²

¹ IREC, Barcelona, Spain; ² Carl von Ossietzky University of Oldenburg, Oldenburg, Germany

2BV.2.12 Exploring Picosecond and Femtosecond Laser Ablation for Kesterite-Based Thin-Film Solar Modules

David Canteli¹, Cristina Munoz-Garcia¹, David Munoz-Martin¹, Sara Lauzurica¹, Jacob Andrade-Arvizu², Victor Izquierdo-Roca², Pedro Vidal-Fuentes², Carlos Molpeceres¹, Miguel Morales¹

¹ UPM, Madrid, Spain; ² IREC, Barcelona, Spain

2BV.2.13 Monolithic Interconnection of Thin Film Minimodule Prepared by a CNC Mechanical Scribing

David Payno¹, Jacob Andrade-Arvizu², Marta Miró-Llorente², Pedro Vidal-Fuentes², Raquel Caballero³, Victor Izquierdo-Roca², Alejandro Perez-Rodriguez²

¹ UAM, Madrid, Spain; ² IREC, Barcelona, Spain; ³ CSIC, Madrid, Spain

2BV.2.14 Photovoltaic Properties of Hydroxy Minerals in Polymer Electrolytes on Dye-Sensitized Solar Cells

Mi-Ra Kim¹, Sungsoo Park¹

¹ Dong-Eui University, Busan, South Korea

2BV.2.15 Zn_{1-x}Sn_xO Thin Films via ALD as a Cd-Free Alternative for Narrow Gap Cu₂ZnSnSe₄

Umair Razi¹, Jacob Andrade Arvizu¹, Gustavo Alvarez¹, David Rovira², Victoria Rotaru¹, Laura Garcia-Carreras³, Maxim Guc¹, Lorenzo Calvo-Barrio³, Alex Jimenez-Arguijo², Edgardo Saucedo², Alejandro Pérez Rodríguez¹, Yudania Sánchez¹

¹ IREC, Sant Adrià de Besòs, Spain; ² Polytechnic University of Catalonia, Barcelona, Spain; ³ University of Barcelona, Barcelona, Spain

2BV.2.17 Buffer Development on Low-bandgap CIGSSe Absorbers for Tandem Applications

Anastasia Zelenina¹, Dimitrios Hariskos², S. Oueslati¹, Rico Gutzler², Hossam Elanzeery¹, Thomas Dalibor¹

¹ Avancis, Munich, Germany; ² ZSW, Stuttgart, Germany

2BV.2.18 Organic Molecules and Biopolymers as Acceptors and Donors in High Efficiency Organic and Perovskite Solar Cells

Marie Sow¹, Abdoulaye Gassama¹, Diouma Kobor¹, Michael Rivard²

¹ University Assane Seck of Ziguinchor, Ziguinchor, Senegal; ² Paris-Est Institute of Materials Chemistry, Paris, France

2BV.2.19 Kinetic Morphology Evolution of Non-Fullerene Bulk Heterojunction Blends: The Role of Solvent Additives in Thermal Stability

Tzu-Yen Huang¹, Anton Le Brun²

¹ National Synchrotron Radiation Research Center, Hsinchu, Taiwan; ² Australian Nuclear Science and Technology Organisation, Lucas Heights, Australia

2BV.2.20 Enhancing CIGS Solar Cells Efficiency through Infrared Laser Illumination for Wireless Charging Systems

Jakub Zdziebowski¹, Krzysztof Anders¹, Ryszard Piriadowicz¹, Nicolas Barreau², Pawel Zabierowski¹

¹ Warsaw University of Technology, Warsaw, Poland; ² University of Nantes, Nantes, France

2BV.2.21 Toward Cu(In,Ga)Se₂ Solar Cells on Textile Substrates

Neslihan Akcay¹, Pedro Sousa¹, João Rodrigues¹, Jorge Padrão², José Abreu², Ana Moura³, Neha Kumari¹, Inês Alves⁴, José Gouveia⁴, Juliana P.S. Sousa¹, Ana Maria Rocha², Sascha Sadewasser¹, Pedro Anacleto¹

¹ INL, Braga, Portugal; ² University of Minho, Guimarães, Portugal; ³ University of Minho, Braga, Portugal; ⁴ Copo Textil, Santo Tirso, Portugal

2BV.2.22 On the Viability of CIGS Technology for Silicon Based Tandem Solar Cells

Juan Carlos Jimeno¹, Vanesa Fano¹, Eneko Cereceda¹, Aloña Otaegi¹, Nekane Azkona¹, Rubén Gutiérrez¹, Federico Recart¹, Velia Rodríguez¹, Carlos Cañizo², David Fuentet²

¹ UPV/EHU, Bilbao, Spain; ² IES-UPM, Madrid, Spain

2BV.2.23 Inline Low-Gap CIGS as Bottom Cell for Tandem Applications

Dimitrios Hariskos¹, Rico Gutzler¹, Ana Kanevce¹, Stefan Paetel¹

¹ ZSW, Stuttgart, Germany

2BV.2.24 Intentional and Unintentional Doping on a-Ge:H Deposited by PECVD for Multijunction Solar Cells

Paula Perez-Rodriguez¹, Devansh Sharma¹, Shubham Litke¹, Shijie Liao¹, Arno H. M. Smets¹

¹ TU Delft, Delft, The Netherlands



2BV.2.26 Study of the Effect of Precursor Solution Aging on Bismuth-Based Chalcogenide Thin Films by Solution Method for Photovoltaic Applications

Benjamin Fritz Muñoz¹, Giulia Longo², Bernabé Marí Soucase²
¹ UPV, València, Spain; ² Universitat Politècnica de València UPV - CPI, València, Spain

2BV.2.27 Novel Hole-Transporting Materials Based on P-Phenylenediamine Skeleton Functionalized with Sulfur-Containing Moieties for Organic Optoelectronic

Svetlana Sargsyan¹, Mariia Stanitska¹, Melika Ghasemi¹, Rasa Keruckiene¹, Dmytro Volyniuk¹, Viktorija Andruleviciene¹, Narine Durgaryan², Juozas Vidas Grazulevicius¹
¹ Kaunas University of Technology, Kaunas, Lithuania; ² Yerevan State University, Yerevan, Armenia

2BV.2.28 Transport Properties of GaOx Hole Transport Layer Passivated Back-Contact for Efficient 1.0 eV CuInSe2 Bottom Cells for Tandem Applications: Cu and Na Doping

Francesco Lodola¹, Zhuangyi Zhou¹, Boaz Koren¹, Michele Melchiorre¹, Susanne Siebentritt¹
¹ University of Luxembourg, Belvaux, Luxembourg

2BV.2.29 Understanding Group-I-Poor Secondary Phases in Wide-gap (Ag,Cu)(In,Ga)Se2 Solar Cells

Ann Maria James¹, Kostiantyn Sopiha¹, Patrick Pearson¹, Jan Keller¹, Charlotte Platzer-Björkman¹
¹ Uppsala University, Uppsala, Sweden

2BV.2.30 Thin-Films Cell Fabrication: a Practical Approach to Teaching Photovoltaics Fundamentals

Maria Jesus Ariza Camacho¹, María José García-Salinas¹, Manuel Pérez-García¹, D. A. Núñez-Osorio², Joaquín Alonso-Montesinos², Antonio Manuel Puertas López²
¹ University of Almería, Almería, Spain; ² University of Almería, Almería, Spain

VISUAL PRESENTATIONS 4BV.3

13:30 - 15:00 Solar Resource and Forecasting

Chairpersons: Ana Maria Gracia Amillo
CENER, Sarriguren, Spain
Dunia Bachour
HBKU/ Qatar Foundation, Doha, Qatar

4BV.3.1 Evaluating the Accuracy of Single-Camera Irradiance Forecasting

Jacob K. Thorning¹, Sergiu V. Spataru¹, Adam R. Jensen², Peter B. Poulsen¹
¹ DTU, Roskilde, Denmark; ² DTU, Kongens Lyngby, Denmark

4BV.3.2 Efficient Reconstruction of Annual Irradiance Using Low-Dimensional Representations of Irradiance Data

Evgenii Sovetkin¹, Andreas Gerber¹, Bart E. Pieters¹
¹ FZJ, Jülich, Germany

4BV.3.4 Development of Deep Learning Techniques for Single PV Plant Power Forecasting using Sequence-to-Sequence Models

Jacopo Baldacci¹, Ciro Lanzetta¹, Nabi Taheri², Antonio Piazzì¹
¹ i-EM, Livorno, Italy; ² University of Pisa, Pisa, Italy

4BV.3.5 New Empirical Model for Backside Irradiance

Kristijan Brec¹, Emilio Muñoz Cerón², Juan de la Casa Higuera², Marko Topić¹
¹ University of Ljubljana, Ljubljana, Slovenia; ² University of Jaén, Jaén, Spain

4BV.3.7 Anomaly Detection in a Network of Irradiance Sensor

Gianmaria Tarantino¹, Giorgio Fighera², Giacomo Gorni¹
¹ Eni, San Donato Milanese, Italy; ² Eni Plenitude, Roma, Italy

4BV.3.8 Deep Learning-Based Solar Irradiance Decomposition Models for Nordic Regions

Alfredo Sanchez Garcia¹, Berhane Darsene Dimd¹
¹ SINTEF, Trondheim, Norway

4BV.3.12 Advancing Very Short-Term Solar Irradiance Forecasting in Africa: A Low-Cost Sky Imaging and Machine Learning-Based Approach

Martin Ansong¹, Bryce Richards²
¹ KIT, Eggenstein-Leopoldshafen, Germany; ² KIT, Karlsruhe, Germany

4BV.3.13 Implementation of an Open-Source Sky Imaging System for Solar Forecasting in a Solar Farm in Burkina Faso

Sami Florent Palm¹, Martin Ansong², Soro Y. Moussa¹, Bryce Richards²
¹ 2iE, Ouagadougou, Burkina Faso; ² KIT, Eggenstein-Leopoldshafen, Germany

4BV.3.14 Lessons Learned in Automating Quality Control: Insights, Challenges, and Innovative Approaches in Real World Ground Measurements

Assa Camara¹, Katarina Bistak Catlosova¹, Tomas Cebecauer¹, Martin Jakubik¹, Marketa Hulik Jansova¹, Oliver Osvald¹
¹ Solargis, Bratislava, Slovakia

4BV.3.15 Machine Learning-Based PV Potential Classification in the EU using Key Parameters

Or Gindi¹, Sara Golroodbari¹, Wilfried Van Sark¹
¹ Utrecht University, Utrecht, The Netherlands

4BV.3.16 Automated Solar Data Quality Reporting Framework

Daniel Perez-Astudillo¹, Dunia Bachour¹
¹ QEERI, Doha, Qatar

4BV.3.17 How Complex are Satellite-Based Irradiation Data?

Philippe Malcorps¹, Anastasia Dagla¹, Gofran Chowdhury¹
¹ 3E, Brussels, Belgium

4BV.3.18 Blending Short and Medium Term Solar Forecast

Jan Remund¹, Michael Schmutz¹, Pascal Graf¹, Pirmin Neyer¹
¹ Meteotest, Bern, Switzerland

4BV.3.19 Evaluation of Clear Sky Models under Dusty Conditions

Dunia Bachour¹, Daniel Perez-Astudillo¹, Abdulwahab Ziaullah¹
¹ QEERI, Doha, Qatar

4BV.3.20 Weather and Air Quality Effects on Photovoltaic System Efficiency: a Modeling Approach

Luis Carrillo Mejía¹, Elvis Eduardo Gaona García¹, Johann Alexander Hernández Mora¹
¹ District University of Bogotá, Bogotá, Colombia

4BV.3.21 Specialized Irradiation Modeling for Alpine Regions: Clearsky and Diffuse Fraction Estimation

Bernhard Kubicek¹, Marcus Rennhofer¹, Philipp Weihs²
¹ AIT, Vienna, Austria; ² BOKU University, Vienna, Austria



4BV.3.22 Determination of Dark Doldrums based on Meteorological Data: Comparison with PV Yield Data

Philipp Weihs¹, Michael Thon¹, Marcus Rennhofer², Bernhard Kubicek², Sarah Reisenbauer²

¹ BOKU University, Vienna, Austria; ² AIT, Vienna, Austria

4BV.3.23 Updates on the CAMS Radiation Service v4.6: Validation of the Himawari Field of View

Jorge Lezaca¹, Marion Schroedter-Homscheidt¹, Faiza Azam¹, Diego Miranda¹, Mireille Lefevre², Laurent Saboret³, Antti Arola⁴, Yves-Marie Saint-Drenan²

¹ DLR, Oldenburg, Germany; ² MINES Paris, Sophia-Antipolis, France; ³ Vaisala, Sophia-Antipolis, France; ⁴ FMI, Kuopio, Finland

4BV.3.24 A Novel Implementation of Quality Checks of Spectral Direct Normal Irradiance Measurements

Sergiu Mihai Hategan¹, Jacob K Thorning², Marius Paulescu¹, Sergiu V Spataru²

¹ West University of Timisoara, Timisoara, Romania; ² DTU, Roskilde, Denmark

4BV.3.25 Evaluating the Suitability of Köppen-Geiger Climate Classifications for Photovoltaic Systems: Micro-climate Analysis and Risk Assessment Maps

Pavan Kumar Panda¹, Hugo Sanchez¹, Leila Mortazavifar¹, Ralph Gottschalg²

¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle, Germany

4BV.3.26 Satellite-Derived Irradiance Data for PV Performance Assessments in High Latitudes

Hugo E. Huerta¹, Juha Karhu², Anders Lindfors², Shuo Wang¹, Sami Jouttijärvi³, Samuli Ranta¹, Kati Miettunen³

¹ Turku University of Applied Sciences, Turku, Finland; ² Finnish Meteorological Institute, Helsinki, Finland; ³ University of Turku, Turku, Finland

4BV.3.27 Optimized Albedometer Height: a Simple Model for Accurate Albedo Measurement

Eneko Ortega¹, Eneko Cereceda¹, Nekane Azkona¹, Alona Otaegi¹, Vanesa Fano¹, Jose Ruben Gutierrez¹, Juan Carlos Jimeno¹

¹ UPV/EHU, Bilbao, Spain

4BV.3.28 Open Source Tool for Weather Data Estimation in Photovoltaic Systems Monitoring

Sonia Maria Rodriguez¹, Beatriz Chicote², Eneko Ortega¹, Gerardo Aranguren³, Juan Carlos Jimeno³

¹ UPV/EHU, Leioa, Spain; ² Mondragon University, Arrasate-Mondragon, Spain; ³ UPV/EHU, Bilbao, Spain

4BV.3.29 Performance Evaluation of CAMS Reanalysis to Enhance a Solar Resource Assessment and Forecasting Service Tool for Qatar's specific Desert Climate

Abdul Wahab Ziaullah¹, Dunia Bachour¹, Daniel Perez-Astudillo¹, Lionel Menard², Philippe Blanc²

¹ QEERI, Doha, Qatar; ² MINES Paris, Nice, France

4BV.3.32 Defining an Irradiance Quantity for Outdoor Assessment of PV System Performance

Anton Driesse¹, James Blakesley²

¹ PV Performance Labs, Freiburg, Germany; ² NPL, Teddington, United Kingdom

4BV.3.33 AI-Powered Clear-Sky Detection and Unsupervised Weather Classification for Enhanced PV Monitoring

Hugo Quest¹, Bohan Li², Christophe Ballif², Alessandro Virtuani³

¹ 3S Swiss Solar Solutions, Thun, Switzerland; ² EPFL, Neuchâtel, Switzerland; ³ CSEM, Neuchâtel, Switzerland

VISUAL PRESENTATIONS 4BV.4

15:15 - 16:45

BIPV

Chairpersons:

Gabriele C. Eder

OFI, Vienna, Austria

Eduardo Román Medina

Tecnalia, Derio, Spain

4BV.4.1 Time-Resolved Energy Yield Estimation of Residential Photovoltaic Systems: the Impact of Tree Shading

Richard de Jong¹, Patrizio Manganiello¹, Olivier Dupon¹, Sara Bouguerra², Arnaud Morlier¹

¹ imec, Genk, Belgium; ² UHasselt, Genk, Belgium

4BV.4.2 A Comprehensive Analysis of Synergistic Interactions between Bifacial Photovoltaic and Green Roofs

Ammar Tummali¹, Bruno Bueno¹

¹ Fraunhofer ISE, Freiburg, Germany

4BV.4.3 Mitigating Fire Hazards in Lightweight Photovoltaic Modules: Performance and Effects of Advanced Flame Retardants

Florian Ollagnon¹, Hengyu Li², Emma Gottis², Olaia Aurrekoetxea-Arrabitel³, Xabier Olano-Azkune³, Matthieu Despeisse², Antonin Faes¹, Christophe Ballif¹

¹ EPFL, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland; ³ TECNALIA, Azpeitia, Spain

4BV.4.4 PV System Design with Curtailment in Mind: Cost Comparison at the Prosumer Level

Linda Brodnick¹, Alissa Ganter¹, Giovanni Sansavini¹, Natasa Vulic²

¹ ETH, Zurich, Switzerland; ² University of Applied Arts and Sciences Northwestern Switzerland, Muttens, Switzerland

4BV.4.5 BIPV Simulation with Conventional Tools and Models; Do We Need More Accuracy?

Ana Marcos-Castro¹, Nuria Martín-Chivelet¹, Jesús Polo¹

¹ CIEMAT, Madrid, Spain

4BV.4.6 How does the Color get into the PV Modules?

Joachim Sting¹, Ralf Haselhub¹

¹ Deutsche Gesellschaft für Sonnenenergie Landesverband Berlin Brandenburg, Berlin, Germany

4BV.4.7 Design Aspects for the Solarization of Façade Components

Bruno Bueno¹, Frank Ensslen¹, Martin Heinrich¹

¹ Fraunhofer ISE, Freiburg, Germany

4BV.4.9 Economic Value of Building-Integrated PV Production at High-Latitude Locations

Sami Jouttijärvi¹, Lauri Karttunen¹, Magda Szarek¹, Bergpob Viriyaraj², Samuli Ranta³, Kati Miettunen¹

¹ University of Turku, Turku, Finland; ² Aalto University, Espoo, Finland; ³ TUAS, Turku, Finland



- 4BV.4.10 Towards Sustainable Cities with Integrated Photovoltaic Ceramic Roof Tile**
Alicia Buceta¹, Jaime Polo¹, Roberto Diaz², Marta Álvarez¹, Eugenia Zugasti¹, Jaione Bengoechea¹
¹ CENER, Sarriguren, Spain; ² Notio Association, Toledo, Spain
- 4BV.4.12 Façade Application of Light-Weight Glass-Free Colored PV Modules: Reliability Testing of the Large-Format Modules and Monitoring of the Demonstration Site**
Umang Desai¹, Leïla Mazirt¹, Yuliya Voronko², Gabriele Eder², Nikolina Pervan³, Gernot Oreski³, Antonin Faes¹, Christophe Ballif¹
¹ EPFL, Neuchâtel, Switzerland; ² OFI, Vienna, Austria; ³ PCCL, Leoben, Austria
- 4BV.4.13 Simulation-Based Analysis of Fire Safety for BIPV Cladding Systems**
Su-Bin Jeong¹, Jin-Hee Kim¹, Jun-Tae Kim¹
¹ Kongju National University, Cheonan, South Korea
- 4BV.4.14 Evaluating PVT Module Performance Across Diverse European Climates: A Simulation Study**
Angelica Saretti¹, Giuseppe Vero¹, Aissa Chouder², Silvano Vergura¹, Santiago Silvestre³
¹ Polytechnic University of Bari, Bari, Italy; ² University of M'sila, M'sila, Algeria; ³ UPC, Barcelona, Spain
- 4BV.4.15 Extended KPIs for Decisions-Makers in the Development of BIPV Solutions**
Simon Boddaert¹, Olaia Aurrekoetxea², Julieu Jacob³, Simone Germani⁴, Ignas Ceuppens⁵, Hervé Lamblot⁶, Tatjana Vavilkin⁷, Maria Jimenez⁸, Xavier Gauvin⁹, Tonis Eelma¹⁰
¹ CSTB, Sophia Antipolis, France; ² TECNALIA, Saint Sebastian, Spain; ³ METABUILD, Berlin, Germany; ⁴ CEI, Milan, Italy; ⁵ BUILD'UP, Aarschot, Belgium; ⁶ Sunstyle, Paris, France; ⁷ Soltech, Genk, Belgium; ⁸ Onyx Solar, Avila, Spain; ⁹ Bouygues Construction, Saint-Quentin-en-Yvelines, France; ¹⁰ IBS, Tartu, Estonia
- 4BV.4.16 Fire Safety Evaluation: Assessing Internal Fire Exposure in BIPV/BAPV Systems**
Nerea Otano-Aramendi¹, Fabio Parolini², Xabier Olano-Azkune¹, Olaia Aurrekoetxea-Arratibel¹, Ainhoa Odriozola-Alberdi¹, Pierluigi Bonomo²
¹ TECNALIA Research & Innovation, Azpeitia, Spain; ² SUPSI – ISAAC, Manno, Switzerland
- 4BV.4.17 The Use of Life Cycle Assessment to Support Development of an Innovative BIPV System with a Steel Frame**
Lea Roulleau¹, Simon Bailache¹, Simon Boddaert², Jean-Pierre Reyal³, Yves Biard³
¹ CSTB, Grenoble, France; ² CSTB, Sophia Antipolis, France; ³ SemperStyl Technologies, Cergy, France
- 4BV.4.18 A Phase Change Material-Based Passive Air-Based Dual-Purpose Photovoltaic-Thermal System: a CFD Study Analysis and Experimental Performance**
Omid Fakhraei¹, Shiva Gorjian¹, Barat Ghobadian¹, Gholamhassan Najafi¹
¹ Tarbiat Modares University, Tehran, Iran
- 4BV.4.19 Exploring Fire Safety Protocols: Should Photovoltaic Systems be Active During Testing?**
Olaia Aurrekoetxea-Arratibel¹, Nerea Otano-Aramendi¹, Daniel Valencia-Caballero², Iñigo Vidaurrezaga³, Xabat Oregi⁴, Xabier Olano-Azkune¹
¹ TECNALIA, Azpeitia, Spain; ² TECNALIA, Donostia, Spain; ³ TECNALIA, Derio, Spain; ⁴ CAVIAR UPV/EHU, Donostia, Spain

- 4BV.4.20 Technical Analysis of PV/T Systems in Utrecht Primary Schools**
Ruben van der Veen¹, Sara Mirbagheri Golroodbari¹, Annanta Kaul², Wilfried G.J.H.M. van Sark¹, Or Gindi³
¹ Utrecht University, Utrecht, The Netherlands; ² Utrecht University, Amersfoort, The Netherlands; ³ Utrecht University, Amsterdam, The Netherlands
- 4BV.4.22 Economic Analysis of Building Integration of Flexible PV Modules**
Paulo Carmo¹, José A. Silva¹, Luís Fialho¹, Pedro Horta¹
¹ University of Évora, Évora, Portugal
- 4BV.4.23 Customizable Color Foils for Photovoltaic Modules: A New Approach to Aesthetic and Efficient Solar Energy Integration**
Ananta Paul¹, Jani Lamminaho¹, Catarina Ferreira², Markus Babin³, Karlis Petersons⁴, Leif Yde⁴, Jan Stensborg⁴, Nanna Lysgaard Andersen³, Peter Behrendorff Poulsen³, Sune Thorsteinsson³, Joel D Cox², Morten Madsen¹
¹ SDU Climate Cluster, Odense, Denmark; ² POLIMA, SDU, Odense M, Denmark; ³ DTU, Roskilde, Denmark; ⁴ Stensborg, Roskilde, Denmark
- 4BV.4.24 Performance, Operational Data and Stability of Commercial CIGS Thin-Film PV Modules in BIPV Systems**
Stefan Grünsteidl¹, Peter Borowski¹, Thomas Dalibor¹
¹ Avancis, Munich, Germany
- 4BV.4.25 Experimental Testing of BIPVT for Arctic Residential Applications**
Daniel Baril¹, Andreas Athienitis², Hua Ge²
¹ Concordia University, Dollard-Des-Ormeaux, Canada; ² Concordia University, Montreal, Canada
- 4BV.4.27 Photovoltaic Integration in Football Stadiums: Global Trends, Regional Disparities, and Future Potential**
Johanna Buchmann¹, Niels Feuerherdt¹, Bert Stegemann¹
¹ Berlin University of Applied Sciences, Berlin, Germany
- 4BV.4.28 The Role and Functions of the BIPV Demonstration Center for Promoting the Expansion of BIPV in Republic of Korea**
Dasol Kim¹, Seungjoon Lee¹, Kyu-Jin Kim¹, WonWook Oh²
¹ Korea Conformity Laboratories, Eumseong-gun, South Korea; ² Chungbuk Technopark, Jincheon-gun, South Korea
- 4BV.4.29 Luminescent Solar Concentrator based on Upconverting Material for Building Integrated Photovoltaic to Achieve Sustainable Energy Buildings**
Paramsinh Zala¹, Brijesh Tripathi¹, Mayank Gupta¹
¹ PDPU, Gandhinagar, India
- 4BV.4.30 Structural Factor Analysis of Barriers to BIPV Deployment in Korea**
Sookyoung Jeong¹, Jongrak Back¹
¹ The Seoul Institute, Seoul, South Korea
- 4BV.4.31 A Technology for Reducing Heat Generation and Improving Power Generation Efficiency of BIPV Using Roof Ventilation System of Building Span Roof**
Hyunwoo Jeon¹, Kiwon Nam², Hyungil Kim¹
¹ Energy Net, Seoul, South Korea; ² Energy Net, Daejeon, South Korea



VISUAL PRESENTATIONS 1BV.5

17:00 - 18:30 Crystalline Silicon Material: Defects and Recycling | Processes and Concepts for the Manufacturing of Silicon Solar Cells

Chairpersons: Marina Foti

3Sun, Catania, Italy

Bertrand Paviet-Salomon

CSEM, Neuchâtel, Switzerland

1BV.5.1 Photovoltaic Waste Recycling for Highly Stable Nano-Silicon Particles in Lithium-Ion Batteries

Jun-Hong Min¹, Gi-Hwan Kang¹, Jin-Seok Lee¹

¹ KIER, Daejeon, South Korea

1BV.5.3 Solar Silicon Recycling from End-of-Life PV Silicon Modules via Chemical and Vacuum Refining Techniques

Jonas Låstad¹, Jafar Safarian¹

¹ NTNU, Trondheim, Norway

1BV.5.4 Novel PV Conversion Mechanisms in Crystalline Silicon Filled with Conditioned Amorphized Grains

Zbigniew T. Kuznicki¹

¹ SEGTON Advanced Technology, Versailles, France

1BV.5.5 Analysis of Cu-Associated Defects in Silicon through Lifetime Spectroscopy

Nerea Dasilva-Villanueva¹, David Fuertes Marrón¹, Carlos del Cañizo¹

¹ UPM, Madrid, Spain

1BV.5.6 Oxygen and Carbon Impurity Effects in CZ-Silicon Wafers: Improvement through Thermal Annealing

Nurhayat Yıldırım¹, Sertaç Eroğlu²

¹ KalyonPV, Ankara, Türkiye; ² Eskişehir Osmangazi University, Eskişehir, Türkiye

1BV.5.7 Investigation of Process Parameters on the Distribution of the Material Parameters in Cz-Crystals doped with Antimony

Frank Mosel¹, Nadine Schueler²

¹ PVA TePla, Wittenberg, Germany; ² Freiburger Instruments, Freiberg, Germany

1BV.5.8 Ellipsometry Characterization and Modelling of Porous Silicon Layers: Utilizing Different Absorption Depths to Aid Modelling

Per-Anders Hansen¹, Junjie Zhu²

¹ Institute for Energy technology, Kjeller, Norway; ² Institute for Energy Technology, Kjeller, Norway

1BV.5.21 The Bondi Process: LCO-free, Fire through Micro-Contact PERC AL that Outperforms Standard PERC Solar Cells

Alexander Slade¹, Richard Young¹, Matt Edwards¹, Thomas Buck², Mertcan Comak², Dominik Rudolph²

¹ Avalon Solar Technologies, Sydney, Australia; ² ISC Konstanz, Konstanz, Germany

1BV.5.22 Integration of Parallel Dispensing Technology and Tempo Presto Metallization Platform

Nicola Frasson¹, Marco Galiuzzo¹, Maximilian Pospischil², Bernd Steinhauser²

¹ Applied Materials, San Biagio di Callalta, Italy; ² HighLine Technology, Freiburg, Germany

1BV.5.23 Combination of Silicon Heterojunction and Metal Wrap through Technologies for BIPV Module Realization

Nicola Frasson¹, Marco Galiuzzo¹

¹ Applied Materials, San Biagio di Callalta, Italy

1BV.5.24 Sustainable, High-throughput, Industry-ready, Next-generation Technology for European Manufacturing Leadership in Photovoltaics (SHINE PV)

Marco Galiuzzo¹, Sven Kluska², Vincent Barth³, Jonathan Govaerts⁴, Frank Lenzmann⁵, Giovanni Borzi⁶, Betina Debastiani Benato⁷, Matevž Bokalič⁸, Margit Lang⁹, Victor Acinas¹⁰

¹ Applied Materials, San Biagio di Callalta, Italy; ² Fraunhofer ISE, Freiburg, Germany; ³ CEA, Le Bourget-du-Lac, France; ⁴ imec, Genk, Belgium; ⁵ TNO Energy Transition, Petten, The Netherlands; ⁶ Enginsoft, Padua, Italy; ⁷ AMIRES, Prague, Czech Republic; ⁸ University of Ljubljana, Ljubljana, Slovenia; ⁹ PCCL, Leoben, Austria; ¹⁰ Applied Materials, Dublin, Ireland

1BV.5.25 A Simple Method to Estimate Defect Density in Monocrystalline Silicon Wafers

Veronica Gonzalez¹, Marija Demicoli¹, Luciano Mule'Stagno¹

¹ University of Malta, Marsaxlokk, Malta

1BV.5.27 Beyond Silver: Comparative Performance Analysis of Alternative Metallization Strategies in Silicon Solar Cells

Seda Kilickaya¹, Melisa Korkmaz Arslan¹, Esma Alloji², Serdar Akbayrak², Veysel Unsur²

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² Necmettin Erbakan University, Konya, Türkiye

1BV.5.28 Progress in Screen Printed Hybrid Copper and Silver Metallization for N-Type ZEBRA IBC Cells

Dominik Rudolph¹, Mertcan Comak¹, Justus Carstens¹, Jan Lossen¹, Isaac Rosen², Jonathan Linke¹, Florian Buchholz¹

¹ ISC Konstanz, Konstanz, Germany; ² Copprint, Jerusalem, Israel

1BV.5.32 Impact of Doped Polysilicon Process for Mass Production TOPCon Solar Cell

Cheng-Wen Kuo¹, Ta-Ming Kuan¹, Yung-Chih Li¹, Chun-Wei Lee¹, Li-Guo Wu¹, Cheng-Yeh Yu¹

¹ TSEC, Hsinchu, Taiwan

1BV.5.33 Exploring Carbon-Based Pastes for Silver-Free Metallization of Silicon Heterojunction Solar Cells

Mihir Mahajan¹, Bart Reekmans¹, Valerie Depauw¹, Thomas Baumeler², Vaishakh Kedambaimoole², David Martineau², Hariharsudan Sivaramakrishnan Radhakrishnan¹, Bart Vermang³

¹ imec, Genk, Belgium; ² GraphEnergyTech, Lausanne, Switzerland; ³ Hasselt University, Hasselt, Belgium

1BV.5.34 Analysis of Texture Etching to Reduce Laser-Induced Damage in Boron-Doped Selective Emitters

Bruno Krever Lopes¹, Adriano Moehlecke¹, Moussa Ly¹, Izete Zanesco¹, Felipe Chini de Freitas¹

¹ PUCRS, Porto Alegre, Brazil

1BV.5.35 Influence of Reduced Gas Flow Rates on the Sheet Resistance of Boron-Diffused Layers Performed in a Compact Furnace

Izete Zanesco¹, Adriano Moehlecke¹, Lucas Caçapietra Pires da Silva¹, Moussa Ly¹, João Victor Zanatta Britto¹, Vitor Gomes de Venuto¹

¹ PUCRS, Porto Alegre, Brazil



1BV.5.36 Innovations in PERC and TOPCon Solar Cell Metallization: Reduction of Process Steps and Efficiency Improvement

Mert Kahraman¹, Burcu Gümüş Çiftçi¹

¹ Kalyon PV, Ankara, Türkiye

1BV.5.37 Ultrashort Pulsed Laser Ablation in Photovoltaics: Power Attenuator and Pulse Spacing Effects

Nastaran Hayati-Roodbari¹, Audrey Morisset², Frank Reil¹, Agata Lachowicz², Valentin Satzinger¹, Roman Trattnig¹

¹ Joanneum Research, Weiz, Austria; ² CSEM PV-center, Neuchâtel, Switzerland

1BV.5.38 Reliability of Double-Side Ni/Cu Plated Contacts on Wet Etch Opened TOPCon Solar Cells

Roberto Boccardi¹, Clara Bolette Brendstrup Møller¹, Io Mizushima², Torben Tang², Rasmus Schmidt Davidsen³, Peter Behrendsdorff Poulsen¹, Gisele Alves dos Reis Benatto¹, Sune Thorsteinsson¹

¹ DTU, Roskilde, Denmark; ² IPU P/S, Virum, Denmark; ³ Aarhus University, Aarhus, Denmark

1BV.5.39 Optimization of Cu Metallization in HJT Solar Cell Manufacturing and Investigation of Possible Cu in-Diffusion during Module Reliability Testing

Yu Wu¹, Lars A. G. Oke¹, Eric J. Kossen¹, E. Busra Kucuk¹, Astrid Gutjahr¹, Victor Rosca¹, L. J. Geerligs¹

¹ TNO, Petten, The Netherlands

1BV.5.40 Self-Assembled Films of Carbazole Derivatives on the Aluminum Back Contact of Silicon Solar Cells

Sergii Mamykin¹, Nina Roshchina¹, Daria Kuznetsova¹, Vadym Naumov¹, Petro Smertenko¹, Saulius Grigalevicius², Gintare Krucaite², Raminta Beresneviute², Dovydas Blazelevicius²

¹ NAS, Kyiv, Ukraine; ² Kaunas University of Technology, Kaunas, Lithuania

1BV.5.41 Luminescent Insulating Intermediate Layer for Thin Film Solar Modules P1 Laser Scribing on Low-cost Galvanized Steel

MariFe Menéndez¹, Ana Martínez¹, Pascal Sanchez¹

¹ Fundación Idonial, Gijón, Spain

Wednesday, 24. September 2025

VISUAL PRESENTATIONS 4CV.1

13:30 - 15:00 Advances in Operation, Performance and Maintenance of PV Systems

Chairpersons: Gisele A. dos Reis Benatto

DTU, Roskilde, Denmark

Ioannis (John) Tsanakas

CEA, Le Bourget-du-Lac, France

David Moser

Becquerel Institute Italia, Trento, Italy

Claudia Buerhop-Lutz

HI ERN, Erlangen, Germany

4CV.1.1 Closing Data Gaps in Floating PV: A Case Study Comparing Machine Learning and Conventional Reconstruction of Irradiance and Module Temperature

Harsha Walpita¹, Magnus Moe Nygård², Erling Ween Eriksen², Marie Syre Wiig², Vilde Stueland Nysted², Josefine H. Selj², Erik Stensrud Marstein²

¹ University of Oslo, Kjeller, Norway; ² Institute for Energy Technology, Kjeller, Norway

4CV.1.2 Construction and Comparison of Outdoor PV Test Stands in Different Climate Zones

Rita Ebner¹, Marcus Rennhofer¹, Vassilissa Neussl¹, Bernhard Kubicek¹, Ankit Mittal¹, Gusztav Ujvari¹, Brian Azzopardi², Alexandre Mignonac³, Carlos Meza⁴, Sebastian Dittmann⁴, Ana Gracia Amillo⁵, Juan Manuel Cuadra⁵

¹ AIT, Vienna, Austria; ² FIR, Birkirkara, Malta; ³ CEA, Saint-Paul-Lez-Durance, France; ⁴ HSA, Köthen, Germany; ⁵ CENER, Sarigurren, Spain

4CV.1.3 Intense Mid-Level Wind Speeds and Flat Tracker Tilts during Rear Glass Breakages on Non-Large-Format Bifacial PV Modules on Trackers

Darryl Wang¹

¹ DNV Singapore, Singapore, Singapore

4CV.1.4 Analytical Monitoring of Bypass Diode Short Circuit Signatures in PV Scada Data in Ground-Mounted Solar Farms

Qi Wang¹, Ju Lim¹

¹ Sunalytics, Singapore, Singapore

4CV.1.5 Ray-Tracing Method for Accurate Energy Yield Simulation of Bifacial Module Carport Systems

Sungho Hwang¹, Jung-Dae Kwon², Myunghun Shina³

¹ Korea University, Seoul, South Korea; ² Korea Institute of Materials Science, Changwon, South Korea; ³ Korea Aerospace University, Goyang, South Korea

4CV.1.6 Distance Weighted Irradiance for Performance Monitoring in Large Scale PV Assets with Sparse Irradiance Sensors

Giorgio Fighera¹, Giacomo Gorni², Gino Ferretti², Anna Scaccabarozzi²

¹ Eni Plenitude, Rome, Italy; ² Eni, San Donato Milanese, Italy



- 4CV.1.7 Comparative Study of Energy Yield in PV Systems Using Different Module Technologies and Inverter Configurations**
Matevž Bokalič¹, Kristijan Brecl¹, Marko Topič¹
¹ University of Ljubljana, Ljubljana, Slovenia
- 4CV.1.8 A Highly Adaptable Performance Evaluation Method for PV Systems Using Remote Meteorological Data and On-Site Reference Comparisons**
Weizhen Xiong¹, Jindan Cui¹, Yuzuru Ueda¹
¹ Tokyo University of Science, Tokyo, Japan
- 4CV.1.10 Reliability of PV Inverters: PV-Reliability.ch**
Christof Bucher¹, Matthias Hügi¹
¹ BFH, Burgdorf, Switzerland
- 4CV.1.12 Investigation and Discuss of Failures during Operation and Maintenance in Floating Photovoltaic**
Jieun Lee¹, Hyunsik Jo¹, Jungi Jeong¹, Donggeon Yang¹
¹ K-water, Daejeon, South Korea
- 4CV.1.13 Study on Power Generation Estimation Model using Inverter Data and Machine Learning**
Suk-Whan Ko¹, Young-Chul Ju¹, Hye-Mi Hwang¹, Jin-Seok Lee¹, Woo-Gyun Shin¹
¹ KIER, Daejeon, South Korea
- 4CV.1.14 Application of Multivariate Data Analysis and NIR Spectroscopy in Evaluating PV System Performance and Packaging Degradation**
Brahim Anis Belferkous¹, Chiara Barretta¹, Guillermo Oviedo Hernandez², Daniela Maria Godinho Ariolli², Lukas Koester³, David Moser³, Gernot Oreski¹
¹ PCCL, Leoben, Austria; ² BayWa r.e, Rome, Italy; ³ Eurac Research, Bolzano, Italy
- 4CV.1.15 Automated Identification of Open Circuits in Photovoltaic Arrays via Mask-RCNN, Thermographic Signal Processing and Hybridized Region-Growth Algorithms**
Daniel Jason Castillo Patton¹, Lucas Viani¹, Mario Martínez González¹, Sergio Suárez Sánchez¹, Fernando García², Sofía Rodríguez-Conde¹, José Manuel Rivas Rodríguez¹
¹ Enertis Applus+, Madrid, Spain; ² UC3M, Madrid, Spain
- 4CV.1.16 Digital Twin in PV: a Comparison of Physical and Machine Learning Models for PV Systems in High Radiation Environments**
Robinson Cavieres¹, Felipe Valencia¹
¹ ATAMOSTEC, Antofagasta, Chile
- 4CV.1.17 Power Generation Performance Analysis of East-West Oriented Bifacial PV Systems on Gabled Roofs**
Ha Yeong Kim¹, Jin Hee Kim¹, Jun Tae Kim¹, Hoon Sim²
¹ Kongju National University, Chungcheongnam-do, South Korea; ² JH Energy, JH Energy, South Korea
- 4CV.1.18 Impact of Soiling and Natural Cleaning Events on Bifacial Photovoltaic Modules in the PSDA**
Abel Taquichiri¹, Douglas Olivares¹, Carlos Portillo¹, Felipe Valencia², Edward Fuentealba¹
¹ University of Antofagasta, Antofagasta, Chile; ² ATAMOSTEC, Santiago, Chile

- 4CV.1.19 Underperformance of PV Plants. An Analysis in over 6GW**
Jorge Solorzano¹, Monica Quiroz¹
¹ QPV, Madrid, Spain
- 4CV.1.21 Anomaly Detection for PV Facade Systems Using Neural Networks**
Jonas Petzschmann¹, Dirk Stellbogen¹, Roland Einhaus¹, Alexander Wagner²
¹ ZSW, Stuttgart, Germany; ² Solar-Log, Geislingen-Binsdorf, Germany
- 4CV.1.22 Baseline Efficiency: a new Key Performance Indicator for PV Systems**
Anastasios Kladas¹, Bert Herteleer¹, Jan Cappelle¹
¹ KU Leuven Research Group ELECTA, Ghent, Belgium
- 4CV.1.23 Soiling Forecasts for Cleaning Scheduling Optimization**
Fernanda Norde Santos¹, Stefan Wilbert¹, Carl Becker¹, Elena Ruiz Donoso¹, Laura Campos Guzman¹, Álvaro Fernández Solas¹, Luis Zarzalejo², Anne Forstinger³, David Helten³, Veith Pietsch⁴, Robert Pitz-Paál⁵
¹ DLR, Almería, Spain; ² CIEMAT, Madrid, Spain; ³ CSP Services, Cologne, Germany; ⁴ Aquila Capital, Hamburg, Germany; ⁵ DLR, Cologne, Germany
- 4CV.1.24 Adapting PV Panel Cleaning Strategies to Market Dynamics: the Impact of Variable Pricing and Regulatory Market Participation**
Marta Redondo Cuevas¹, Carlos A. Platero Gaona¹
¹ UPM, Madrid, Spain
- 4CV.1.25 Advancing Photovoltaic Performance through Digitalisation in Living Laboratories: Insights from the Promise Project**
Brian Bartolo¹, Brian Azzopardi¹, Carmel Azzopardi¹, Austeja Mockeviciute-Azzopardi¹, Alexandre Mignonac², Marcus Rennhofer³, Bernhard Kubicek³, Rita Ebner³, Carlos Meza⁴, Melodie de l'Epine⁵, Eugenia Zugasti⁶, Steve Zerafa⁷, Kenneth Scerri⁸
¹ The Foundation for Innovation and Research, Birkirkara, Malta; ² CEA, Cadarache, France; ³ AIT, Vienna, Austria; ⁴ Anhalt University of Applied Sciences, Köthen, Germany; ⁵ Becquerel Institute, Brussels, Belgium; ⁶ CENER, Pamplona, Spain; ⁷ PIXAM, Msida, Malta; ⁸ University of Malta, Msida, Malta
- 4CV.1.26 UAV-based Autonomus Monitoring and Real-time Thermal Anomaly Detection of Photovoltaic Modules**
Ghaem Taghipour Kani¹, Sayyed Majid Esmailifar¹, Amirreza Ghahremani¹, Mohammadreza Aghaei²
¹ Amirkabir University of Technology, Tehran, Iran; ² NTNU, Aalesund, Norway
- 4CV.1.27 Accurate Yield Modelling of a Semi-Transparent Facade Agri-PV System**
Lavanya Malarkannan¹, George Koutsourakis¹, Daniel Parsons¹, Martyn Rush², Ollie Cowdall², James Blakesley¹
¹ NPL, Teddington, United Kingdom; ² Polysolar, Cambridge, United Kingdom
- 4CV.1.28 Photovoltaic Power Output Estimation with Digital Visible Cameras**
Verónica Abad Alcaraz¹, Enrique García Campos¹, José Domingo Álvarez Hervás¹, Manuel Pérez García¹, José Antonio Carballo López¹, María del Mar Castilla Nieto¹, Joaquín Alonso Montesinos¹
¹ University of Almería, La Cañada de San Urbano, Spain
- 4CV.1.29 Dynamic Cleaning Optimization Based on Historical Analysis and Real-Time Soiling Data**
Franco Vicente Clandestino Muñoz¹, Thore Müller¹, Kostiantyn Pogorelov¹
¹ PVRADAR Labs, Ebersberg, Germany



4CV.1.30 Machine Learning-Based Prediction of Photovoltaic Power Generation: a Case Study using Two-Year Time Series Amsterdam Weather Data and SAM Simulations

Guang Hu¹, Roel Loonen¹, Angèle Reinders¹
¹ Eindhoven University of Technology, Eindhoven, The Netherlands

4CV.1.31 Intercomparison of Soiling Measurement Methodologies

Nicole Torres¹, Felipe Valencia¹, Robinson Cavieres¹, Douglas Olivares²
¹ ATAMOSTEC, Antofagasta, Chile; ² University of Antofagasta, Antofagasta, Chile

4CV.1.33 Automatic Fault Detection and Diagnosis In Photovoltaic Plants based on Convolutional Neural Networks

Javier Martín-Rueda¹, Javier R. Ledesma¹, Celena Lorenzo¹, Pablo Merodio¹, Luis Narvarte¹
¹ UPM, Madrid, Spain

4CV.1.35 Temporal Graph Neural Networks for Early Anomaly Detection and Performance Prediction via PV System Monitoring Data

Srijani Mukherjee¹, Laurent Vuillon², Liliane Bou-Nassif³, Stephanie Giroux-Julien⁴, Herve Pabiau³, Denys Dutykh⁵, Ioannis Tsanakas¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² CNRS, Chambéry, France; ³ CETHIL, Lyon, France; ⁴ CNRS, Lyon, France; ⁵ Khalifa University, Abu Dhabi, United Arab Emirates

4CV.1.36 Optimization of Maintenance of PV Module Arrays based on Asset Management Strategies: Case of Study

Luis Cardenas¹, Fernando Herrera¹, Ernesto Pérez¹, Andrés Figueroa¹
¹ National University of Colombia, Bogotá, Colombia

4CV.1.37 CartesiaNet: a Lightweight Neural Network for PV Module Corner Detection

Thøger Kari¹, Rodrigo Del Prado Santamaria¹, Gisele Alves dos Reis Benatto¹, Peter Behrendorff Poulsen¹, Sergiu Viorel Spataru¹
¹ DTU, Roskilde, Denmark

4CV.1.38 Impact of Bird Droppings on Floating Photovoltaic (FPV) Module Performance: Maintenance and Deterrence Methods

Myenggil Gang¹, Seong Dae Kim¹, Alex Lim¹, Aram Han¹, Young shin Lim¹, Choong sub Won², Hyunsik Jo³, Jieun Lee³, Chang-Sub Won¹
¹ MIRAE, Seoul, South Korea; ² MIRAE, Seoul, South Korea; ³ K-Water Research Institute, Daejeon, South Korea

4CV.1.39 A Spatially Resolved Clear-Sky Filter using Photovoltaic Modules as Cloud Detectors

Elin Dypvik Sødahl¹, Magnus Moe Nygård¹, Marie Syre Wiig¹
¹ IFE, Kjeller, Norway

4CV.1.40 Dust, Data, and Decisions: An Integrated Sensor-to-Solver Framework for Maximising PV Output

Tolga Yalcin¹, J. Luis Domínguez-García¹, Pol Paradell Sola¹, Mònica Aragüés Peñalba²
¹ IREC, Sant Adrià de Besòs, Spain; ² UPC, Barcelona, Spain

4CV.1.41 Development of Computational Models for Energy Production Estimation in Bifacial Modules under Different Configurations at the Atacama Desert Solar Platform (PSDA)

Mauricio Trigo-Gonzalez¹, Abel Taquichiri¹, Jorge Rabanal-Arabach¹, Jorge Vega-Herrera¹, Felipe Valencia², Edward Fuentealba¹
¹ University of Antofagasta, Antofagasta, Chile; ² AtamosTec, Santiago, Chile

4CV.1.43 Assessing PV Module Quality Risks in South Africa: Performance Insights across Utility, Commercial and Industrial, and Residential Sectors

Jacqueline Crozier McClelland¹, Monphas Vumbugwa¹, Ndumiso Mngomezulu², Frederik J. Vorster¹, Ernest E. van Dyk¹
¹ Nelson Mandela University, Gqeberha, South Africa; ² PVinsight, Gqeberha, South Africa

4CV.1.44 Can Regular String IV Measurements Complement MPP Monitoring Data?

Martin Bartholomäus¹, Fernando Román Vecino¹, Peter Behrendorff Poulsen¹, Mahmoud Dhimish¹, Sergiu Viorel Spataru¹
¹ DTU, Roskilde, Denmark

4CV.1.45 Tracking the Tracker

Maitheli Nikam¹, Julien Deckx¹, Karel De Brabandere¹, Gofran Chowdhury¹
¹ 3E, Brussels, Belgium

4CV.1.46 Aggregation Errors based on PV Production Data in the Timescale of Seconds

Bernhard Kubicek¹, Marcus Rennhofer¹, Thomas Hutterer-Tik², Christian Öttl²
¹ AIT, Vienna, Austria; ² Watt Analytics, Vienna, Austria

4CV.1.47 Soiling Loss Estimation in Utility-Scale Plants using the Dynamic Internal Reference Method

Karel De Brabandere¹, Maitheli Nikam¹, Julien Deckx¹, Gofran Chowdhury¹
¹ 3E, Brussels, Belgium

4CV.1.48 In-Field Assessment of Soiling Effects on a Floating Photovoltaic System in a Humid Subtropical Urban Area

Renzo Vargas¹, Givaldo dos Reis¹, Rodrigo P. Maruyama¹, Alex Manito¹, Marcelo Pinho Almeida¹, Roberto Zilles¹
¹ University of São Paulo, São Paulo, Brazil

4CV.1.49 The Panoramic Reconstruction Images to Photovoltaic Modules for Solar Power Plant Management

Chao-Wei Ou¹, Cheng-Yu Peng¹, Han-Chang Liu²
¹ National Chin-Yi University of Technology, Taichung, Taiwan; ² ITRI, Tainan, Taiwan

4CV.1.50 Detection and Clustering of Photovoltaic Faults

Anastasios Kladas¹, Jarid Van Der Gucht¹, Bert Herteleer¹, Jan Cappelle¹
¹ KU Leuven Research Group ELECTA, Ghent, Belgium

4CV.1.51 Photovoltaic Modules Self-Testing by Junction Box-Embedded Wireless Monitoring Solution

Eneko Ortega¹, Gerardo Aranguren¹, Julius Denafas², Paulius Laurikėnas², Ricardo Alonso³, Juan Carlos Jimeno¹
¹ UPV/EHU, Bilbao, Spain; ² Solitek, Vilnius, Lithuania; ³ Tecnalia, Derio, Spain

4CV.1.52 Data-Driven Assessment of Inverter Efficiency Losses and Load Profiles in PV Systems

David Daßler¹, Stephanie Malik², Dharm Patel², Andreas Dietrich³, Jan Spihola³, Kai Kaufmann⁴, Carsten Hennig⁵, Robert Klengel², Carola Klute², Ulrike Jahn¹, Matthias Ebert¹
¹ Fraunhofer CSP, Halle, Germany; ² Fraunhofer IMWS, Halle, Germany; ³ DiSUN Deutsche Solarservice, Werder, Germany; ⁴ DENKweit, Halle, Germany; ⁵ saferay holding, Berlin, Germany



4CV.1.53 Quantifying Uncertainty in Performance Loss Rate Measurements from Timeseries Data

James Blakesley¹, Lavanya Malarkannan¹, Yuhui Luo¹, George Koutsourakis¹, Peter Harris¹, Giuliano Luchetta-Martins², Lucas Sergio Zanicoski², Elena Koumpli², Jan Muller²

¹ NPL, Teddington, United Kingdom; ² Statkraft UK, London, United Kingdom

4CV.1.54 Enhancing Autonomus Aerial Monitoring of Large-Scale Photovoltaic Plants Using a Deep Reinforcement Learning Approach for Multi-Aerial Robot Systems

Amirhossain Aghamohammadi¹, Sayyed Majid Esmaeilifar¹, Mohammad Kolahi², Amirmohammad Moradi Sizkouhi³, Mohammadreza Aghaei⁴

¹ Amirkabir University of Technology, Tehran, Iran; ² University of Isfahan, Isfahan, Iran; ³ Concordia University, Montreal, Canada; ⁴ NTNU, Aalesund, Norway

4CV.1.55 Machine learning enhanced modeling for floating PV

Marcus Reitz¹, Mirza Khalid Baig², Minne M. de Jong²

¹ TNO, Utrecht, The Netherlands; ² TNO, Eindhoven, The Netherlands

4CV.1.56 AI-Based Estimation of the Levelized Cost of Energy for Industrial Photovoltaic Systems in Korea

Ju-Hee Kim¹, Min-Jae Oh¹, Minkook Kim¹, Young Ah Park¹, Hyejeong Yang¹, Yong Hyun Kim¹

¹ KOPTI, Bukgu, South Korea

4CV.1.57 Preprocessing I-V curve data for enhanced CNN-Based fault diagnosis in Photovoltaic strings

Woo-Gyun Shin¹, Young-Chul Ju¹, Hye-Mi Hwang¹, Jin-Seok Lee¹, Suk-Whan Ko¹

¹ KIER, Daejeon, South Korea

4CV.1.58 Performance Analysis of a Dual Concentrated Photovoltaic System with Phase Change Materials

Qamar Abbas¹, Hafiz Muhammad Ali¹

¹ KFUPM, Dhahran, Saudi Arabia

4CV.1.59 Enhancing Thin-Film PV Module Performance in Hot Climates: The Role of Wind-Induced Convective Cooling

Qamar Abbas¹, Hafiz Muhammad Ali¹

¹ KFUPM, Dhahran, Saudi Arabia

4CV.1.60 SolarASP Tool For Early Fault Detection and Remote Diagnosis in Photovoltaic Generators

Sandra Riaño¹, Ricardo Alonso², Jose Domingo Santos¹, Miguel Esteras¹, Ainhua Pereda¹, Antonio Salvador³, Jose Antonio Osuna³, Javier del Ser⁴

¹ TECNALIA, Derio, Spain; ² TECNALIA, Derio, Spain; ³ MAGTEL, Córdoba, Spain; ⁴ UPV/EHU, Bilbao, Spain

4CV.1.61 Fire Performance of Power Optimizers in Photovoltaic Systems

Lasse Halle¹, David Joss¹, Christof Bucher¹

¹ BUAS, Burgdorf, Switzerland

4CV.1.62 Online Characterization of PV Strings by Smart Inverters Using a Self-Referencing Algorithm

Maximilian Schönauf¹, Darwin Daume¹, Sasikumar Krishnan¹, Alexander Kusch¹, Christian Knausdorf¹, Sahereh Obeidavi¹, Achim Schulze², Dieter Landes¹, Bernd Hüttl¹

¹ University of Applied Sciences Coburg, Coburg, Germany; ² Rosenheim University of Applied Sciences, Rosenheim, Germany

VISUAL PRESENTATIONS 1CV.2

15:15 - 16:45 Si Solar Cells | Characterisation & Modelling of Silicon Cells and Their Building Blocks

Chairpersons: Aloña Otaegi

UPV/EHU, Bilbao, Spain

Audrey Morisset

CSEM, Neuchâtel, Switzerland

Delfina Muñoz

CEA, Le Bourget-du-Lac, France

1CV.2.1 Minimizing Parasitic Optical Losses in Bifacial TOPCon Solar Cells through Laser-Induced Localized Polysilicon Thinning

Ning Song¹, Yalun Cai¹, Shuo Deng¹, Jiliang Huang¹, Yuhao Cheng¹, Martin A. Green¹

¹ UNSW, Sydney, Australia

1CV.2.2 Laser-Induced Thermal Effect Enhances Polycrystalline Silicon Crystallinity in TOPCon Solar Cells

Zhipeng Liu¹, Jingjia Ji¹, Yusen Qin¹, Meixian Huang², Jianbo Shao²

¹ Jiangsu Xianghuan Technology, Wuxi, China; ² Jiangnan University, Wuxi, China

1CV.2.3 Selective Etching of Doped Polysilicon Layers

Sebastian Mack¹, Viola Neuber¹, Laurent Clochard², Andreas Wolf¹

¹ Fraunhofer ISE, Freiburg, Germany; ² Nines Photovoltaics, Dublin, Germany

1CV.2.4 A TOPCon IBC Solar Cell Architecture with Sputtered Tunnel Oxide and Polysilicon Doped Regions: Design and Process Optimization

Valentin Dan Mihailetchi¹, Vaibhav V. Kuruganti¹, Thomas Buck¹, Volker Linß², Eric Schneiderlöchner²

¹ ISC Konstanz, Konstanz, Germany; ² VON ARDENNE, Dresden, Germany

1CV.2.5 Comparison of Passivation Properties of Phosphorus and Boron Ex-Situ Doped Poly-Silicon on Oxide Layers

Raphael Cabal¹, Clarisse Laurens-Berge¹, Baptiste Marteau², Anis Jouini², Sébastien Dubois¹

¹ University Grenoble Alpes, Le Bourget-du-Lac, France; ² ECM Technologies, Grenoble, France

1CV.2.6 Advanced Passivating Contact Engineering: Ex-Situ Doped p+ Poly-Si/SiO_x with Additional Pre-Annealing Step for Efficient TOPCon Single-Junction and Tandem Solar Cells

Yiğit Mert Kaplan¹, Berkay Uygun¹, Seda Kılıçkaya Ünver¹, Sven Kluska², Raşit Turan¹, Hisham Nasser¹

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² Fraunhofer ISE, Freiburg, Germany

1CV.2.7 Advancements in the Passivation and Screen-Printed Metallization of P+ Poly-Si Layers

Vaibhav Venkat Kuruganti¹, Haifeng Chu¹, Thomas Buck¹, Valentin Dan Mihailetchi¹

¹ ISC Konstanz, Konstanz, Germany

1CV.2.9 Overcoming Process Related Limitations in the Context of the Back Contacted polyZEBRA Solar Cell Technology

Jonathan Linke¹, Lazhar Rachdi¹, Sebastian Veerman¹, Jan Hoß¹, Jan Lossen¹, Lejo Joseph Koduvelikulathu¹, Florian Buchholz¹

¹ ISC Konstanz, Konstanz, Germany



1CV.2.10 Advancing TOPCon Silicon Solar Cells with Laser-Grooved Buried Contact Technology

Mohammad Hossein Mohammadi¹, Roberto Boccardi², Io Mizushima³, Gisele Alves dos Reis Benatto², Peter Behrendsdorff Poulsen², Sune Thorsteinsson², Rasmus Schmidt Davidsen¹

¹ Aarhus University, Aarhus, Denmark; ² DTU, Copenhagen, Denmark; ³ IPU, Copenhagen, Denmark

1CV.2.11 Elongated Strip Crystalline Si Solar Cells for BIPV Applications

Hitoshi Sai¹, Takuya Matsui¹

¹ AIST, Tsukuba, Japan

1CV.2.12 Understanding the Root Causes of UV-Induced Degradation in TOPCon Solar Cells: Insights from Materials and Surface Passivation Characterization

Jonathan Bryan¹, Diego Zubietta Sempertegui², Nicholas Moser-Mancewicz³, Sophia Buffone², Sijia Cheng², Ngobile G. Tshuma², Evan Jones², Carlos Biaou¹, Kristopher O. Davis⁴, Mariana I. Bertoni³, Laura S. Bruckman², Ina T. Martin²

¹ GAF Energy, San Jose, United States of America; ² Case Western Reserve University, Cleveland, United States of America; ³ Arizona State University, Tempe, United States of America; ⁴ University of Central Florida, Orlando, United States of America

1CV.2.13 QUOKKA3 Simulation of Topcore Solar Cells: Investigating Front-Side Hole-Selective Layer

Eni Muka¹, Hisham Nasser¹, Raşit Turan¹

¹ ODTÜ GÜNAM, Ankara, Türkiye

1CV.2.14 Hybrid c-Si Solar Cells Incorporating MoOx and n-type poly-SiOx Transport Layers

Yingwen Zhao¹, Yifeng Zhao¹, Yi Zheng¹, Liqi Cao¹, Paul Procel Moya¹, Engin Ozkol¹, Miro Zeman¹, Luana Mazzarella¹, Olindo Isabella¹

¹ TU Delft, Delft, The Netherlands

1CV.2.15 Local Edge Passivation of Laser Scribed Shingle Cells for Compensating Cut Losses

Dheeraj Sah¹, Karolis Parfeniukas², Roberto Boccardi³, Narendra Bandaru¹, Benjamin Borie², Mira Baraket², Maksym Plakhotnyuk², Sune Thorsteinsson³, Peter B. Poulsen³, Rasmus Schmidt Davidsen¹

¹ Aarhus University, Aarhus, Denmark; ² ATLANT 3D, Taastrup, Denmark; ³ DTU, Copenhagen, Denmark

1CV.2.17 SiLEAN Project – Development of Silicon Heterojunction Solar Cells with Low Environmental Footprint and Advanced Interfaces

Karsten Bittkau¹, Muhammad Ainul Yaqin¹, Binbin Xu¹, Giuliano Vescovi², Valerie Depauw³, Mihir Mahajan³, Bart Reekmans³, Hamed Javanbakht Lomeiri³, Yi Zheng⁴, Engin Özkol⁴, Olindo Isabella⁴, Malte R. Vogt⁴, Miro Zeman⁵, Thomas Baumeler⁶, David Martineau⁶, Giuliana Giuliano⁷, Anna Molinari⁸, Kaining Ding¹

¹ FZJ, Jülich, Germany; ² Nexwafe, Freiburg, Germany; ³ imec, Genk, Belgium; ⁴ TU Delft, Delft, The Netherlands; ⁵ PV Works, Delft, The Netherlands; ⁶ GraphEnergyTech, Lausanne, Switzerland; ⁷ 3SUN, Catania, Italy; ⁸ Uniresearch, Delft, The Netherlands

1CV.2.19 Boron Doped Nanocrystalline Silicon as a Rear-Emitter in Silicon Heterojunction Solar Cells

Amanda Merino Leiva¹, Tristan Gageot¹, José Alvarez², Jean-Paul Kleider², Delfina Muñoz¹

¹ CEA / INES, Le Bourget-du-Lac, France; ² Paris-Saclay University, Gif-sur-Yvette, France

1CV.2.21 Optimization of Phosphorus Doped Nc-Si:H Emitter Layers for High-Efficiency SHJ Solar Cells

Arghavan Salimi¹, Valerie Depauw², Milad Ghasemi¹, Shankha Mukherjee³, Hariharsudan Sivaramakrishnan Radhakrisnan², Hisham Nasser¹, Rasit Turan¹

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² imec, Genk, Belgium; ³ imec, Leuven, Belgium

1CV.2.23 A Comprehensive Study on the Aging of RF Sputtered AZO for Heterojunction Solar Cells

Claudia Malerba¹, Luca Serenelli¹, Francesca Menchini¹, Luca Martini¹, Glauco Stracci¹, Enrico Salza¹, Alberto Mittiga¹, Mario Tucci¹, Paola Delli Veneri²

¹ ENEA, Rome, Italy; ² ENEA, Portici, Italy

1CV.2.24 Advancements in Amorphous Silicon Heterojunction (SHJ) Solar Cells through the Use of Plasmonic Nanoparticles

Brahim Aissa¹, Mohammad Hossain¹, Alessandro Sinopoli¹

¹ QEERI, Doha, Qatar

1CV.2.25 Precision UV Laser Scribing for Amorphous Silicon Solar Cells: Layer-Specific Analysis and Optimization

Narendra Bandaru¹, Asbjørn Moltke², Ole Bang², Rasmus Schmidt Davidsen¹

¹ Aarhus University, Aarhus, Denmark; ² DTU, Lyngby, Denmark

1CV.2.26 Innovative Approach for the Industry-Compatible Cu Plating Metallization of Silicon Heterojunction Solar Cells

Bülent Arıkan¹, Melisa Korkmaz Arslan¹, Seda Kılıçkaya Ünver¹, Raşit Turan²

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² METU, Ankara, Türkiye

1CV.2.27 Student Awards Finalist Presentation: Mitigating Contaminant-Induced Degradation in TOPCon Solar Cells via Copper Plating

Xutao Wang¹, Chandany Sen¹, Xinyuan Wu¹, Yuan-Chih Chang¹, Haoran Wang¹, Muhammad Umair Khan¹, Bram Hoex¹

¹ UNSW, Sydney, Australia

1CV.2.28 Impact of Pre-Oxidation Treatment on Al2O3 Layers for High-Performance Silicon Solar

Kyung Taek Jeong¹, Minsoo Jeong¹, Yong-Jin Kim¹, Hee-eun Song¹, Min Gu Kang¹

¹ KIER, Daejeon, South Korea

1CV.2.30 Thin Silver Layers for Metal Grid Free and Indium-free Silicon Heterojunction Solar Cells

Malte Brinkmann¹, Felix Haase¹, Rickard Gunnarsson², Viktor Elofsson², Kostas Sarakinos², Hans-Peter Sperlich³, Hermann Nonnenmacher³, Andreas Waltinger³, Henning Schulte-Huxel⁴

¹ ISFH, Emmerthal, Germany; ² MIMSI Materials, Linköping, Sweden; ³ Meyer Burger, Hohenstein-Ernstthal, Germany; ⁴ Institute for Solar Energy Research Hamelin (ISFH), Emmerthal, Germany

1CV.2.42 High Efficiency SHJ Silicon Bottom Cell with IWO/SiO2 Stack Layer for III-V/Si Tandem Photovoltaics

Yoshio Ohshita¹, Kyotaro Nakamura¹, Hyunju Lee², Atsushi Ogura²

¹ Toyota Technological Institute, Nagoya, Japan; ² Meiji University, Kanagawa, Japan



1CV.2.43 Student Awards Finalist Presentation: Exploring the Use of Heated ITO Depositions for Large-Area TOPCon-Based Perovskite/Silicon Tandem Solar Cells on Industrial Wafers

Erik M. Spaans¹, Gabby De Luna¹, John Derek Arcebal¹, Yu Jin Yang¹, Jinhyun Kim¹, Yong Ryun Kim¹, Selvaraj Venkataraj¹, Pradeep Padhamnath², Armin Aberle¹

¹ SERIS, Singapore, Singapore; ² AGH University of Krakow, Kraków, Poland

1CV.2.44 Design and Fabrication of EU Project Nexus Industrial PERC/TOPCon Bottom Cell with Enhanced Performance for Perovskite-Si Tandem Solar Cells

Hisham Nasser¹, Yigit Mert Kaplan¹, Eni Muka¹, Melisa Korkmaz Arslan¹, Berkay Uygun¹, Gokhan Altiner¹, Ozan Aydin¹, Delfina Munoz², Perrine Carroy², Henry Snaith³, Rasit Turan¹

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² CEA-INES, Le Bourget-du-Lac, France; ³ University of Oxford, Oxford, United Kingdom

1CV.2.45 Passivation of TOPCon Bottom Cell for Perovskite/Si Tandem Devices via RF-Sputtered ITO:H2

Francisco José Pérez-Zenteno¹, Reyu Sakakibara², Thibault Schaller², Julien Hurni², Franz-Josef Haug², Eric Garcia-Hemme¹, Enrique San Andrés Serrano¹

¹ UCM, Madrid, Spain; ² EPFL, Neuchâtel, Switzerland

1CV.2.46 Indium free TCO Layers for Perovskite/TOPCon2 Tandem Solar Cells

Sadaf Ghasemi¹, Mario Hanser¹, Martin Bivour¹, Jan Benick¹, Martin Hermle¹, Stefan W. Glunz¹

¹ Fraunhofer ISE, Freiburg, Germany

1CV.2.60 On the Mechanism Behind the Improved Passivation Performance at the TiOx/c-Si Heterointerface Through Forming Gas Annealing

Yuto Michishita¹, Shohei Fukaya¹, Kazuhiro Gotoh², Yasuyoshi Kurokawa¹, Noritaka Usami¹

¹ Nagoya University, Nagoya, Japan; ² Niigata University, Niigata, Japan

1CV.2.61 Temperature Distribution in c-Si PV Modules Unraveled by Detailed Thermal Modeling

Špela Tomšič¹, Benjamin Lipovšek¹, Matevž Bokalič¹, Marko Topič¹

¹ University of Ljubljana, Ljubljana, Slovenia

1CV.2.62 Reverse Analysis of Constitutive Properties of Screen-Printed Silver of Silicon Heterojunction Solar Cells from Nanoindentations

Pei-Chieh Hsiao¹, Jack Colwell², Daniel Chen², Chris Huang², Vince Allen², Alison Lennon¹, Renate Egan¹

¹ UNSW, Sydney, Australia; ² SunDrive Solar, Kurnell, Australia

1CV.2.63 A Reactive Molecular Dynamics Simulation of Silicon Nanocrystal Growth in Silicon Oxide Nanolayers

Genta Tamura¹, Kazuhiro Gotoh², Noritaka Usami³, Takashi Tokumasu¹

¹ Tohoku University, Sendai-shi, Japan; ² Niigata University, Niigata-shi, Japan; ³ Nagoya University, Nagoya-shi, Japan

1CV.2.64 Status and Prospects of Solar Cell Characterization

Klaus Ramspeck¹, Jonas Horn¹, Michael Meixner¹

¹ halm elektronik, Frankfurt am Main, Germany

1CV.2.66 Assessment of the Applicability of Non-Contact Quantum Efficiency Measurements to Various Solar Cell Architectures

Hedayatullah Karimy¹, Stefan Eiternick¹, Marko Turek¹

¹ Fraunhofer CSP, Halle (Saale), Germany

1CV.2.68 Quality Activation Maps: Estimation of Spatially Resolved IV-Parameter Maps for Solar Cells based on Inline Measurements

Philipp Kunze¹, Wolfram Kwapił¹, Stefan Rein¹, Matthias Demant¹

¹ Fraunhofer ISE, Freiburg, Germany

1CV.2.69 High-Throughput Contactless Imaging of Series Resistance in Solar Cells using Line-Scanning Technique

Tanushree J. B. Nath¹, Yan Zhu¹, Lucas Ehret¹, Shuai Nie¹, Ziv Hameiri¹

¹ UNSW, Sydney, Australia

1CV.2.70 Applying Materials Characterization Methods to Reveal Defects in and Configuration of Commercial Silicon Solar Cells

Theresa Magorian Friedlmeier¹, Wolfram Hempel¹, Clementine Warres², Roland Einhaus¹

¹ ZSW, Stuttgart, Germany; ² Naturwissenschaftliches und Medizinisches Institut, Reutlingen, Germany

1CV.2.71 Study for Decay Trend of the Solar Cell under Varied Radiation Dose

Yean-San (Mickey) Long¹, Cheng-Wen Kuo², Yung-Tsung Liu¹, Min-An Tsai¹, Ta-Ming Kuan², Cheng-Yeh Yu²

¹ ITRI, Hsinchu, Taiwan; ² TSEC Corporation, Hsinchu, Taiwan

1CV.2.73 Analysis of Series Resistance Effects in Current Solar Cell Technologies

Yeray Mateos¹, Alona Otaegi¹, Eneko Cereceda¹, Vanesa Fano¹, Nekane Azkona¹, Eneko Ortega¹, José Rubén Gutiérrez¹, Juan Carlos Jimeno¹

¹ UPV/EHU, Bilbao, Spain

1CV.2.74 Analyzing Reverse I-V Curve Characteristics across Solar Cell Technologies

Ahmad Hashem¹, Hugo Sanchez¹, Leila Mortazavifar¹, Bengt Jaeckel², Ralph Gottschalg²

¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle (Saale), Germany

1CV.2.75 Investigating Edge Passivation Using Photoluminescence Imaging

Kristin Bergum¹, Chang Chuan You², Per-Anders Hansen¹, Junjie Zhu²

¹ IFE, Oslo, Norway; ² IFE, Kjeller, Norway

1CV.2.76 Systematic Ellipsometry Modeling of Nanocrystalline Silicon Contact Layers for Silicon Heterojunction Solar Cells

Ezgi Genc¹, Philipp Wagner¹, Bernd Stannowski¹

¹ HZB, Berlin, Germany



VISUAL PRESENTATIONS 2CV.3

17:00 - 18:30 Perovskite-based Tandems and Multijunctions

Chairpersons: Lili Wang
Technology Innovation Institute, Abu Dhabi, United Arab Emirates
Tom Aernouts
imec, Genk, Belgium
Fabian Fertig
Hanwha Q CELLS, Bitterfeld-Wolfen, Germany

2CV.3.1 Overview and Perspective of Hybrid Si Tandem Solar Cells and Modules

Masafumi Yamaguchi¹, Patrick Schygulla², Ivona Kafedjiska³, Frank Dimroth², Rutger Schlatmann³
¹ Toyota Technological Institute, Nagoya, Japan; ² Fraunhofer ISE, Freiburg, Germany; ³ HZB, Berlin, Germany

2CV.3.2 Impact of Self-Assembling Molecules in Efficient Fully-Textured Perovskite/Silicon Tandem Solar Cells

Christian Schwarz¹, Patricia S. C. Schulze¹, Oliver Fischer¹, Jann B. Landgraf¹, Oussama Er-Raji¹, Georgios Loukeris², Juliane Anna Borchert¹
¹ Fraunhofer ISE, Freiburg, Germany; ² University of Freiburg, Freiburg, Germany

2CV.3.4 Co-Evaporated Perovskite Absorbers for Textured Monolithic Perovskite/Silicon Tandem Solar Cells

Lars Korte¹, Viktor Škorjanc¹, Matthew Leyden¹, Marcel Roß¹, Stefanie Severin¹, Aleksandra Miaskiewicz¹, Angelika Harter¹, Dorothee Menzel¹, Suresh Maniyarasu¹, Bernd Stannowski¹, Steve Albrecht¹
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2CV.3.7 Laminated All-Perovskite Tandem Photovoltaics with Transparent Conductive Adhesives

Hang Hu¹, Ting Pan¹, Roja Singh¹, Bahram Abdollahi Nejand¹, Ulrich Paetzold¹
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2CV.3.8 Spatial Atomic Layer Deposition of Aluminium doped Zinc Oxide as Recombination Junction for Tandem Solar Cells

Floor Souren¹, Jons Bolding¹, Hindrik De Vries¹, Perrine Carroy², Paul Fassi³, Joshua Damm³, David McMeekin⁴, Sam Teale⁴, Seongrok Seo⁴
¹ SALD, Eindhoven, The Netherlands; ² CEA, Grenoble, France; ³ KIT, Karlsruhe, Germany; ⁴ University of Oxford, Oxford, United Kingdom

2CV.3.10 Exploring Novel Oxide-Perovskites for Tandem PV Applications

Anjali Choubey¹, Holger von Wenckstern¹, Ola Nilsen¹, Henrik Hovde Sønsteby¹
¹ University of Oslo, Oslo, Norway

2CV.3.12 Exploring the Potential of Two-Terminal Voltage-Matched Perovskite-CIGSe Tandem Solar Cells for Improved Energy Yield

Yokozuna Schirmer¹, Nicolas Otto¹, Guillermo Farias-Basulto², Rutger Schlatmann², Klaus Jäger³, Bert Stegemann¹, Christof Schultz¹
¹ HTW, Berlin, Germany; ² PVcomB / HZB, Berlin, Germany; ³ HZB, Berlin, Germany

2CV.3.13 Perovskite/ Silicon Tandem Solar Cells with Dopant Free Silicon Heterojunction Bottom Cell

Laura Lancellotti¹, Eugenia Bobeico¹, Maria Federica Caso¹, Marco Della Noce¹, Giuseppe Nasti¹, Gennaro Vincenzo Sannino², Elena Santoro¹, Pietro Scognamiglio¹, Iurie Usatii¹, Paola Delli Veneri¹, Lucia Vittoria Mercaldo¹

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2CV.3.14 Physical Vapor Deposition Processes for Scaling Monolithic Perovskite Silicon Tandem Solar Cells

Jona Kurpiers¹, Arman Mahboubi Soufiani¹, Hajar Moumine¹, Stefanie Severin¹, Tobias Bertram¹, Viktor Skorjanc¹, Marlene Härtel¹, Jannik Niels Kleesiek¹, Alexandros Cruz¹, Marcel Roß¹, Angelika Harter¹, Steve Albrecht¹, Rutger Schlatmann¹, Bernd Stannowski¹

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2CV.3.15 Bifacial 2T Large Area Perovskite-Silicon devices: From Processing to Modules and Outdoor Measurements

Marcel Simor¹, Ryley Ratnasigham¹, Yu Wu², Melvin ten Kate², Hande Ciftpinar², Victor Rosca², Petra Manshanden², Bart Geerligs², Sjoerd Veenstra¹, Valerio Zardetto¹

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2CV.3.16 Optimizing Interconnection Strategies for Two-Terminal Perovskite-CIGSe Tandem Solar Modules: 3-Step vs. 4-Step Laser Patterning

Nicolas Otto¹, Christof Schultz¹, Tadeus Ranisch¹, Guillermo Farrias-Basulto², Rutger Schlatmann¹, Bert Stegemann¹

¹ HTW, Berlin, Germany; ² PVcomB / HZB, Berlin, Germany

2CV.3.17 Toward Two-Terminal Perovskite/(Ag,Cu)(In,Ga)Se₂ Tandems with Open-Circuit Voltage >2 Volt

Rico Gutzler¹, Tina Wahl¹, Erik Ahlswede¹, Cordula Wessendorf¹

¹ ZSW, Stuttgart, Germany

2CV.3.18 Optimizing the Hybrid Deposition Method for Ultra-Wide Bandgap Perovskite Designed for Pk/Pk/Si Triple Junction Solar Cells

Selin Seyrek¹, Cristian Villalobos Meza¹, Valerie Depauw¹, Yinghuan Kuang¹, Hariharsudan Sivaramakrishnan Radhakrishnan¹, Jef Poortmans¹, Bart Vermang¹

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2CV.3.19 Elucidating the Process of Accurate Spectral Calibration for Tandem I-V Measurement using Multi-Lamp Light Sources

Antoine Bourgeois¹, Stella Hadiwidjaja², Zoltan Nicot-Senneville², JiaYi Ye², Kwan Bum Choi², Qilin Zhou², Yi Hou²

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2CV.3.20 Lower Decay and Toward 17.89% Efficiency of n-TOPCon Solar Cell Filtered by the Semitransparent Perovskite Absorber

Yung-Tsung Liu¹, Yean-San (Mickey) Long¹, Min-An Tsai¹, Cho-Fan Hsieh¹

¹ ITRI, Hsinchu, Taiwan

2CV.3.22 Achieving Superior Light Trapping in Perovskite/CIGS Solar Cells with Grating-Enhanced Bilayer Heterojunctions

Mohammad Hossein Mohammadi¹, Narendra Bandaru¹, Rasmus Schmidt Davidsen¹

¹ Aarhus University, Aarhus, Denmark



2CV.3.23 Development of Flexible Monolithic All-Perovskite Tandem Minimodules within the SuperTandem Project

Amina Labiod¹, Jules Allegre¹, Polyxeni Tsoulka¹, Solenn Berson¹
¹ CEA-INES, Le Bourget du Lac, France

2CV.3.24 Fabrication of Bendable Perovskite/ Silicon Heterojunction Bifacial Tandem Solar Cells

Kimihiko Saito¹, Kanji Takahashi¹, Hirotaka Shishido¹, Ryouosuke Ishikawa¹, Makoto Konagai¹
¹ Tokyo City University, Setagaya, Japan

2CV.3.25 Surface Reactions and the Impact of Ions During Aging in Tandem-related High-efficiency Perovskite Solar Cells with 1.68 eV Bandgap

Florian Scheler¹, Sebastian Berwig¹, Marcel Roß¹, Dorothee Menzel¹, Phillipe Holzhey¹, Arman Mahboubi Soufiani¹, Lea Zimmerman¹, Eike Köhnen¹, Lars Korte¹, Steve Albrecht¹
¹ HZB, Berlin, Germany

2CV.3.26 Improved Optical and Electronic Properties for Highly Efficient All-perovskite Tandem Solar Cells

Philipp Tockhorn¹, Sebastian Berwig¹, Yeonghun Yun¹, Isabella Taupitz¹, Kevin Prince¹, Philippe Holzhey¹, Florian Riesebeck¹, Stepan Demchyshyn¹, Christiane Becker¹, Steve Albrecht¹
¹ HZB, Berlin, Germany

2CV.3.40 Fabrication of FACsPbI₃ Perovskite Solar Cells: Ethylammonium Bromide Both as an Additive and Surface Passivation

Amalraj Peter Amalathas¹, Tereza Staňková², Lucie Landová², Neda Neykova², Jakub Holovsky²
¹ University of Jaffna, Jaffna, Sri Lanka; ² Czech Technical University in Prague, Prague, Czech Republic

2CV.3.41 Fluorene-Based Passivation Strategy for Enhancing the NiOx/Perovskite Interface in Inverted Perovskite Solar Cells

Zeynep Gözükar Karabağ¹, Bahri Eren Uzuner¹, Aliyekber Karabağ¹, Selçuk Yerci¹, Görkem Günbaş¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye

2CV.3.42 25.2 % Efficient EDAI₂-Passivated Single Junction Perovskite Solar Cells with Negligible Hysteresis

Johannes Löhr¹, Annika Raugewitz¹, Felix Haase¹, Larissa Mettner¹, Verena Steckenreiter¹, Joachim Vollbrecht¹, Robby Peibst¹, Jan Schmidt¹
¹ ISFH, Emmerthal, Germany

2CV.3.43 Self-Assembled Monolayers as Hole Selective Contacts for Perovskite Solar Cells: Surface Charge versus Dipole Moment

Meng-Hsueh Kuo¹, Naini Jain¹, Neda Neykova¹, Rupendra Kumar Sharma¹, Zhivko Velkov², Chih-Yu Chang³, Jakub Holovsky¹
¹ Czech Technical University, Prague, Czech Republic; ² South-West University, Blagoevgrad, Bulgaria; ³ National Taiwan University of Science and Technology, Taipei, Taiwan

2CV.3.44 Improving Perovskite Solar Cell Efficiency through Tailored SAM Blends

Elshan Asadi¹, Mustafa Yaşa¹, Selçuk Yerci¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye

2CV.3.45 Heat Stability of Perovskite Solar Cells with Self-Assembled Electron Transport Layer

Ryusei Emura¹, Takashi Funaki¹, Kohei Yamamoto¹, Naoyuki Nishimura¹, Hiroyuki Yaguchi², Takuro N. Murakami¹
¹ AIST, Tsukuba, Japan; ² Saitama University, Saitama, Japan

2CV.3.46 Thermal Stability of Perovskite Solar Cells Effected by Amorphous Indium Zinc Oxide

Kohei Yamamoto¹, Takuro Murakami¹
¹ AIST, Tsukuba, Japan

2CV.3.47 Long-Term Degradation Analysis of Perovskite Solar Cells Over Three Years

Mohammad Istiaque Hossain¹, Yongfeng Tong¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar

2CV.3.48 Enhancing Semi-Transparent Perovskite Solar Cell Efficiency in Harsh Environments with SiO₂/ITO Transparent Contacts and Anti-Soiling Coatings

Mohammad Istiaque Hossain¹, Atef Zekri¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar

2CV.3.50 Homogeneous FA:Cs Cationic Distribution Assisted Humidity Stability and Efficiency Boost in Perovskite Solar Cells

Muhammed P.U. Haris¹, Chaorong Guo², Yansheng Chen², Peng Huang², Amir Al-Ahmed¹
¹ KFUPM, Dhahran, Saudi Arabia; ² Southwest Jiaotong University, Chendu, China

2CV.3.51 The Role of Tetraoctylammonium Chloride in Suppressing Photoinduced Phase Segregation in Mixed-Halide Perovskite Solar Cells

Amalraj Peter Amalathas¹, Neda Neykova², Archchana Rajavinayagam¹, Lucie Landová², Tereza Staňková², Milan Dopita³, Jakub Holovsky²
¹ University of Jaffna, Jaffna, Sri Lanka; ² Czech Technical University in Prague, Prague, Czech Republic; ³ Charles University, Prague, Czech Republic

2CV.3.52 How to Tame your Bromine (in a Gas Phase Transport Perovskite Deposition Process)

Roland Clausing¹, Joachim Vollbrecht¹, Robby Peibst¹
¹ ISFH, Emmerthal, Germany

2CV.3.53 Effect of Composition and Exposure to Air on Crystal Structure and Electronic Properties of CsSnI₃ Combinatorial Thin Films

Marin Rusu¹, Fatima Akhundova¹, Susan Schorr¹, Thomas Unold¹
¹ HZB, Berlin, Germany

2CV.3.56 Study of the Influence of Pb Substitution by Zn²⁺ Ions on the Properties of CsPbBr₃-xI_x Thin Films

Gerardo Gordillo¹, Oscar Torres¹, Julian Peña²
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2CV.3.57 Measuring the Temperature Coefficients of Perovskite Solar Cells

Blago Mihaylov¹, Harald Mülleians¹, Ewan D. Dunlop¹
¹ European Commission JRC, Ispra, Italy

2CV.3.59 The Effect of Reduced Graphene Oxide (RGO)-Contacted Cell on the Heat Generation and Thermal Distribution of Lead-Free Cs₃Sb₂I₉ Perovskite Solar Cells: a Simulation Study using COMSOL

Ali T. Hajjiah¹, Aliaa Hajjiah¹, Aamnah Alqatan¹
¹ Kuwait University, Safat, Kuwait



2CV.3.60 Role of Contact Barriers Height, Charge and Dipole Moment on the Thin-film Solar Cells Performance: Theoretical Insights

Naini Jain¹, Meng-Hsueh Kuo¹, Rupendra Kumar Sharma¹, Jakub Holovsky¹

¹ Czech Technical University, Prague, Czech Republic

2CV.3.61 Facile Energy Level Tunable Hole-Transporting Layer for Efficient Inverted Perovskite Solar Cells

Sungjun Hong¹, Hung Tran¹, Sejin Ahn¹, Inyoung Jeong¹, Junseop Byeon¹, Donghyeop Shin¹, Kihwan Kim¹

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2CV.3.63 Fabrication of Inverted Multi-Cationic Perovskite Solar Cells by Electrostatic Spraying

Koichi Yamamoto¹, Tetsuo Soga¹, Shinya Kato¹

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2CV.3.64 Enhancing the Efficiency of Perovskite Solar Cells via Chemical Bath Deposition of SnO₂ on Mesoporous TiO₂ Electrodes

Shih-Hsuan Chen¹, Wei-Hao Chiu¹, Ying-Kai Huang¹, Min-An Tsai², Cho-Fan Hsieh², Kun-Mu Lee¹

¹ Chang Gung University, Taoyuan City, Taiwan; ² ITRI, Hsinchu City, Taiwan

2CV.3.65 Enlarging the Bandgap of Co-Evaporated Mapbi3 with Simple Treatments toward Tandem Application

Lucia V. Mercaldo¹, Manuela Ferrara¹, Anna De Girolamo Del Mauro¹, Carmen Serpico¹, Maria Federica Caso¹, Gennaro V. Sannino¹, Paola Delli Veneri¹

¹ ENEA, Portici, Italy

2CV.3.66 Wrinkles-Free Surface Morphology and Enhanced Performance of Wide Bandgap Perovskite Film using Double Anti-Solvent Technique

Owais Ahmad¹, Jonghoon Han¹, Jincheol Kim¹, Shujuan Huang¹

¹ Macquarie University, Sydney, Australia

2CV.3.67 Spatially Non-Uniform Degradation in Perovskite Solar Cells after Indoor and Outdoor Aging

Ulas Erdil¹, Mark Khenkin¹, Lars Bergenholtz², Marko Remec¹, Guillermo Farias Basulto¹, Quiterie Emery¹, Andreas Bartelt², Antonio Abate¹, Eugene A. Katz³, Rutger Schlattmann¹, Carolin Ulbrich¹

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2CV.3.68 SCAPS-1D Simulation and DFT Study of Lead-Free BaXSe3 (x = Zr, Ti, Hf) Chalcogenide Perovskite Solar Cells with Efficiency Exceeding 30%

Mohamed ALLA¹, Salma Daim¹, Hicham Zalrhi¹, Lahoucine Atourki¹

¹ Mohammed V University, Rabat, Morocco

2CV.3.69 Holistic Performance Optimization of Perovskite Solar Cells via Enhanced Photon Utilization, Retarded Nucleation Kinetics, and Improved Thermal Robustness

Shuyan Chen¹, Zhaoyun Jin¹, Chang Yan¹

¹ The Hong Kong University of Science and Technology, Guangzhou, China

2CV.3.70 Thermal and Humidity Resilient FAPbI₃ Perovskite Solar Cells for Harsh Climates

Muhammed P.U. Haris¹, Amir Al-Ahmed¹

¹ KFUPM, Dhahran, Saudi Arabia

2CV.3.71 Comparative Analysis and Efficiency Optimization of Sulfur-based Chalcogenide Perovskites (MgHfS₃, CaZrS₃, BaZrS₃) via Interface Engineering for High-Performance Solar Cells

Anees ur Rehman¹, Kun Ding¹, Jingwei Zhang¹, Xiang Chen¹

¹ Hohai University, Changzhou, China

2CV.3.72 Buried Interfacial Cs₂PbI₂Cl₂ Formation Enhances Stability and Performance of CsPbI₃ Perovskite Solar Cells

Syed Fawad Ali Shah¹, Muhammad Rehan², Hyeonwook Park¹, Donghyeop Shin², Kihwan Kim², Jae Ho Yun³

¹ KENTECH, Naju-Si, South Korea; ² KIER, Daejeon, South Korea; ³ KENTECH, Naju-si, South Korea

2CV.3.73 Realizing Efficient and Stable Perovskite Solar Cells via Passivation with Mn²⁺ Ion-doped CsPbCl₃ Perovskite Quantum Dots

Seok-Hyun Jeong¹, Jiyeon Nam¹, Donghwan Kim¹, Yoonmook Kang¹, Hyunju Lee², Hae-Seok Lee¹

¹ Korea University, Seoul, South Korea; ² Meiji University, Tokyo, Japan

2CV.3.74 Additive-free Sequential Thermal Evaporation of Near-intrinsic Low Bandgap Perovskites: From Thin Film to Device Fabrication

Lara van der Poll¹, Moises Camara Diaz¹, Niels van Silfhout¹, Reinder Boekhoff¹, Poojalakshmi V², Dibyajyoti Ghosh², Swapna Ganapathy¹, Lars Bannenberg¹, Arno Smets¹, Tom Savenije¹

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Thursday, 25. September 2025

VISUAL PRESENTATIONS 4DV.1

08:30 - 10:00 Agrivoltaics Approaches, Experiences, Results | Integrated and Innovative PV Applications

Chairpersons: Ignacio Antón Hernández
UPM, Madrid, Spain
Tsvetelina Merdzhanova
Forschungszentrum Jülich, Germany
Marc Andre Schüller
Next2Sun Technology GmbH, Dillingen, Germany

4DV.1.1 An Analysis of Agrivoltaics Farms in the Netherlands

Sebastian Haile¹, Sara Mirbagheri Golroodbari¹, Wilfried van Sark¹, Annanta Kaul², Or Gindi³
¹ Utrecht University, Utrecht, The Netherlands; ² Utrecht University, Amersfoort, The Netherlands; ³ Utrecht University, Amsterdam, The Netherlands

4DV.1.2 Beyond Agri PV and Into Climate Resilience

Gofran Chowdhury¹, Sofia Saavedra Bruno², Yves Rochebeuf¹, Shorouq Sallam¹, Geert Palmers¹, Nikita Shah²
¹ 3E, Brussels, Belgium; ² ORG Architecture & Urbanism , Brussels, Belgium

4DV.1.3 Developing a European Cooperation for Agrivoltaics Development: The Experience of the Symbiosyst Project

Paolo Picchi¹, Angela Grassi¹, Giulio Poggiani¹, Maurizio Cocchi¹, Lucia Montoni¹
¹ ETA-Florence Renewable Energies, Florence, Italy

4DV.1.4 A Techno-Economic Analysis of the Potential of Agrivoltaics in Olive Groves in Jaén, Spain

João Gabriel Bessa¹, Pedro J. Perez-Higueras¹, Fredy A. Sepúlveda-Velez¹, Diego Lopez Talavera¹
¹ University of Jaén, Jaén, Spain

4DV.1.5 Maximizing Economic Performance of Agrivoltaic Systems through Module Array Design

Habeel Alam¹, Jenny Nelson², Alona Armstrong¹, Duncan Whyatt¹, Nauman Butt³
¹ Lancaster University, Lancaster, United Kingdom; ² Imperial College London, London, United Kingdom; ³ Lahore University of Management Sciences, Lahore, Pakistan

4DV.1.6 Unveiling the Specificities of Energy Yield Estimations in Agrivoltaic Tracker Projects: Insights from the French Market

Khalil Sfar¹
¹ enoé , Marseille, France

4DV.1.7 Bifacial Factors of Agri-Photovoltaics Systems

Keith McIntosh¹, Solomon Freer¹, Malcolm D. Abbott¹, Bastien J. J. Ardisson¹, Benjamin A. Sudbury¹
¹ PV Lighthouse, Coledale, Australia

4DV.1.8 Microclimate and Biodiversity Measurements in Norway's First East-West Tilted Agrivoltaic System

Erlend Hustad Honningdalsnes¹, Erik Stensrud Marstein¹, Anne Catriona Mehlhoop², Astrid Brekke Skrindo², Heidi Solstad², Heine Nygard Riise¹
¹ IFE, Kjeller, Norway; ² Norwegian Institute of Nature Research, Trondheim, Norway

4DV.1.9 A Microclimate Assessment between Photovoltaics Rows: Opportunities for Biodiversity and Agricultural Integration

Hugo Sánchez Ortiz¹, Sebastian Dittmann¹, Carlos Meza¹, Ralph Gottschalg²
¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle, Germany

4DV.1.10 Performance Analysis of Agrivoltaic System Configurations in Nordic Conditions

Magda Szarek¹, Sami Jouttijärvi¹, Samuli Ranta², Kati Miettunen¹
¹ University of Turku, Turku, Finland; ² TUAS, Turku, Finland

4DV.1.11 Irradiance Management for the First Significant Agrivoltaics Demonstration Project in Finland

Shuo Wang¹, Soroush Moradi Zavie Kord², Antti Lajunen², Hugo E. Huerta Medina¹, Samuli Ranta¹
¹ TUAS, Turku, Finland; ² University of Helsinki, Helsinki, Finland

4DV.1.12 An Innovative Agrivoltaic System for Desert Climates with Anti-Soiling, Irradiance Control, and Water Management

Sagarika Kumar¹, Min Hsian Saw¹, Suniti Singh¹, Shilpi Shital¹, Carlos G. Parrilla², Francois M. Tsombou², Fouad Lamghari², Mauro Pravettoni¹
¹ Technology Innovation Institute, Abu Dhabi, United Arab Emirates; ² Fujairah Research Centre, Fujairah, United Arab Emirates

4DV.1.15 Review of Sensor Technologies for Monitoring Agrivoltaic Systems

Sara Pereira¹, José Silva¹, Luís Fialho¹, Pedro Horta¹
¹ University of Évora, Évora, Portugal

4DV.1.16 Commercially Viable Solar Parks with Improved Soil Quality

Antonius R. (Teun) Burgers¹, Bas B. van Aken¹, Koen M. de Groot¹, Gertjan J. de Graaf¹, Benjamin W.J. Kikkert¹, I. (Kay) Cesar¹, Friso F. van der Zee², Sander Leone³
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4DV.1.17 Symbiosyst Growing Greener 2.0: the Monitoring Campaign

Giovanni Borz¹, Enrico Dalla Maria¹, David Moser¹, Gofran Chowdhury²
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4DV.1.18 Power Output Modelling of a Single-Axis Backtracking Bifacial Module in an Agrivoltaic System in Palaiseau, France

Maira Itzel Torres Aguilar¹, Shusen Yu², Anne Migan-Dubois¹, Jordi Badosa Franch², Bouchra Mekhaldi², Johan Parra², Vincent Bourdin³
¹ CNRS, Gif-sur-Yvette, France; ² Polytechnic School, Palaiseau, France; ³ CNRS, Orsay, France

4DV.1.19 Agrivoltaics Experimental Case: Growth of Lettuce Crops Inside Pilot Installations with Semi-Transparent PV Materials

Alejandro Cruz Escabias¹, João Gabriel Bessa¹, Jesús Montes Romero¹, José Luis Lombardo García¹, Genoveva Carmen Martos de la Fuente¹, Ana María Fernández Ocaña¹, Pedro Jesús Pérez Higuera¹, Florencia Marina Almonacid¹, Eduardo Fernández Fernández¹
¹ University of Jaén, Jaén, Spain



4DV.1.20 Modeling of Luminescent Solar Concentrators with Front-Facing Solar Cells for Agrivoltaic Applications

Marinela Gjestila¹, Leonardo Sollazzo², Giulio Mangherini², Valentina Diolaiti², Nazim Aslam², Donato Vincenzi²

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4DV.1.21 Blue-Emitting Metal Complexes for Agricultural Photovoltaics: A Literature-Based Evaluation for Luminescent Solar Concentrators

Omar Moudam¹

¹ Independent, Oulton, United Kingdom

4DV.1.22 Yield and PR Estimation for Vertical Agrivoltaics Systems

Guillermo Moreda Cantero¹, Miguel-Ángel Egido¹, Valero Pascual Gallego¹, Delia Rodríguez Lucas², Miguel-Ángel Muñoz-García¹

¹ UPM, Madrid, Spain; ² Ekilabs, Boston, United States of America

4DV.1.24 Semi-Transparent Organic Photovoltaic Cells Integrated in Photosynthetic Cultivation Systems

David Burrueco-Subirà¹, Thibault Combroux², Pierre Albrand², Jeremy Pruvost², Helene Marec², Mariana Titica², Michele Manca¹

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4DV.1.25 Agrivoltaic - Study of Potential in Portugal

Jeremias dos Santos¹, José Silva¹, Luís Fialho¹, Pedro Horta¹

¹ University of Évora, Évora, Portugal

4DV.1.26 Innovative Suspended Cable Agri-PV System: a Cost-Effective Solution for Highly Mechanized and Efficient Agriculture

Imanol Olaskoaga¹

¹ Powerfultree, Durango, Spain

4DV.1.28 Simulation-Based Optimization of Vertical AV to Minimize the Levelized Costs of Electricity

Fabian Spera¹, Simon Lahr¹, Marc Andre Schüler²

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4DV.1.29 Development of a Simple Tool for Estimating Irradiation Reduction in Agrivoltaic Greenhouses

Paula Sanchez-Friera¹, Guillermo Correa², Luis Pérez²

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4DV.1.30 A New Model of Poly-tunnel-integrated Agri-PV Systems

Benedict Winchester¹, Emilio Alexis de la Cruz Nuñez Andrade², Bhavya Sharma¹, Taylor Pomfret¹, Yaar Safra¹, Hamish Beath³, Martyn Rush⁴, Christos N. Markides¹, James Ryan², Elinor Thompson⁵, Jenny Nelson¹

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4DV.1.31 REGACE: A Multilateral Strategy for Integrating Solar Energy Production and Crop Growth in Greenhouse Agrivoltaics

Gianluigi Bovesecchi¹, Luca Rosati¹, Federico Andreozzi¹, Francesco Bisio¹, Emiliano Serì¹, Ali Sohani¹, Cristina Cornaro¹, Marco Berardo Di Stefano², Ibrahim Yehia³

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4DV.1.32 Tomato Cultivation in Semitransparent PV Greenhouses in Southeast of Spain

Carlos Toledo¹, Virginia Hernández¹, Fulgencio Contreras¹, Vincenzo Tucci¹, Elia Molina¹, Pilar Hellin¹, Alicia Sánchez¹, Jose Fenoll¹, Pilar Flores¹

¹ IMIDA, Murcia, Spain

4DV.1.33 PV and PVT Systems Design for "raspa y amagado" Greenhouses

José Manuel Naveiro¹, Beatriz Muñoz Vidal², Eduardo Pardo Martínez³, María Miguel Laborda², Ana Escudero Oriol², Raquel Simón Allué⁴, Gonzalo Brun Gresa¹, Raúl Villén¹, Yolanda Lara¹

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4DV.1.34 Influence of Agricultural Photovoltaics on Microclimatic Conditions: A Case Study in Lusatia, Germany

Rezwana Ahmed¹, Sebastian Scholz¹, Katja Trachte¹

¹ Brandenburg University of Technology Cottbus–Senftenberg, Germany, Cottbus, Germany

4DV.1.35 Nature-Inclusive Operation and Maintenance of PV Parks – An Expert Elicitation of PV Performance and Ecological Impacts

Heine Nygard Riise¹, Anne Catriona Mehlhoop², Nathan Roosloot¹, Magnus Moe Nygård¹, Erling Ween Eriksen¹, Harsha Walpita¹, Mari Benedikte Øgaard¹, Marie Syre Wiig¹, Marija Vukovic¹

¹ IFE, Kjeller, Norway; ² Norwegian Institute for Nature Research, Trondheim, Norway

4DV.1.40 Integrating PV into Urban Cycling Infrastructure: Freiburg's Solar Bicycle Path

David Melgar¹, Christian Braun¹, Christian Schill¹

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4DV.1.41 Investigating Spectral, Thermal and Positional Effects on the Performance of 5-Junction CPV Cells

Elizabeth M. Hagemann¹, Frederik J. Vorster², E. Ernest Van Dyk¹, Ruediger F. Loeckenhoff³

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4DV.1.42 Epoxy Resin and Fiberglass to Integrate PV into Terrestrial Electric Vehicles

Fernando Castro-Gallardo¹, Jorge Rabanal-Arabach¹, Sebastián

Rodríguez-Romero¹, Sonia Beltrán-Condori¹, Edward Fuentealba-Vidal¹

¹ University of Antofagasta, Antofagasta, Chile

4DV.1.43 Design, Sizing, and Sensorization of an FPV Power Plant at the Monte Novo Dam, Portugal

Dorivaldo Duarte¹, José Silva¹, Luis Fialho¹, Sara Pereira¹, Pedro Horta¹

¹ University of Évora, Évora, Portugal

4DV.1.44 Validation of VIPV Modules: Experimental Performance under Atacama Desert Operational Conditions

Fernando Castro-Gallardo¹, Jorge Rabanal-Arabach¹, Sebastián Rodríguez-Romero¹, Sonia Beltrán-Condori¹, Mauricio Trigo-González¹, Edward Fuentealba-Vidal¹

¹ University of Antofagasta, Antofagasta, Chile



- 4DV.1.46 Mobile E-bike Sharing Systems with Integrated Photovoltaics: Electric Mobility Solutions for Large Events in Évora, Portugal**
 Helena Oliveira¹, Paulo Carmo¹, José A. Silva¹, Luís Fialho¹, Paulo Infante¹, Pedro Horta¹
¹ University of Évora, Évora, Portugal
- 4DV.1.47 Mismatch Losses for Road-Integrated Photovoltaics: Large-Scale Simulations in North Rhine-Westphalia, Germany**
 Carina Schmitt¹, Evgenii Sovetkin¹, Andreas Gerber¹, Bart E. Pieters¹
¹ FZJ, Jülich, Germany
- 4DV.1.48 The Solar Potential of the Railway at Varied Spatial Scales: Portugal as a Case Study**
 Margarida Luís¹, Miguel Centeno Brito¹
¹ University of Lisbon, Lisbon, Portugal
- 4DV.1.49 Ribbons/Wires lengthening in Photovoltaic Assemblies Exposed to Large Amplitude Thermal Cycling**
 Jean-Baptiste Charpentier¹, Julien Gaume¹, Philippe Voarino¹
¹ CEA / INES, Grenoble, France
- 4DV.1.51 Performance Analysis of Non-Isolated DC-DC-Boost Converter Topologies in VIPV Systems under Variable Irradiance**
 Sebastián Rodríguez-Romero¹, Jorge Rabanal-Arabach¹, Christian A. Rojas², Mauricio Trigo-Gonzalez¹, Gino Mondaca-Cuevas¹, Fernando Castro-Gallardo¹, Edward Fuentealba-Vidal¹
¹ University of Antofagasta, Antofagasta, Chile; ² Federico Santa María Technical University, Valparaíso, Chile
- 4DV.1.53 Monitoring System for Vehicle Integrated Photovoltaics**
 Jaša Vid Meh Peer¹, Marko Topič¹, Marko Jankovec¹
¹ University of Ljubljana, Ljubljana, Slovenia
- 4DV.1.54 Development of Video Processing Technology for Continuous Analysis of Power Generation on Vehicles**
 Naoki Mukai¹, Nobuteru Takeshita¹, Kenji Araki¹, Kensuke Nishioka¹, Yasuyuki Ota¹
¹ University of Miyazaki, Miyazaki, Japan
- 4DV.1.55 3D Integrated Photovoltaic Surfaces for Portable Applications**
 Thomas M. Kraft¹, Riikka Suhonen¹, Kaisa-Leena Väisänen¹, Kyösti Heikkinen¹, Mari Ylikunnari¹
¹ VTT Technical Research Centre of Finland, Oulu, Finland
- 4DV.1.56 Assessing the Floating Photovoltaic Potential of the Netherlands**
 Annanta Kaul¹, Sara Mirbagheri Golroodbari¹, Wilfried van Sark¹
¹ Utrecht University, Utrecht, The Netherlands
- 4DV.1.57 Fuel Savings Potential of Solar-Assisted City and Intercity Buses in Turkey: A VECTO-Based Simulation Approach**
 Mirosław Wendeker¹, Łukasz Grabowski¹
¹ Lublin University of Technology, Lublin, Poland
- 4DV.1.59 A Research Platform for Evaluating Solar Tracking in CPV Applications Featuring a Custom Control Unit for Precision and Performance Optimization**
 Imane Ourraoui¹, Ali Ahaitouf¹
¹ FST, Fes, Morocco

- 4DV.1.60 Empirical Study of Establishing Floating Substation Standards for Floating Photovoltaics**
 Hyunsik Jo¹, Jieun Lee¹, Jungi Jung¹, Donggun Yang¹
¹ Korea Water Resources, Daejeon-Si, South Korea
- 4DV.1.61 Quantifying Thermal Dynamics: Measured Data Analysis of FPV Systems in Lake Beilen**
 Annanta Kaul¹, Niek van den Nobelen¹, Sara Golroodbari¹, Wilfried van Sark¹
¹ Utrecht University, Utrecht, The Netherlands
- 4DV.1.62 Development of a Large Knitted Textile Solar Panel**
 Parvin Ebrahimi¹, Arash Moghadassian Shahidi¹, Demosthenes Koutsogeorgis¹, Carlos Oliveira¹, Jake Kaner¹, Tilak Dias¹, Theodore Hughes-Riley¹
¹ Nottingham Trent University, Nottingham, United Kingdom
- 4DV.1.63 Modelling of Marine Assembly Logistics for an Offshore Floating Photovoltaic Plant subject to Weather Dependencies**
 Lu-Jan Huang¹, Simone Mancini², Minne M. de Jong²
¹ TNO, Leiden, The Netherlands; ² TNO, Eindhoven, The Netherlands
- 4DV.1.64 Internal Inspection of 3D-Curved PV Modules Using Non-Destructive Techniques**
 Kaiki Matsubayashi¹, Kenji Araki¹, Daisuke Sato¹, Yasuyuki Ota¹, Kensuke Nishioka¹
¹ University of Miyazaki, Miyazaki, Japan
- 4DV.1.65 Floating Electrical Room Integration in PV Power Stations: Analysis of Power Generation Efficiency and Cost-Effectiveness**
 Jinhee Hyun¹, YeongBeom Kang¹, Byeongwan Bhang¹, HyunGu Lee¹
¹ Yunjune Engineering, Seoul, South Korea
- 4DV.1.75 Sizing Strategy for Green Hydrogen Production: Maximizing PV Utilization and Electrolyzer Efficiency**
 Carlos Meza¹, Mohammad Nabipour¹, Matthias Ebert²
¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle, Germany
- 4DV.1.76 Retrofitting Shipping Containers into Positive Energy Bus Stations with Photovoltaic LVDC Microgrids for Sustainable Transport in Renewable Resource-rich, Harsh Environments**
 Mohammad Nazififard¹, Erwin Franquet¹, Ahmad Sedaghat², Mohammad Salem², Mohammad Farhat²
¹ Côte d'Azur University, Nice, France; ² Australian University, Kuwait City, Kuwait
- 4DV.1.77 Comparative Study of Solar PV Water Pumping Systems in India: Transforming Agriculture**
 Richa Parmar¹, Anmol Ratan Saxena², Prashant Misra¹, Jai Prakash¹
¹ NISE, Gurugram, India; ² NIT, Delhi, India
- 4DV.1.78 Partial Load Efficiency of Photovoltaics in Direct Coupling to Hydrogen Electrolysis**
 Marcus Rennhofer¹, Philipp Mayer-Ullmann¹, Diana Maria Krainer¹, Gusztav Ujvari¹, Janine Lichtenberger¹, Konrad Kainz¹, Vassilissa Neuss¹
¹ AIT, Vienna, Austria



4DV.1.79 Quick Assessment of Solar-to-Chemical Efficiency in Photovoltaic-Driven Electrolyzers: Bridge between Electrochemistry and Photovoltaics

Oleksandr Astakhov¹, Thérèse Cibaka¹, Lars Wieprecht¹, Uwe Rau¹, Tsvetelina Merdzhanova¹

¹ FZJ, Jülich, Germany

4DV.1.80 Analysis and Modeling of the Performance Degradation of a Hybrid Photovoltaic System with Battery Storage

Nassima Ait Said Ouhammou¹, Mohamed Akhsassi², Abdelkader Elkissani¹

¹ Cadi Ayyad University, Marrakech, Morocco; ² Ibn Zohr University, Agadir, Morocco

VISUAL PRESENTATIONS 5DV.2

10:30 - 12:00 Life Cycle Analysis and PV Recycling | Citizens Participation and Awareness

Chairpersons: Claire Agraffail

CEA, Le Bourget-du-Lac, France

Silvia Caneva

WIP Renewable Energies, Munich, Germany

5DV.2.1 The Utilisation of Building Integrated Photovoltaics (BIPV) in the Context of Environmental Labelling

Momir Tabakovic¹, Sune Thorsteinsson², Manuel Trampert¹

¹ University of Applied Sciences Technikum Wien, Vienna, Austria; ² DTU, Roskilde, Austria

5DV.2.2 Utilisation of High Purity Silicon based Scrap PV Materials in the Production of Advanced Ballistic Technology Materials

Hatice Duman¹, Mehmet Engür², Dilara Akdağ², Çağrı Taha Delikanlı¹, Özlem Coşkun¹, Meriç Çalışkan Arslan¹, Ümit Yurdağül², Murat Sert²

¹ KalyonPV, Ankara, Türkiye; ² KIM Technologies, Kayseri, Türkiye

5DV.2.3 A Prospective Life Cycle Assessment of Silicon-Perovskite Tandem Photovoltaics

Mitchell Van der Hulst¹, Mirjam Theelen², Dorottya Magoss¹, Yiri Massop¹, Sjoerd Veenstra², Niels Van Loon², Ilker Dogan², Gianluca Colletti³, Mark Huijbregts¹, Rosalie Van Zelm¹, Mara Hauck⁴

¹ Radboud University, Nijmegen, The Netherlands; ² TNO, Eindhoven, The Netherlands; ³ FuturaSun, Cittadella, Italy; ⁴ Technical University Eindhoven, Eindhoven, The Netherlands

5DV.2.4 Synthesis and Analysis of Polyaniline Properties with Various Counterions for Silver Recovery from Technological Solutions after Silicon PV Cells Leaching

Hanna Rodziejewicz¹, Anna Kuczyńska-Lazewska¹, Agnieszka Witkowska¹

¹ Gdansk University, Gdansk, Poland

5DV.2.5 Heat Debonding for Efficient Layer Separation in Photovoltaic Modules with Different Encapsulants

Emma Gottis¹, Florian Ollagnon², Antonin Faes¹, Matthieu Despeisse¹, Hengyu Li¹, Christophe Ballif¹

¹ CSEM, Neuchâtel, Switzerland; ² EPFL, Neuchâtel, Switzerland

5DV.2.6 Recycling Strategies to Valorize EVA Recovered from PV Panels
Raquel Rodríguez¹, Beatriz Perez¹, Maialen Chapartegui¹, Olatz Ollo¹, Sonia García¹

¹ TECNALIA, Donostia-San Sebastian, Spain

5DV.2.7 Comparative LCA Analysis of Delamination Methods for Photovoltaic Modules Made of CdTe

Anna Kuczyńska-Lazewska¹

¹ Gdansk University of Technology, Gdansk, Poland

5DV.2.8 Design for Repair of PV Modules - a Meaningful or Crazy Idea?

Gernot Oreski¹, Sonja Feldbacher¹, Anika Gassner², Gabriele Eder², Ioannis Tsanakas³, Timea Bejat³

¹ PCCL, Leoben, Austria; ² OFI, Vienna, Austria; ³ CEA, Le Bourget-du-Lac, France

5DV.2.9 European Silicon Light Weight PV System: a Game Changer for Building Decarbonization

Nouha Gazbour¹, Julien Gaume², Yannick Veschetti¹

¹ CEA / INES, Le Bourget-du-Lac, France; ² HELIUP, Le Bourget-du-Lac, France

5DV.2.10 Advancing Solar Energy Sustainability: Tackling Photovoltaic Cell Upcycling through Metal Recovery

Alejandra Vázquez Adán¹, Juan Manuel López Cuéllar¹, Lucía Ríos Moral¹, Luis Jaime Caballero², Nerea Dasilva Villanueva², David Fuertes Marrón², Carlos del Cañizo Nadal², Eduardo Díez Alcántara¹, Araceli Rodríguez Rodríguez¹

¹ Complutense University of Madrid, Madrid, Spain; ² UPM, Madrid, Spain

5DV.2.11 Integrated Carbon Emissions and Production Costs of Metallurgical Grade Silicon Manufacturing

Le Uyen Kha Doan¹, Nathan Chang², Michelle Vaqueiro Contreras², Rabin Basnet¹, Daniel Macdonald¹

¹ ANU, Canberra, Australia; ² UNSW, Sydney, Australia

5DV.2.12 Waste 2 Energy and Commodities – an Offbeat use of Silicon Kerf Loss and other Silicon-Based Waste with Amazing Side Effects

Wolfram Palitzsch¹, Arvid Killenberg¹, Ingo Röver¹

¹ LuxChemtech, Freiberg, Germany

5DV.2.13 DEM-based Machine Learning Method for Particle Separation in Photovoltaic Panel Recycling

Mariye Jahannoush¹, Zhouzun Xie¹, Yansong Shen¹

¹ UNSW, Sydney, Australia

5DV.2.14 Sustainability Strategies for Optimising the use Phase of Photovoltaics: an Overview

Ana Rosa Gamarra¹, Yolanda Lechón¹, Daniel Garraín¹

¹ CIEMAT, Madrid, Spain

5DV.2.16 Efficient Method for Separation and Valorization of Materials from End of Life PV Panel

Romain Duwald¹, Youcef Karar¹, Fabrice Coustier², Roland Riva², Xavier Mackre-Delannoy²

¹ CEA LITEN/DTNM, Grenoble, France; ² CEA LITEN/DTS, Le-Bourget-du-lac, France

5DV.2.17 Innovative Approach for Recycling of End-of-Life Solar Panels via Atmospheric Plasma Pyrolysis

Kalpna Lodhi¹, Sushil Kumar¹

¹ National Physical Laboratory, New Delhi, India



5DV.2.18 Towards Zero-Waste Solar Energy: Eco-Friendly Recycling and Reuse Strategies

Tejendra Kumar Gupta¹, Richa Kasana¹, Lekhanshu Singh¹

¹ Amity University, Noida, India

5DV.2.20 Life Cycle Assessment of Recycling Processes for Desmetallisation of PV Cells: Preliminary Results

Daniel Garraín¹, Juan-Manuel López-Cuellar², Eduardo Díez-Alcántara², Araceli Rodríguez-Rodríguez², David Fuertes-Marrón³, Carlos del Cañizo³, Ana-Rosa Gamarra¹

¹ CIEMAT, Madrid, Spain; ² UCM, Madrid, Spain; ³ UPM, Madrid, Spain

5DV.2.21 Separating the Glass Panel from Decommissioned PV Panels Using Hot Knife, Xe Light Flashing, and Pulsed and Continuous NIR Lasers

Per-Anders Hansen¹, Rune Søndena²

¹ Institute for Energy technology, Kjeller, Norway; ² Institute for Energy Technology, Kjeller, Norway

5DV.2.22 Optimizing Material Recovery from End-of-life Photovoltaic Modules: a Multi-Step Approach

Aistis Rapolas Zubas¹, Dmitri Goljandin², Remigijus Ivanauskas¹, Egidijus Griškonis¹, Gintaras Denafas¹, Jolita Kruopienė¹

¹ Kaunas University of Technology, Kaunas, Lithuania; ² Tallinn University of Technology, Tallinn, Estonia

5DV.2.23 Environmental Benefits of Reusing and Repairing Photovoltaic Modules via Life Cycle Assessment Approach

Nouha Gazbour¹, Luc Federzoni²

¹ CEA / INES, Le Bourget-du-Lac, France; ² SOLREED, Bourgoin-Jallieu, France

5DV.2.24 Material and Social Footprint of Rooftop Photovoltaics in the Basque Country

Alex Tro-Cabrera¹, Estitxu Villamor¹, Rosa Lago-Aurrekoetxea¹, Leire Urkidi¹, Gorka Bueno¹

¹ UPV/EHU, Bilbao, Spain

5DV.2.26 Europe in 2050 – Material Challenges of Scaling up Photovoltaics

Olga Kanz¹, Petra Zapp¹, Christina Wulf¹

¹ FZJ, Jülich, Germany

5DV.2.28 Hyperspectral Imaging for Advanced Material Identification and Quantification of processed PV Materials

Lukas Neumaier¹, Martin De Biasio¹, Gabriele C. Eder², Anika Gassner²

¹ Silicon Austria Labs, Villach, Austria; ² OFI, Vienna, Austria

5DV.2.29 Social LCA of Perovskites: Initial Findings and Paths for Improvement

Anna Barguès¹, Philippe Macé², Melodie de l'Epine¹, Damien Gautier²

¹ Becquerel Institute France, Lyon, France; ² Becquerel Institute, Brussels, Belgium

5DV.2.30 Life Cycle Assessment of Photovoltaic Recycling Strategies: Chemical and Thermal-Mechanical Processes

Juan Antonio Saura¹, Nieves Espinosa¹

¹ University of Murcia, Murcia, Spain

5DV.2.31 The Landscape of PV Recycling: Challenges to Make PV an Example of Circular Economy

Carlos del Cañizo¹, David Fuertes Marrón¹

¹ UPM, Madrid, Spain

5DV.2.32 Recovery of Metal Contacts and Reutilization of Silicon Substrates from Recycled Solar Cells

Nerea Dasilva-Villanueva¹, David Fuertes Marrón¹, Luis Jaime Caballero¹, Araceli Rodríguez², Eduardo Díez², Marcos Tierno², Jesús Ángel Muñoz², Alejandro F. Braña³, José Luis Plaza Canga-Argüelles³, Enrique Cánovas⁴, Mariela Menghini⁴, Carlos del Cañizo¹

¹ UPM, Madrid, Spain; ² UCM, Madrid, Spain; ³ Autonomous University of Madrid, Madrid, Spain; ⁴ IMDEA Nanoscience Institute, Madrid, Spain

5DV.2.33 Critical Review of Environmental LCA Methods and their Representation of Current PV Market

Cristina Polacchi¹, Atse Louwen¹, Sandra Gallmetzer¹, Denet Soler², Luis Fialho¹

¹ Eurac Research, Bolzano, Italy; ² University of Antofagasta, Antofagasta, Chile

5DV.2.34 Life Cycle Assessment of Building-Integrated Photovoltaics in Europe: Swedish Case Study

Ilham Ihoume¹, Michiel van Noord², André Augusto¹

¹ Dalarna University, Falun, Sweden; ² RISE, Stockholm, Sweden

5DV.2.35 A Multi-Modal Machine Learning Framework for Improved Health Assessment of End-of-Life PV Modules

Berhane Darsene Dimd¹, Martin Bellmann¹, Christine Klos²

¹ SINTEF, Trondheim, Norway; ² Buhck Re.Energy, Hamburg, Norway

5DV.2.36 Remote Assessment of PV Panel Recyclability using UAV Imagery correlated to Electroluminescence Images

Christoph Waibel¹, Pieter-Jan Baeck¹, Elias Hafidi²

¹ Flamish Institute for Technological Research (VITO), Mol, Belgium; ² Inflight BV, Brussels, Belgium

5DV.2.37 Life Cycle Carbon Footprint Assessment of a Low-Carbon Solar PV Tracker

André Martins Silveira¹, Henrique Leonardo Maranduba¹, Mohit Gupta¹, Sarah Albert²

¹ Nextrack, Fremont, United States of America; ² Nextrack, Madrid, Spain

5DV.2.38 Development of a PV Module Leach Testing Database

Fang Li¹, Sai Tatapudi¹, Stephanie Shaw², Cara Libby², Bulent Bicer¹, Govindasamy Tamizhmani¹

¹ Arizona State University, Tempe, United States of America; ² EPRI, Palo Alto, United States of America

5DV.2.39 Cost and Material Estimations for Decommissioning and Repowering Utility-Scale PV Plants

Cara Libby¹, Alberto Pico¹, Robin Bedilion¹, Anand Kumar¹

¹ EPRI, Palo Alto, United States of America

5DV.2.40 Recent Trends in PV Module Recycling Technologies R&D

Keiichi Komoto¹, Claire Agraffel², Andrea Danelli³, Marco Tammaro⁴, Carmen Alonso-García⁵, Nieves Espinosa⁶, Anika Gassner⁷, Yansong Shen⁸, Garvin Heath⁹

¹ Mizuho Research & Technologies, Tokyo, Japan; ² CEA, Le Bourget-du-Lac, France; ³ RSE, Milan, Italy; ⁴ ENEA, Portici, Italy; ⁵ CIEMAT, Madrid, Spain; ⁶ University of Murcia, Murcia, Spain; ⁷ OFI, Vienna, Austria; ⁸ UNSW, Sydney, Australia; ⁹ NREL, Golden, United States of America



5DV.2.41 Enabling Innovation Through ESG: A Roadmap for the European PV

Abeer Ali Khan¹, Paula Sanchez-Friera², Sebastien Lizin³, Samira Aden⁴, Pinar Derin Gure⁵, Jan Clyncke⁶, Ioannis (John) Tsanakas⁷, Marcello Passaro⁸, Perine Fleury⁹, Cristina Polacchi¹⁰, Elisa Veronese¹⁰

¹ First Solar, Mainz, Germany; ² Solkeys, Gijón, Spain; ³ UHasselt, Hasselt, Belgium; ⁴ HZB, Berlin, Germany; ⁵ METU, Ankara, Türkiye; ⁶ PV Cycle, Brussels, Belgium; ⁷ CEA, Le Bourget-du-Lac, France; ⁸ Sunzest Solar, Rotterdam, The Netherlands; ⁹ Biosphere Solar, Delft, The Netherlands; ¹⁰ Eurac Research, Bolzano, Italy

5DV.2.42 A Novel Tool for the Identification of Suitable Locations of Marine Floating Photovoltaic Plants

Gotzon Mandiola Solozabal¹, Ibon Galparsoro¹, Asier Sanz Martinez², Iñigo Mendikoa², María Jesús Belzunce¹, Juan Bald¹, Iratxe Menchaca¹

¹ AZTI, PASAIA, Spain; ² TECNALIA, BRTA, Derio, Spain

5DV.2.43 Life Cycle Assessment of a Silicon Heterojunction based PV System

Arthur W. Weeber¹, Shashank Bhardwaj¹, Olindo Isabella¹, Malte Vogt¹

¹ TU Delft, Delft, The Netherlands

5DV.2.44 Reuse, Redesign and Recovery of Residential Solar Installations Components

Yolanda Lara¹, Raúl Villén¹, Raquel Simón Allué¹, Gonzalo Brun Gresa¹, Isabel Guede Medrano¹

¹ ENDEF, Zaragoza, Spain

5DV.2.45 Innovative Approaches for the Dry Recycling of Photovoltaic Module Composites by Electrostatic Separation

Ferozan Azizi¹, Florian Eregger¹, Karl Friedrich¹, Georg Schmölder¹, Thomas Nigl¹

¹ Montanuniversitaet Leoben, Leoben, Austria

5DV.2.54 Rooftop Solar Explorer: Mapping the Rooftop Solar Potential of 100+ Cities in India

Shantanu Roy¹, Mahesh Kalshetty², Saptak Ghosh²

¹ CSTEP, Noida, India; ² CSTEP, Bengaluru, India

5DV.2.55 Generating Equity, Nurturing Diversity, Energising Resilience for Power against Energy Poverty

Olgu Birgi¹, Rita Mergner¹, Rainer Janssen¹, Dominik Rutz¹, Jannis Haack¹

¹ WIP Renewable Energies, Munich, Germany

5DV.2.56 Interactive Learning for PV Systems: a Board Game-based Teaching Strategy for Operations and Maintenance

Melodie de l'Epine¹, Carlos Meza², Brian Azzopardi³

¹ Becquerel Institute, Brussels, Belgium; ² Anhalt University of Applied Sciences, Köthen, Germany; ³ The Foundation for Innovation and Research, Valletta, Malta

5DV.2.58 Bridging Agriculture and Renewable Energy: European Higher Education Insights

Henny Grewe¹, Ana María Barrena², Luis Hernandez², Juan Sebastian Eastman³, Carlos Meza¹, Luis E. Tobon³, José Luis Villa⁴

¹ Anhalt University of Applied Sciences, Anhalt, Germany; ² UPV, Valencia, Spain; ³ Xavierian Pontifical University, Cali, Colombia; ⁴ UTB, Cartagena, Colombia

5DV.2.59 Women in Photovoltaics: Experiences and Support Mechanisms

Chiara Busto¹, Hande Eryılmaz², Nikoletta Fodor³, Ivan Gordon⁴, Pinar Derin Gure⁵, Perine Fleury⁶, Ulrike Jahn⁷, Sebastien Lizin⁸, Delfina Muñoz⁹, Paula Sanchez-Friera¹⁰, Ioannis (John) Tsanakas⁹, Büşra Yılmaz¹¹

¹ Eni, Novara, Italy; ² ODTÜ-GÜNAM, Ankara, Türkiye; ³ SolarPower Europe, Brussels, Belgium; ⁴ imec, Genk, Belgium; ⁵ METU, Cankaya, Türkiye; ⁶ Biosphere Solar, Delft, The Netherlands; ⁷ Fraunhofer CSP, Halle (Saale), Germany; ⁸ UHasselt, Hasselt, Belgium; ⁹ CEA, Le Bourget-du-Lac, France; ¹⁰ Solkeys, Gijón, Spain; ¹¹ Kameleon Solar, Roosendaal, The Netherlands

5DV.2.61 Advanced Machine-Learning-Based Analysis of Critics and the Silent Majority regarding the Energy Transition and Photovoltaics on TikTok

Marc Gabriel Schneider¹, Janek Gehrlein¹, Jannik Achenbach¹, Anne Maren Feldhof¹, Valérie Varney¹, Eva-Maria Grommes¹

¹ University of Applied Science Cologne, Cologne, Germany

5DV.2.62 The Role of Target Groups and Gatekeepers in the Deployment of more Sustainable Photovoltaic Systems: a Participatory Approach

Alexandra Tönies¹, Larissa Müller¹, Valérie Varney¹, Eva-Maria Grommes²

¹ University of Applied Sciences Cologne, Cologne, Germany; ² University of Applied Science Cologne, Cologne, Germany

VISUAL PRESENTATIONS 5DV.3

13:30 - 15:00 Grid Integration and Flexibility Enablers | Global, Country- and Application-Specific Analysis of PV Deployment Aspects | Costs, Economics, Finance and Markets

Chairpersons: Heinz Ossenbrink

Band Gap, Bad Feilnbach, Germany

Ammar Nayfeh

Khalifa University, Abu Dhabi, United Arab Emirates

Fatima-Zahra Ouchani

Green Energy Park, Benguerir, Morocco

5DV.3.1 Polynomial Surface Model-Based Balancing Market Bid Planning and Evaluation for Multi-Site PV Plants

Jindan Cui¹, Xue Fang¹, Takashi Oozeki², Yuzuru Ueda¹

¹ Tokyo University of Science, Tokyo, Japan; ² AIST, Koriyama, Japan

5DV.3.2 Integration of Solar Energy into Electric Mobility Infrastructure

Diego Julián Rodríguez¹, Jaime Pantoja¹, Johann Hernández¹

¹ Francisco José de Caldas District University, Bogota, Colombia

5DV.3.3 Estimating Photovoltaic Power Ramp Rates Using Single Point Irradiance Measurement

Micke Talvi¹, Jan Kleissl², Kari Lappalainen¹

¹ Tampere University, Tampere, Finland; ² University of California, San Diego, United States of America

5DV.3.6 Optimizing Hybrid Wind-Solar Plants in Brazil: Addressing Curtailment and Constrained-Off Challenges

Letícia Vasconcelos¹, Luiz Filipe Reis¹, Lúcio Paiva¹, Luis Guilherme Castro¹, Rodrigo Santos¹

¹ Casa dos Ventos, Fortaleza, Brazil



5DV.3.7 Comparing Approaches for Estimating Residential PV System Orientations

Johan Lindahl¹, Joakim Munkhammar²

¹ Becquerel Sweden, Knivsta, Sweden; ² Uppsala University, Uppsala, Sweden

5DV.3.8 Advanced Energy Management System for Solar-Plus-Storage Systems

Demetris Marangis¹, Panayiotis Herodotou¹, Andreas Livera¹, Georgios Makides¹, George E. Georghiou¹

¹ University of Cyprus, Nicosia, Cyprus

5DV.3.9 An Open Virtual Power Plant for Renewable Energy Communities - Strategies for Centralized Batteries

Rita Hogan Almeida¹, Luis Miguel Carrasco¹, Javier Ramírez Ledesma¹, Javier Martín Rueda¹, Ana Belén Cristóbal¹, Laura Palomino¹, Kiane Alves e Silva¹, Luis Narvarte¹

¹ UPM, Madrid, Spain

5DV.3.10 Reactive Power Optimization in Photovoltaic Systems for Grid Voltage Stability: Comparing the Performance of the PSO and Jaya Algorithms

Sabri Murat Kısakürek¹, Ahmet Serdar Yılmaz², Yusuf Uras²

¹ Kahramanmaraş İstiklal University, Kahramanmaraş, Türkiye; ² Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Türkiye

5DV.3.11 Validation of a Multistrategy Energy Management System for Battery in PV Plants

Celena Lorenzo¹, Laura Barrutia¹, Luis Narvarte¹, Jesús Heras², Carlos Awadallah²

¹ UPM, Madrid, Spain; ² Wattkraft, Madrid, Spain

5DV.3.13 Cyber-Physical Security of Photovoltaic Inverters: Evaluating Risks to the Electrical Grid from a European Perspective

Stefan Übermasser¹

¹ AIT, Vienna, Austria

5DV.3.14 Photovoltaic Hosting Capacity in Nordic Distribution Grids

Lauri Aaltonen¹, Kari Lappalainen¹

¹ Tampere University, Tampere, Finland

5DV.3.16 Maximizing Market Value in Solar Power Plants Using Battery Storage Systems

Hossein Rafiee¹, Sebastian Schäfer¹, Rasoul Manochehrian¹

¹ Frankfurt University of Applied Sciences, Frankfurt am Main, Germany

5DV.3.17 Unlimited Pumped Hydro Energy Storage to Support 100% Renewable Energy in Europe

Andrew Blakers¹

¹ ANU, Canberra, Australia

5DV.3.19 Dynamic Assessment of Energy Flexibility in Italian Residential Buildings: Enhancing Photovoltaic Integration through Smart Thermal Load Management

Paolo Zangheri¹, Silvia Erba², Roberto Armani², Lorenzo Pagliano²

¹ ENEA, Milan, Italy; ² Polytechnic University of Milan, Milan, Italy

5DV.3.31 Road to Ecological Transition: the Italian Perspective of the Agrivoltaics Development

Celeste Mellone¹, Giulia Guidetti², Valeria Viti³, Alessandra Scognamiglio⁴, Fabio Salis⁵

¹ Green Horse Advisory, Rome, Italy; ² Green Horse Advisory, Milan, Italy; ³ Legance, Milan, Italy; ⁴ ENEA, Naples, Italy; ⁵ Iberdrola, Rome, Italy

5DV.3.32 Potential of Agrivoltaics in the EU under Different Regulation Scenarios

Julien Van Overstraeten¹, Caroline Plaza², Philippe Macé¹, Elina Bosch¹, Mélodie de l'Épine²

¹ Becquerel Institute, Brussels, Belgium; ² Becquerel Institute France, Lyon, France

5DV.3.33 On the Changing Role of Solar Photovoltaics in Energy Transition Scenarios – Celebrating 50 Years of 100% Renewable Energy Systems Research

Christian Breyer¹, Siavash Khalili¹, Dennis Bredemeier², Dominik Keiner¹

¹ LUT University, Lappeenranta, Finland; ² Leibniz University Hannover, Hannover, Germany

5DV.3.34 Are We Ready to Handle PV Waste? A Review of PV Recycling Regulations in Europe, US, China, and India

Umer Shahzad¹, Ian Peters Marius¹

¹ FZJ, Erlangen, Germany

5DV.3.35 PVGIS 6: a Modern Software for a Future-Proof Public Service to Support the Energy Transition

Nikos Alexandris¹, Olympia Gounari², Alba Santos Rodrigues³, Alexandros Falangas²

¹ European Commission JRC, Ispra, Italy; ² TRASYS International, Brussels, Belgium; ³ Former trainee in the JRC, Ispra, Italy

5DV.3.36 Projected Technical Innovations could solve Silver Demand Crisis in the Terawatt-Scale Photovoltaics Era

Chengjian Xu¹, Olindo Isabella¹, Malte Ruben Vogt¹

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5DV.3.37 Smart Energy System Integration of Photovoltaic: from Strategic and Research Innovation Agenda to EU Funded Projects

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5DV.3.38 Fostering Collaboration of Research Infrastructures and Stakeholders in Europe and Latin America towards Climate-resilient PV Systems: The CACTUS Project

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5DV.3.39 Photovoltaic Solar Energy Integration in the Basic Education Curricula in Brazil

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5DV.3.40 Analysis of the Photovoltaic Systems Construction Capacities and Conditions on the Residential Rooftops in Serbia

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5DV.3.41 Photovoltaic Development and Landscape Conflicts in Taiwan: Status and Resolutions

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5DV.3.42 BREEZE Project: Advancing PV Implementation in Building Renovations

Duygu Celik¹, Johannes Stierstorfer¹, Claire Morin², Thomas Garabetian², Cristian Pozza³, Francesco Babich³, Akshit Gupta³, Laura Maturi³, Ulrich Filippi Oberegger³, Daniele Antonucci³, Simone Ciuffi³, Pawel Wargocki⁴, Andrei Vladimir Lițiu⁵, Nicolandrea Calabrese⁶, Giovanni Murano⁶, Francesca Caffari⁶, Jerzy Kwiatkowski⁷, Katarzyna Rajkiewicz⁷, Olivier Greslou⁸, Dominique Caccavelli⁸
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5DV.3.43 Integrating Energy Policy into Spatial Planning Frameworks: A Study of Taiwan's Approach

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5DV.3.44 Assessment of PV+Wind Cogeneration for Hydrogen Development Opportunities Using OPA-GIS Analysis

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5DV.3.59 The Impact of Photovoltaic Module Recycling on Silver Market Dynamics: Analysis and Projections

Michael Straub-Mück¹, Amelie Schischke¹, Andreas Rathgeber¹
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5DV.3.60 Utilization of Small-Scale Solar Power Production in Finnish Grid-Balancing Markets through a Virtual Power Plant

Eino Kujansivu¹, Aleksi Ojala¹, Juho Ylipaino², Juha Koskela³
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5DV.3.61 The Optimal Azimuth and Tilt Angle of BIPV Panels Considering the Prices at Electricity Spot Market

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5DV.3.62 Supporting EU PV Manufacturing Market through PV Module Recycling

Elisa Veronese¹, Cristina Polacchi¹, Rama Sharma², Jan Clyncke³, Luis Fialho¹, Germain Castermans³
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5DV.3.63 Techno-Economic Analysis of Solar Cell Manufacturing in Türkiye

Hande Karakan Cankul¹, Burak Demir¹, Bülent Arıkan¹, Raşit Turan²
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5DV.3.64 Economics on Various Operation Strategies of Grid Supporting Powerplants combining PV+ Batteries

Gerhard Mütter¹, Diana Jula², Dennis Beckmann³
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5DV.3.65 Market Uptake Role of Colored PV: A Stakeholder-Centric Analysis of Facilitating and Restraining Forces

Bilge Senturk¹, Pinar Derin-Gure¹, Gunes Kurtulus¹
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5DV.3.66 Rooftop PV on Apartment Buildings: Business Models and Experiences

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5DV.3.67 Techno-Economic Modeling of Industrial-Scale Single-Junction Perovskite Module Manufacturing

Ian Kenchington¹, Anna Barguès², Melodie de l'Epine², Philippe Macé¹, Gaëtan Masson¹, Akhildev Pillai²
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5DV.3.69 Photovoltaic Systems as Building Blocks in Highly Electrified Households: Impacts on Self-Consumption and Energy Bills

Maarten Dörenkämper¹, Andrei Roncea¹, Minne de Jong¹
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5DV.3.73 Decarbonizing Solar PV: Evaluating the Role of Critical Mineral Supply Chains

Engin Deniz¹, Melih Soner Çeliktas¹
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5DV.3.74 A Financial Model for the Deployment of Korean Farm-Based Photovoltaic System

Hye-mi Hwang¹, Seok-whan Ko¹, Woo-gyun Shin¹, Young-chul Ju¹, Jin-Seok Lee¹
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- 5DV.3.75 Photovoltaic Energy Production in Two University Campuses: A Comparative Study**
 Aaron Ortiz-Pena¹, Mahamadou Abdou-Tankari², Andrés Honrubia-Escribano³, Emilio Gomez-Lazaro¹
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- 5DV.3.76 Fire Safety for Building Applied Photovoltaic (BAPV) systems on Commercial and Industrial Buildings**
 Jens Steemann Kristensen¹, Martin Sturdy¹
¹ Danish Institute of Fire and Security Technology, Hvidovre, Denmark
- 5DV.3.86 Driving Global Leadership in the Solar PV Module Value Chain: The Role of Early Adoption and Implementation of IEC Standards**
 Deepti Deepti¹, Saurabh Kumar², Sushma Sharma¹, Gaurav Kumar³
¹ SRM University, Sonapat, India; ² PTB, Braunschweig, Germany; ³ MERI College of Engineering and Technology, Bahadurgarh, India
- 5DV.3.87 EMPOWER: Alternative Processes and Equipment for Advanced Manufacturing of PV Technologies to Boost the European Energy Independence**
 Junjie Zhu¹, Helge Malmbeek¹, Rune Søndén¹, Carlos Escudero¹, Mario Silva¹
¹ IFE, Kjeller, Norway

VISUAL PRESENTATIONS 4DV.4

15:15 - 16:45 PV System Engineering
 Chairpersons: Kari Lappalainen
 Tampere University, Finland
 João M. Almeida Serra
 University of Lisbon, Portugal

- 4DV.4.3 Predicting Shading Losses in Photovoltaic Plants: a Novel Approach**
 Daniel López Dalmau¹, Haritz Mirandona López¹, Carlos J. Lopes Gomes¹, Joan Tomás Villalonga Palou¹, Carlos Rossa¹
¹ Sólida Renewable Energies - Genergia, Madrid, Spain
- 4DV.4.4 Backtracking 3D: a Novel Approach to Conventional Backtracking Algorithms for Improved PV Performance in Complex Terrains**
 Joan Tomás Villalonga Palou¹, Daniel López Dalmau¹, Haritz Mirandona López¹, Carlos Javier Lopes Gomes¹, Carlos Rossa¹
¹ Sólida Renewable Energies - Genergia, Madrid, Spain
- 4DV.4.5 Efficient Assessment of Glare Mitigation Techniques near Residential Areas and Land Transportation Infrastructure**
 Marta Irena Murkowska¹, Jon Kobberup¹, Karina Bredelle¹
¹ EMD International, Aalborg, Denmark
- 4DV.4.6 PV Off-Grid Systems for Cascade Refrigeration of Pharmaceutical Products, Cooling of Food and Tap Water Treatment in Africa**
 Lukas Omlin¹, Kilian Kälin¹, Andreas Reber¹, Paul Gantenbein¹, Mihaela Dudita¹, Kirsten Laaks², Ina Colombo³, Oliver Schmid³, Michael Kauffeld³
¹ OST – University of Applied Sciences, Rapperswil, Switzerland; ² Everflo, Cape Town, South Africa; ³ International Institute of Refrigeration, Paris, France

- 4DV.4.7 Evaluation of Front Eave Load Caused by Snow Accumulation on Photovoltaic Array**
 Tadanori Tanahashi¹, Takahiro Chiba², Satoru Adachi³, Hayato Arakawa³, Yuki Tsuno¹, Kazuaki Ikeda¹, Takashi Oozeki¹
¹ AIST, Koriyama, Japan; ² Hokkaido University of Science, Sapporo, Japan; ³ NIED, Shinjo, Japan
- 4DV.4.8 Flexible and Centralized Digital Solution to Support the Energy Assessment Across the Whole Lifecycle of Utility-Scale Solar PV Plants**
 Stefano Latella¹, Valerio Sabatini¹, Orazio Privitera², Matteo Carbone¹
¹ ENEL Green Power, Rome, Italy; ² ENEL Green Power, Catania, Italy
- 4DV.4.9 Experimental Set-up for Validation of Maximum Power Point Tracking Algorithms for Photovoltaic Arrays**
 Laura Sanchez¹, Gorka Torre¹, Jesus Sanchez², Alexander Maiz², Alain Sanchez-Ruiz², Josu Jugo¹, Eneko Ortega¹
¹ UPV/EHU, Leioa, Spain; ² UPV/EHU, Vitoria-Gasteiz, Spain
- 4DV.4.11 Sizing Photovoltaic Self-Consumption Systems through Mismatch Index and Profitability Analysis**
 Kiane Alves e Silva¹, Luis Miguel Carrasco¹, Eduardo Lorenzo¹
¹ UPM, Madrid, Spain
- 4DV.4.13 Methodology for the Design of Off-Grid Photovoltaic Systems for Residential Electric Vehicle in Shared Transportation Services**
 David Leonardo Rodríguez Salazar¹, Johann Alexander Hernández Mora¹
¹ District University of Bogotá, Bogotá, Colombia
- 4DV.4.14 On-Site Quality Control Plan for Battery Energy Storage Systems (BESS) in Renewable Energy Applications**
 Sergio Suarez Sanchez¹, Mario Martinez Gonzalez¹, Daniel Villoslada Fontán¹, Jonathan Vilela de la Fuente¹, Gustavo Navas¹, Sofia Rodriguez Conde¹
¹ Enertis Applus+, Madrid, Spain
- 4DV.4.15 Independent Structural Reviews of PV Tracker**
 Max Dinkelaker¹, Fabian Gross¹, Matthias Bohn¹, Alf Oschatz¹
¹ sbp sonne, Stuttgart, Germany
- 4DV.4.16 Performance Evaluation of Installed Bifacial PV Modules: Towards the Ground Albedo Enhancement**
 Dounia Dahlioui¹, Steve Schading¹, Ingar Alvaro Høyve², Tore Sandnes Vehus¹
¹ University of Agder, Grimstad, Norway; ² Solkraft Sør, Øyslebø, Norway
- 4DV.4.17 Field-Based Evaluation of Small-Scale PV Systems: Compliance and Installation Practices in Finland**
 Juho Ylipaino¹, Aki Kortetmäki¹, Marko Ylinen², Kari Kallioharju¹, Juha Koskela³
¹ TUAS, Tampere, Finland; ² Satakunta University of Applied Sciences, Pori, Finland; ³ Tampere University, Tampere, Finland
- 4DV.4.18 The Impact of Virtual Net-Metering Allocation on Self-Consumption Ratios in Multi-Dwelling Building Photovoltaic Systems**
 Aki Kortetmäki¹, Juho Ylipaino¹, Kari Kallioharju¹, Juha Koskela², Pertti Järventausta²
¹ TUAS, Tampere, Finland; ² Tampere University, Tampere, Finland



4DV.4.19 IAM Models and Photovoltaic Energy Yield Simulations

Felipe Ríos-Ledesma¹, Laura Barrutia¹, Javier Ledesma¹, Luis Narvarte¹,
Eduardo Lorenzo¹

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4DV.4.21 Estimations of a PV Performance Tool Compared against Measured Data

Katherine Alvino Saavedra¹, Nicolas Zalachas², Maroun Nemer¹

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4DV.4.22 Minimizing the Load Loss Probability (LLP) in a Dairy Sheep Farm Powered by an Isolated Photovoltaic System

Eduardo Fernández Cabal¹, Ignacio García-Ruiz², Cristina Alonso-Tristán¹

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4DV.4.23 Examination of Optimal Design Methods for Large-Scale Photovoltaic System Installed on Sloping Land

Koshi Matsunaga¹, Kenji Araki¹, Yasuyuki Ota¹, Kensuke Nishioka¹

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4DV.4.24 Estimating Future Soiling Losses using Climate Change Models

Gerardo Guerra¹, Pau Mercade Ruiz¹, Gaetana Anamiati¹, Lars Landberg²

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4DV.4.25 Maximum Power Point Tracking Method for Grid-Connected Photovoltaic Systems Using Maximum Power Line

Hyoung-Kyu Yang¹, Seok Won Kim¹, Dongmyoung Joo¹, Yong-Su Noh¹,
Jin-Hong Kim¹

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4DV.4.26 Modelling, Implementation and Validation of Solar Tracking Algorithms in Horizontal Single Axis Trackers

Nuria López¹, Mathis Pasquier², Nicholas Riedel-Lyngskær³, Sergiu V. Spataru¹

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4DV.4.27 Instrumentation to Evaluate Single-Axis Tracker Operation and Irradiance Transposition Calculations

Anton Driesse¹, Maddalena Bruno²

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