

- 3AV.1.9 Scalable Electrospun PVA/SiO₂ Nanofiber Mats Enabling Daytime Passive Radiative Cooling**
Rameeja T. Abdul Rasheed¹, Sneha Mohanan¹, Akhil A. C.¹, Dhanya P. Jacob¹, Aldrin Antony¹
¹ Cochin University of Science and Technology, Ernakulam, India
- 3AV.1.10 Honeycomb-structured Light-Weight Photovoltaic Module with High Strength and Durability**
Taiyufei Liu¹, Takuto Ikeda¹, Michio Kondo², Hiroyuki Wada¹
¹ Institute of Science Tokyo, Yokohama, Japan; ² Waseda University, Tokyo, Japan
- 3AV.1.11 Integrated Photovoltaic Façades for Industrial Buildings: Adhesion Approaches between Backsheet and Galvanized Steel**
Nikolina Pervan¹, Lukas Geymayer², Martin Fleischanderl³, Hannes Kurz³, Gregor Kitzberger³, Friedrich Füreder-Kitzmüller³, Gernot Oreski¹
¹ Polymer Competence Center Leoben, Leoben, Austria; ² voestalpine Stahl, Linz, Austria; ³ voestalpine Stahl, Linz, Austria
- 3AV.1.12 Investigation of P1/P2/P3 Laser Patterning using Femtosecond and Nanosecond Regimes in Kesterite Thin-Film Solar Cells**
Fernando Zahid Anguiano Olivares¹, D. Canteli², Cristina Muñoz García², David Muñoz Martín², Jacob Antonio Andrade Arvizu³, Victor Izquierdo Roca³, Pedro Vidal Fuentes³, Gilberto Gomez Rosas¹, Miguel Morales Furió², Carlos Molpeceres Álvarez²
¹ University of Guadalajara, Jalisco, Mexico; ² UPM, Madrid, Spain; ³ IREC, Barcelona, Spain
- 3AV.1.13 Ultrasonic Monitoring of Ethylene-Vinyl Acetate Encapsulants during Glass-Glass Module Lamination**
Christopher Bruce Konu¹, Rico Meier¹
¹ HTW Berlin, Berlin, Germany
- 3AV.1.14 A Lamination-Stage Soldering Approach for Lead-Free, Low-Temperature Cell Interconnection: Towards Industrially Relevant Interconnection Solutions**
Raphael Shanmugam¹, M. Ignacia Devoto Acevedo¹, Jonas Buddgard², Torgny Lagerstedt², Anirudh Inginshetty², Abhinav Mulasi², Tobias Meßmer¹
¹ ISC Konstanz, Konstanz, Germany; ² Sticky Solar Power, Sollentuna, Germany
- 3AV.1.15 A Self-Healing and Self-Cleaning Transparent Coating for Photovoltaic Solar Panels**
Mehmet Bilgehan Bilgic¹, Ceylan Zafer¹
¹ Ege University, Izmir, Türkiye
- 3AV.1.16 Cost of Ownership Comparison of 3-cut and Shingled Modules with Standard TOPCon Half-cut PV Modules**
Sraisth Sraisth¹, Julian Reichle¹, Hardik Gohil², Mehul Raval¹, Markus Beck¹, Xinyang Li³, Ehtesham Anwer⁴, Wolfgang Jooss¹
¹ RCT Solutions, Constance, Germany; ² RCT Solutions India, Hyderabad, India; ³ Wuhan RCT PV Technology, Wuhan, Germany; ⁴ RCT Solutions India, Hyderabad, Germany
- 3AV.1.17 Design and Manufacture of Hybrid Photovoltaic Thermal Module using Aluminium Tube Based Thermal Absorber**
Paulius Laurikėnas¹, Julius Denafas¹, Povilas Lukinskas¹, Pal Tettie², Martin Bellmann², Yijiang Xu²
¹ SoliTek R&D, Vilnius, Lithuania; ² SINTEF Industry, Trondheim, Norway
- 3AV.1.18 Understanding and Mitigating Encapsulation-Induced Voltage Losses in Perovskite Solar Modules**
Yves Abou Khalil¹, Cynthia Farha¹, Mathis Duplouy¹, Van Son Nguyen¹, Liam Gollino¹, Marion Provost¹, Thomas Guillemot¹, Jean Rousset², Karim Medjoubi¹
¹ IPVF, Palaiseau, France; ² EDF, Palaiseau, France
- 3AV.1.19 Platform for Process Development for Glass Cutting, Glass Drilling, Glass-Glass and Glass-Metal wWiding on 1m2 Substrates**
Stefan Bergfeld¹, Tsvetelina Merdzhanova²
¹ Aachen University of Applied Science, Jülich, Germany; ² FZJ, Jülich, Germany
- 3AV.1.20 Flexible Lamination Concepts for Durable CIGS Photovoltaic Modules**
Nikolina Pervan¹, Nikoleta Kyranaki², Casper van Kessel³, Dorrit Roosen-Melsen³, Michaël Daenen⁴, Gernot Oreski¹
¹ PCCL, Leoben, Austria; ² Hasselt University, Genk, Belgium; ³ TNO, Eindhoven, The Netherlands; ⁴ imec, Leuven, Belgium
- 3AV.1.21 New Developments of Transparent Polymer Materials in Frontsheet Films as Valid Alternative to Glass**
Alessandro Anderlini¹
¹ Coveme, Gorizia, Italy
- 3AV.1.22 Implementation of an Industrial Process for Interconnection of Busbar-less IBC ZEBRA Cells using Ribbons with Electrically Conductive and Non-Conductive Adhesive Pads**
Tudor Timofte¹, Jolina Schmid¹, Simon Emmerich², Susana Soto³, Jean Philippe Aguerre³, Xabier Hernandez³, Maximilian Pospischil⁴, Andreas Dörflinger⁴, Jonas Albrecht⁴, Maximilian Weil⁴, Stephan Großer⁵, Giuseppe Galbiati⁶, Tobias Nitsche⁶, Daniel Buckland⁶, Joris Libal¹, Tobias Messmer¹
¹ ISC Konstanz, Konstanz, Germany; ² Mondragon Assembly, Radolfzell, Germany; ³ Mondragon Assembly, Aretxabaleta, Spain; ⁴ HighLine Technology, Freiburg, Germany; ⁵ Fraunhofer CSP, Halle (Saale), Germany; ⁶ Henkel, Düsseldorf, Germany
- 3AV.1.23 Multi-Wire Module Modeling, Measuring and More**
Jonathan Govaerts¹, Bart Reekmans¹, Hamed Javanbakht Lomeri¹, Tom Borgers¹, Mihir Mahajan¹, Valerie Depauw¹, Hariharsudan Sivaramakrishnan Radhakrishnan¹
¹ imec-EnergyVille-UHasselt, Genk, Belgium
- 3AV.1.24 Development of a Photovoltaic Facade Module**
Ringo Koepge¹, Matthias Pander¹, Sophia Jahreis¹, Nick Schröter¹, Paul Schenk¹, Ali Kanou¹, Wiebke Wirtz², Kevin Meyer², Henning Schulte-Huxel², Stephan Großer¹, Bengt Jaeckel¹
¹ Fraunhofer CSP, Halle (Saale), Germany; ² ISFH, Emmerthal, Germany

VISUAL PRESENTATIONS 3AV.2

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

3AV.2.1 Experimental Repair Technique for Glass Defects of Glass-glass Photovoltaic Modules – A Performance Assessment

Chris Heynen¹, Mathijs Tas², Maurice Goris³, Petra Manshanden⁴, Pim Broekhuizen², Ben Reijntjes⁵, Veronique Gevaerts⁴, Wilfried Van Sark¹
¹ Utrecht University, Utrecht, The Netherlands; ² Boldz, Amsterdam, The Netherlands; ³ TNO, Petten, The Netherlands; ⁴ TNO, Eindhoven, The Netherlands; ⁵ Glass Solution Windowfilm, Purmerend, The Netherlands

3AV.2.2 Country-Scale Monitoring of PV Soiling and Atmospheric Conditions: The Qatar Dust Atlas

Brahim Aissa¹, Atef Zekri¹, Mohamed Abdellrahim¹, Mosab Subeh¹, Mohammad Hossain¹, Dhanup Somasekharan Pillai¹
¹ QEERI, Doha, Qatar

3AV.2.3 PVSPICE: Integration of Electrical Circuit Simulations for PV Degradation Simulations

Norman Jost¹, Brandon K. Byford¹, Jennifer L. Braid², Clifford W. Hansen²
¹ Sandia National Laboratories, Albuquerque, United States of America; ² Sandia National Labs, Albuquerque, United States of America

3AV.2.4 UVID Test Results and Early Indicators

Matthias Pander¹, Bengt Jaeckel¹
¹ Fraunhofer CSP, Halle (Saale), Germany

3AV.2.5 Determination of the Optical Properties of Encapsulants during UV Weathering Using a Four-Flux Model

Rosa Zaigouche-Feldis¹, Mathieu Hebert², Maxime Darnon², Philippe Thony¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² LabHC, Saint-Etienne, France

3AV.2.6 UV-Induced Degradation of PV Modules: a Comparative Study of Light Spectra and Encapsulants

Markus Babin¹, Yuliya Voronko², Gabriele C. Eder², Sune Thorsteinsson¹, Markus Feichtner³
¹ DTU, Roskilde, Denmark; ² OFI, Vienna, Austria; ³ Sonnenkraft, St. Veit/Glan, Austria

3AV.2.7 Evaluation of a Custom-built Integrated Setup for Microscopic Characterization of the Mechanical Stability of Flexible Perovskite Solar Cells

Andreas Bartel¹, Rico Meier¹
¹ University of Applied Science Berlin, Berlin, Germany

3AV.2.8 Outdoor Degradation Assessment from Field Measurements: Isolating Irreversible Degradation from Measured Performance Indicators

Robinson Cavieres¹, Felipe Valencia¹
¹ ATAMOSTEC, Antofagasta, Chile

3AV.2.9 Indoor Characterizations of Modules made from Recycled Silicon

Mickael Albaric¹, Etienne Pihan², Marion Serasset³, Guillaume Capron²
¹ CEA / INES, Le Bourget du Lac, France; ² CEA/INES, Le Bourget du Lac, France; ³ CEA/INES, Le Bourget du lac, France

3AV.2.10 NIR Spectroscopy and Chemometrics as a Tool for Non-Destructive Polymer Degradation Analysis in PV Modules

Anika Gassner¹, Gabriele C. Eder¹, Benedikt Hufnagl², Vasilaki-Maria Archodoulaki³
¹ OFI, Vienna, Austria; ² Hufnagl Chemometrics, Mödling, Austria; ³ Vienna University of Technology, Vienna, Austria

3AV.2.11 PVcracks: Python Repository for Electroluminescence Image Processing, Current-voltage Curve Fitting and Power Loss Estimation

Norman Jost¹, Brandon K. Byford¹, Rodrigo d. Prado Santamaria², Clifford W. Hansen¹, Jennifer L. Braid¹
¹ SNL, Albuquerque, United States of America; ² DTU, Roskilde, Denmark

3AV.2.12 Acceleration of Thermal Cycling Test for PV Modules

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.2.13 Reliability Comparison of P-Type PERC and N-Type TOPCon PV Modules Based on IEC Testing and Encapsulation Materials

San-Yu Ting¹, Yung-Jen Shyong¹, Sheng-Cong You¹, Min-An Tsai¹
¹ ITRI, Hsinchu, Taiwan

3AV.2.14 ReBEL Imaging to Understand Reverse Bias Breakdown Behaviour in Perovskite Devices

Remi Aninat¹, Klaas Bakker¹, Jonathan Henzel¹, Mehrdad Najafi¹, Sjoerd Veenstra¹, Mirjam Theelen¹
¹ TNO, Eindhoven, The Netherlands

3AV.2.15 Lightweight SHJ Modules with Reduced Environmental Impact: an Iterative Approach of BOM Development and Validation

Timea Bejat¹, Lison Marthey², Adeline Lanterne¹
¹ CEA-INES, Le Bourget du Lac, France; ² CSEM, Neuchâtel, Switzerland

3AV.2.16 New Encapsulants Polymers in Photovoltaic Modules

Francesco Levi¹, Valeria Fiandra², Lucio Sannino², Concetta Andreozzi², Antonella De Maria², Paola Delli Veneri², Lucia Vittoria Mercaldo², Odda Ruiz de Ballesteros¹, Finizia Auriemma¹
¹ University of Naples Federico II, Naples, Italy; ² ENEA, Portici, Italy

3AV.2.17 Research on IEC Test Method to Assess Resistance of PV Modules to Foot Traffic During Installation or Maintenance

Tong Yu¹
¹ Jinko Solar, Jiaxing, China

3AV.2.18 Usage, Market Trends, and Moisture Ingress Simulation of Edge Sealants for Photovoltaics Modules

Ashish D. Rana¹, Nikoleta Kyranaki¹, Ismail Kaaya², Loic Guillemot³, Camille Bainier³, Michael Daenen⁴
¹ UHasselt, Hasselt, Belgium; ² imec, Genk, Belgium; ³ Total Energies, Paris, France; ⁴ UHasselt, Hasselt, France



- 3AV.2.19 Two Years Outdoor Performance Measurement of Two Different 35cm² Perovskite Mini-modules**
Jonathan Lehmann¹, Aranzazu Aguirre², Tom Aernouts², Yinghuan Kuang², Tamara Merckx², Anurag Krishna², Stijn Scheerlinck¹, Quentin Van Nieuwenhoven¹
¹ ENGIE Laborelec, Linkebeek, Belgium; ² imec, Genk, Belgium
- 3AV.2.20 FEM Model Development and Extensive Verification of Glass/Backsheet and Glass/Glass PV Modules Using Solar Cell Integrated Stress Sensors**
Pascal Romer¹, Eric Heppner¹, Andreas J. Beinert¹, Jochen Markert¹, Christof Erban²
¹ Fraunhofer ISE, Freiburg, Germany; ² SUNOVATION, Freiburg, Germany
- 3AV.2.21 Investigating the Impact of Mounting Clamps and Frame Adhesive Joints on Glass Breakage of PV Modules**
Pascal Romer¹, Andreas J. Beinert¹, Jochen Markert¹, Dennys Koch²
¹ Fraunhofer ISE, Freiburg, Germany; ² RWE Renewables, Hannover, Germany
- 3AV.2.22 Understanding TOPCon Glass-Backsheet PV Modules Damp Heat Degradation: why 'Standard' BOM Should be Avoided?**
Sraisth Sraisth¹, Mehul Raval¹, Oliver Voigt¹, Xinyang Li², Hardik Gohil³, Marius Luedemann⁴, Michael Wendt⁴, Jishnu Ramachandran Nair⁴, Markus Beck¹, Wolfgang Jooss¹, Anton Mordvinkin⁴, Robert Heidrich⁴
¹ RCT Solutions, Constance, Germany; ² Wuhan RCT PV Technology, Wuhan, China; ³ RCT Solutions India, Hyderabad, India; ⁴ Fraunhofer CSP, Halle (Saale), Germany
- 3AV.2.23 Strength Testing of Full-Size Solar Glass**
Matthias Pander¹, Paul Schenk¹, Bengt Jaeckel¹
¹ Fraunhofer CSP, Halle (Saale), Germany
- 3AV.2.24 Non-Destructive Detection of Moisture Ingress in PV Modules Using NIR Spectroscopy and Hyperspectral Imaging**
Lukas Neumaier¹, Martin De Biasio¹, Anika Gassner², Markus Feichtner³, Simon Prüller⁴, Gabriele C. Eder²
¹ SAL, Villach, Austria; ² OFI, Vienna, Austria; ³ Sonnenkraft, St.Veit/Glan, Austria; ⁴ 2nd Cycle FlexCo, Amstetten, Austria
- 3AV.2.25 Characterization Methods for Perovskite Mini-Module Analysis**
Claudia Buerhop-Lutz¹, Ones Ghaffari¹, Shudi Qiu², Michael Wagner¹, Oleksandr Stroyuk¹, Ian Marius Peters¹
¹ HI ERN, Erlangen, Germany; ² FAU, Erlangen, Germany
- 3AV.2.26 Degradation Mechanisms of Perovskite Solar Cells Under Arid Environmental Conditions**
Mohammad Istiaque Hossain¹, Alaa Elsafi¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar
- 3AV.2.27 Reliability of Screen-Printed Copper Metallization in SHJ Modules**
E. Busra Kucuk¹, Lars A. G. Okel¹, Yu Wu¹, Astrid Gutjahr¹, Bart Geerligns¹, Victor Rosca¹
¹ TNO, Petten, The Netherlands
- 3AV.2.28 Mechanical Behaviour of Framed Glass/Backsheet PV Modules: Influence of Frame Geometry and Mounting Configuration**
Paul Messaoudi¹, Maxime Babics¹, Francesco Giordano², Vincent Barth¹, Timea Bejat¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² 3SUN, Catania, Italy
- 3AV.2.29 Reverse-bias Onset under Bird-Dropping Soiling: a Parametric Electrical Model for PV Module Hotspot Risk**
Baris Dai¹, Minne de Jong¹, Jan Kroon²
¹ TNO, Eindhoven, The Netherlands; ² TNO, Petten, The Netherlands
- 3AV.2.30 Reliability of TOPCon Super Multi Busbar Modules: Role of the Soldering Flux**
Germain Rey¹, Marion Serasset¹, William Denis¹, Lucie Pirot-Berson¹, Rémi Monna¹
¹ CEA / INES, Le Bourget du Lac, France
- 3AV.2.31 New Encapsulants Polymers in Photovoltaic Modules**
Francesco Levi¹, Valeria Fiandra², Lucio Sannino², Concetta Andreozzi², Antonella De Maria², Paola Delli Veneri², Lucia Vittoria Mercaldo², Odda Ruiz de Ballesteros³, Finizia Auriemma¹
¹ University of Naples Federico II, Naples, Italy; ² ENEA, Portici, Italy; ³ ENEA, Naples, Italy
- 3AV.2.32 UV-induced Degradation in State-of-the-Art HJT and TOPCon Solar Cells and Its Mitigation through Encapsulants**
Shilpi Shital¹, Carlo Fanara¹, Philip Hart¹, Aziz Nairi², Lili Wang¹
¹ TII, AbuDhabi, United Arab Emirates; ² SERIS, Singapore, Singapore
- 3AV.2.33 Investigation of the UV-Induced Degradation of Lightweight Silicon Heterojunction Solar Modules**
Rongda Zhang¹, Kai Zhang¹, Andreas Lambertz¹, Luo Bin¹, Henrike Gattermann¹, Karsten Bittkau¹, Andreas Gerber¹, Benedikt Fischer¹, Yanxin Liu¹, Uwe Rau¹, Sebastian Münstermann², Kaining Ding¹
¹ FZJ, Jülich, Germany; ² RWTH Aachen University, Aachen, Germany
- 3AV.2.34 New Method for Evaluation of Resistances inside PV Modules**
Ilya Chebunin¹, Jonathan Govaerts¹
¹ Imec, Genk, Belgium
- 3AV.2.35 Increased Degradation of n-type PV Modules in Field Operational Systems**
Ariel Holin¹, Rafael Fleischman¹, Lior Sarig¹
¹ SolarEdge Technologies, Herzliya, Israel
- 3AV.2.36 Accelerated Life Testing for Photovoltaic Modules: Correlating Damp Heat (DH) and Pressure Cooker Test (PCT)**
Jiaqi Song¹, Xian Jiang¹, Jikai Kang¹, Hansong Guo¹, Yu Chen¹, Chen Li¹, Zhenguo Li¹
¹ Longi Green Energy Technology, Xi'an, China
- 3AV.2.38 Anti-Soiling and Anti-Reflective Properties of a Durable Coating for Solar Cover Glass**
Carmen Wang¹, Madupa Abeywardena¹, QianFeng Xu², Alan Lyons¹
¹ City University of New York, New York, United States of America; ² ARL Designs, Summit, United States of America



3AV.2.39 Development of Polymer-Modified Polyvinylidene Fluoride and Glass Fiber Composites for the Functional Repair of Photovoltaic Backsheets

Carlos González Montesdeoca¹, Luis Manuel Ocaña González¹, Benjamín González-Díaz², Sara González-Pérez², María Elena Llairema García¹

¹ ITER, Granadilla de Abona, Spain; ² ULL, San Cristóbal de La Laguna, Spain

3AV.2.40 Investigating Liquid vs Vapor Moisture Ingress and Resulting Degradation in TOPCon Modules

Nathan Roosloot¹, Gaute Otnes¹, Jan Kroon², Oguzhan Apaydin², Thomas Kaltenbach³, Josefine Selj¹

¹ IFE, Kjeller, Norway; ² TNO, Petten, The Netherlands; ³ Fraunhofer ISE, Freiburg, Germany

3AV.2.41 When Spectra Speak: AI Maps Hidden Polymer Degradation

Brahim Anis Belferkous¹, Chiara Barretta¹, Gernot Oreski¹

¹ PCCL, Leoben, Austria

3AV.2.42 Examples of Real-Life Failure and Claim Challenges of PV Modules at Different Stages of the Life-Cycle from Planning and Production to O&M and Monitoring

Hamed Hanifi¹

¹ AESOLAR, Königsbrunn, Germany

VISUAL PRESENTATIONS 3AV.3

17:00 - 18:30 PV Module Performance – Modelling, Testing, Standards

3AV.3.1 Cell-Resolved Quantification of Shunt Resistance in Photovoltaic Modules via Electroluminescence Imaging

Riya Sharma¹, K. L. Narasimhan¹, B. M. Arora¹, Anil Kottantharayil¹, Narendra Shiradkar¹

¹ IIT Bombay, Mumbai, India

3AV.3.2 Development and Light Transmittance Measurements of Semitransparent c-Si PV Modules for Agrivoltaics

Shu-Ngwa Asa'a¹, Arvid van der Heide², Giacomo Bizinoto Ferreira Bosco³, Hariharsudan Sivaramakrishnan Radhakrishnan², Jef Poortmans², Michael Daenen¹

¹ UHasselt, Hasselt, Belgium; ² imec, Leuven, Belgium; ³ FOTONIQ, Delft, The Netherlands

3AV.3.3 Energy Yield and Lifetime Climate Classification via Machine Learning for Optimizing PV Module Designs and Bill of Materials

Youri Blom¹, Sofia Dutto², Jing Sun¹, Rudi Santbergen¹, Olindo Isabella¹, Malte Ruben Vogt¹

¹ TU Delft, Delft, The Netherlands; ² University of Naples Federico II, Naples, Italy

3AV.3.4 Implementation of an Optimized Multi-Spectrum Method for Determining the Spectral Responsivity of Solar Cells and Modules

Ronak Mahpeyma¹, Ingo Kröger¹, Hendrik Sträter¹, Stefan Winter¹

¹ PTB, Braunschweig, Germany

3AV.3.5 Characterizing Early Commercial Perovskite Modules

Claudia Buerhop-Lutz¹, Ones Ghaffari¹, Bernhardt Kaesser¹, Ian Marius Peters¹

¹ HI ERN, Erlangen, Germany

3AV.3.6 Scanning System for Field Photoluminescence Imaging of PV Modules based on Modulated Light Source

Gisele A. dos Reis Benatto¹, Carl Emil Elling², Jeppe Elias Ekberg Jensen¹, Peter Behrendorff Poulsen¹, Liviu Stoicescu³, Sergiu V. Spataru¹

¹ DTU, Roskilde, Denmark; ² Danish PV Service, Roskilde, Denmark; ³ Solarzentrum Stuttgart, Stuttgart, Germany

3AV.3.7 Energy-yield Modelling of Low-footprint SHJ Modules with Transparent Passivating Contacts

M. Zeman¹, P. Procel Moya², Y. Zhou¹, M. Verkou¹, M. Leonardi³, D. Di Girolamo³, G. Giuliano³, F. Rametta³, M. Foti³, C. Gerardi⁴, K. Bittkau⁵, A. Eberst⁵, K. Ding⁵, Y. Blom², M. R. Vogt², R. Santbergen², O. Isabella²

¹ PV Works, Delft, The Netherlands; ² TU Delft, Delft, The Netherlands; ³ 3SUN, Catania, Italy; ⁴ 3SUN, Catania, The Netherlands; ⁵ FZJ, Jülich, Germany

3AV.3.8 Temperatur Behaviour of Different Solar Cells Architectures for Reverse Breakdown

Bengt Jaeckel¹, Matthias Pander¹, Hamed Hanifi²

¹ Fraunhofer CSP, Halle (Saale), Germany; ² AESOLAR, Königsbrunn, Germany

3AV.3.9 Impact of Spectral Response Variability on Power Determination of Single-Junction Perovskite Modules

Wenhao Xu¹, Yating Zhang¹, Mengdi Liu¹, Christos Monokroussos¹, Giorgio Bardizza², Max Koentopp³, Zhen Li⁴, Ralph Gottschalg⁵

¹ TÜV Rheinland (Shanghai), Shanghai, China; ² TÜV Rheinland (Italy), Milan, Italy; ³ TÜV Rheinland Solar, Cologne, Germany; ⁴ UNSW, Sydney, Australia; ⁵ Fraunhofer CSP, Halle, Germany

3AV.3.10 Soiling Dynamics and Performance Mitigation in Bifacial Photovoltaic Modules Enabled by Anti-Dust Coatings

Brahim Aissa¹, Amir Abdallah¹, Mohammad I. Hossain¹, Dhanup Somasekharan Pillai¹

¹ QEERI, Doha, Qatar

3AV.3.11 Investigation of Soiling Losses on Ethylene Tetrafluoroethylene (ETFE) Front-sheets for Flexible Thin-film PV Applications

K. P. Sreejith¹, Kenneth Mathew¹, Peer Sluijs¹, Arno H. M. Smets¹

¹ TU Delft, Delft, The Netherlands

3AV.3.12 Characterization and Reliability Testing of Segmented PV Modules and their Main Components based on a Practical Outdoor Test

Simon Karl¹, Jens Schneider², Jens Froebel¹, Matthias Pander¹, Pouya Pourshafii³, Andreas Maixner³, Bengt Jaeckel¹, Hamed Hanifi³

¹ Fraunhofer CSP, Halle (Saale), Germany; ² HTWK, Leipzig, Germany; ³ AESOLAR, Königsbrunn, Germany

3AV.3.13 Wind-Interactive Surface Micro-Elements for Mitigating Light Soiling on PV Modules: Performance Mechanism and Preliminary Evaluation

Yoel Sefi¹, Hadar Sefi¹

¹ Dustoss, Malkiya, Israel



- 3AV.3.14 Exploring fast and low Cost I-V Characterization Techniques to extract PV Module Characteristics**
Tommaso Michelon¹, Giacomo Peruzzi¹, Andrea Targa¹, Alessandro Caria¹, Matteo Meneghini¹, Gaudenzio Meneghesso¹, Alessandro Pozzebon¹, Nicola Trivellin¹
¹ University of Padova, Padova, Italy
- 3AV.3.15 Innovative Urban PV Installations using Matrix Shingle Technology – Solar Tiles, Noise Barriers and Carports**
Paul Rémondeau¹, Florian Ollagnon¹, Gaétan Carrier², Mehdi Sahli³, Jacob Forster⁴, Christian Reise⁴, Davide Avantaggiato⁵, John Morello⁶, Antonin Faes¹, Christophe Ballif¹
¹ EPFL, Neuchâtel, Switzerland; ² FREESUNS Solar Roofs, Colombier, Switzerland; ³ Voltec Solar, Dinsheim sur Bruche, France; ⁴ Fraunhofer ISE, Freiburg, Germany; ⁵ Etway, Trento, Italy; ⁶ FREESUNS SA Solar Roofs, Colombier, Switzerland
- 3AV.3.16 Soiling Loss Study of Solar Photovoltaics using Glass Coupons Approach in Outdoor Conditions of Sydney, Australia**
Naveed Hussain¹, Stephen Bremner¹, Fiacre Rougieux¹, Abhnil Prasad¹, Merlinde Kay¹
¹ UNSW, Sydney, Australia
- 3AV.3.17 Assessment of Bifacial PV Modules Power Matrix under Indoor Conditions**
Teodora Stoyanova Lyubenova¹, Ewan D. Dunlop¹
¹ Joint Research Centre, Ispra, Italy
- 3AV.3.18 Review of WPVS Missuses in Solar Simulator Calibration**
Gilles Arnoux¹, Christian Dreier¹, Damien Etienne¹, Bertrand Paviet-Salomon², Jonas Geissbühler², Tonio Buonassisi², Vincent Paratte¹
¹ PASAN, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland
- 3AV.3.19 Uncertainty in I-V Measurements of IBC Photovoltaic Modules using Spire and Pasan Sun Simulators**
Nishant Kumar¹, K. L. Narasimhan¹, B. M. Arora¹, Narendra Shiradkar¹
¹ IIT Bombay, Mumbai, India
- 3AV.3.20 Daily and Seasonal Investigation of the Spectral Mismatch Factor of Perovskite Based Devices**
Sumeet Santosh Mujumdar¹, Matthew Norton¹, Vasiliki Paraskeva¹, Elias Peraticos¹, Andreas Kyprianou¹, George E. Georghiou¹, Maria Hadjipanayi¹
¹ University of Cyprus, Nicosia, Cyprus
- 3AV.3.21 Comparative Field Validation of an Integrated Agrivoltaic System in a Desert Environment**
Sagarika Kumar¹, Min Hsian Saw¹, Mauro Pravettoni¹
¹ TII, Abu Dhabi, United Arab Emirates
- 3AV.3.22 Wireless In-situ Monitoring of Temperature, Humidity and Outgassing in Encapsulated Perovskite Solar Cells**
Marko Jankovec¹, Mark Urbančič¹, Arslan Ali¹, Kristijan Brecl¹, Špela Tomšič¹, Antonin Faes², Marko Jošt¹, Marko Topič¹
¹ University of Ljubljana, Ljubljana, Slovenia; ² EPFL, Neuchâtel, Switzerland
- 3AV.3.23 Modular and Tunable Open-source LED Solar Simulator for Enhanced Spectral Fidelity**
Leonardo Sollazzo¹, Rachele Grazzi¹, Valentina Diolaiti¹, Nazim Aslam¹, Fabio Rossi¹, Diego Bernardoni¹, Eleonora Baccega¹, Donato Vincenzi²
¹ University of Ferrara, Ferrara, Italy; ² Consorzio Futuro in Ricerca, Ferrara, Italy
- 3AV.3.24 Impact of Wind on Vertical Bifacial Photovoltaic Systems: Thermal Modeling and CFD Analysis**
Amr Osama¹, Giuseppe Marco Tina¹, Antonio Gagliano¹, Stefano Aneli¹
¹ University of Catania, Catania, Italy
- 3AV.3.25 Extension of Analytical Thermal Models to Assess Integrated Photovoltaics and Mobile Applications**
Max Mittag¹, Alexander Protti¹, Christian Reichel¹, Holger Neuhaus¹
¹ Fraunhofer ISE, Freiburg, Germany
- 3AV.3.26 Spectral Mismatch Uncertainty in Energy Rating Calculations in Accordance with IEC 61853**
Werner Herrmann¹, Giorgio Bardizza², Christos Monokroussos³, Harald Müllejjans⁴, Lorenz Rimmelspacher⁵
¹ TÜV Rheinland, Cologne, Germany; ² TÜV Rheinland, Milan, Italy; ³ TÜV Rheinland, Shanghai, China; ⁴ European Commission JRC, Ispra, Italy; ⁵ Lorenz Rimmelspacher, Cologne, Germany
- 3AV.3.27 Comparative Analysis of I-V Curve Correction Methods for WPVS Reference Cells**
Wenhao Xu¹, Yating Zhang¹, Mengdi Liu¹, Christos Monokroussos¹, Giorgio Bardizza², Werner Herrmann³, Max Koentopp³, Ingo Kröger⁴, Stefan Winter⁴
¹ TÜV Rheinland (Shanghai), Shanghai, China; ² TÜV Rheinland (Italy), Pogliano Milanese, Italy; ³ TÜV Rheinland Solar, Cologne, Germany; ⁴ PTB, Braunschweig, Germany
- 3AV.3.28 Passive Geothermal-Assisted Thermal Regulation for Enhanced Photovoltaic Module Performance in Desert Environments**
Saji Salkalachen¹, Lokabhiraman Subbaraya¹
¹ Independent Researcher, Bangalore, India
- 3AV.3.29 Effect of Metastable States of Modern Solar Modules on Module Calibrations and Dark I-V-Curves**
Hasan Manavbasi¹, Stefan Riechelmann¹, Stefan Winter¹
¹ PTB, Braunschweig, Germany
- 3AV.3.30 Long-term Reliability Study of the Oldest PV System in Sweden**
Yusuf Rostom¹, Emmanouil Psimopoulos¹, André Augusto¹
¹ Dalarna University, Borlänge, Sweden
- 3AV.3.31 Reducing PV Operational Temperature by Radiative Cooling Coatings: a Thermal Transport Modeling Approach Using COMSOL**
Or Gindi¹, Sara Golroodbari¹, Wilfried Van Sark¹
¹ Utrecht University, Utrecht, The Netherlands
- 3AV.3.32 Estimation of the Effective DC Power Rating for Bifacial PV Arrays in an Arid Climate**
José R. Angulo Abanto¹, Juan de la Casa², Jan Amaru Töfflinger¹
¹ PUCP, Lima, Peru; ² University of Jaén, Jaén, Spain



3AV.3.33 Performance Assessment of Bifacial and Monofacial PERC Modules using an Accurate Method based on Superellipse Model

Khadija El Ainaoui¹, Mhammed Zaimi², Said Elhamaoui¹, Yasmine El mrabet¹, Khadija Ibaararen², Youssef Bouasria², Abdellatif Ghennioui¹, El Mahdi Assaid²

¹ Green Energy Park, Benguerir, Morocco; ² Chouaib Doukkali University, El Jadida, Morocco

3AV.3.34 Beyond Efficiency: Shading Tolerability as a Driver for Architecture Selection in Perovskite-on-Silicon Modules

Jose Maria Cuevas Davila¹, Hariharsudan Sivaramakrishnan Radhakrishnan², Patrizio Manganiello¹, Quentin Jeangros³, Jozef (Jef) Poortmans²

¹ imec, Genk, Belgium; ² imec, Leuven, Belgium; ³ CSEM, Switzerland, Slovenia

3AV.3.35 Thermo-Mechanical Analysis and Prediction of Shear Stresses by FEM in ECA/NCA Interconnects of IBC Solar Cells

Matthias Pander¹, Stephan Grosser¹, Tudor Timofte², Tobias Nitsche³, Daniel Buckland³, Giuseppe Galbiati³, Bengt Jaeckel¹

¹ Fraunhofer CSP, Halle (Saale), Germany; ² ISC Konstanz, Konstanz, Germany; ³ Henkel, Düsseldorf, Germany

3AV.3.36 Orientation-based Optimization of BIPV Colored Module Arrangement

Hyoungbeen Kim¹, Jaehyeong Lee²

¹ Sungkyunkwan University, Suwon, South Korea; ² University of Sungkyunkwan, Suwon, South Korea

Tuesday, 15. September 2026

VISUAL PRESENTATIONS 1BV.1

08:30 - 10:00 Single Junction Silicon Cells | Silicon Bottom Cells for Tandem Photovoltaics | Characterisation & Modelling of Silicon Cells

1BV.1.1 Optimization of n-type nc-SiO_x:H Window Layer for Silicon Heterojunction Solar Cells via CO₂-H₂ Pretreatment, Oxygen Content, and Thickness Variation

Vahdet Özyahni¹, Karsten Bittkau¹, Andreas Lambertz¹, Alexander Eberst¹, Uwe Rau¹, Kaining Ding¹

¹ FZJ, Jülich, Germany

1BV.1.2 Approaches to Enhance the VOC of Moly-Poly Hybrid c-Si Solar Cells

Yingwen Zhao¹, Yi Zheng¹, Liqi Cao¹, Paul Procel¹, Martijn Tijssen¹, Engin Özkol¹, Luana Mazzarella¹, Yifeng Zhao¹, Miro Zeman¹, Olindo Isabella¹

¹ Delft University of Technology, Delft, The Netherlands

1BV.1.3 Optimization of Boron-Doped Polycrystalline Silicon Passivating Contacts on Textured Silicon Surfaces

Clarisse Laurens-Berge¹, Raphaël Cabal¹, Sébastien Dubois¹

¹ CEA, Le-Bourget-du-Lac, France

1BV.1.4 Application of nc-SiC:H as Transparent Passivation Contacts in Silicon Heterojunction (SHJ) Solar Cells on Industrial Sizes

Karsten Bittkau¹, Alexandr Zamchiy¹, Binbin Xu¹, Alexander Werner¹, Andreas Lambertz¹, Alexander Eberst¹, Kaining Ding¹

¹ FZJ, Jülich, Germany

1BV.1.5 Viability of Ultrathin Crystalline Silicon Solar Cells below 70 µm

Vanesa Fano¹, Mario Cruz¹, Alvaro Briones¹, Alona Otaegi¹, Eneko Cereceda¹, Nekane Azkona¹, Eneko Ortega¹, Federico Recart¹, Jose Ruben Gutierrez¹, Juan Carlos Jimeno¹

¹ UPV/EHU, Bilbao, Spain

1BV.1.6 Research on the Dark-annealing-induced Passivation Degradation of TOPCon Solar Cell

Bangzhao Hong¹, Weiwei Deng¹, Haiyan Chen¹, Tao Xu¹

¹ Canadian Solar, Suzhou, China

1BV.1.7 Organic-Inorganic Hybrid Layer as a Passivating Electron-Selective Contact in Silicon Solar Cells

Milad Ghasemi¹, Naser Beyraghi¹, Selcuk Yerci¹, Rasit Turan¹, Hisham Nasser¹

¹ ODTÜ-GÜNAM, Ankara, Türkiye



- 1BV.1.8 High-Pressure Sputtered Sub-Stoichiometric TiO_x Electron-Selective Contacts Formed by In-Situ Plasma Oxidation for Crystalline Silicon Solar Cells**
Francisco José Pérez-Zenteno¹, Sebastian Duarte¹, Rafael Benítez-Fernández¹, Ignacio Torres², Rocio Barrio², Sari Algaidy³, Rodrigo García-Hernansanz¹, Javier Olea¹, David Pastor¹, Álvaro del Prado¹, Eric García-Hemme¹, Enrique San Andrés¹
¹ Complutense University of Madrid, Madrid, Spain; ² CIEMAT, Madrid, Spain; ³ UPM, Madrid, Spain
- 1BV.1.9 Greener TOPCon processing using UV/O₃ Oxidation and Microwave Annealing**
Rafael Benítez-Fernández¹, Cecilia Mata-Alonso¹, Francisco Pérez-Zenteno¹, Sebastián Duarte-Cano¹, Ignacio Torres², Rocio Barrio², Nieves Gonzalez², Sari Algaidy¹, Javier Olea¹, David Pastor¹, Álvaro del Prado¹, Ignacio Mártil¹, Enrique San Andrés¹, Rodrigo García-Hernansanz¹, Eric García-Hemme¹
¹ Complutense University of Madrid, Madrid, Spain; ² CIEMAT, Madrid, Spain
- 1BV.1.10 Optimization of Back-Contacted polyZEBRA Solar Cell Characteristics for Industrial Fabrication and Application**
Jonathan Linke¹, Saman Sharbaf Kalaghichi¹, Jan Hoß¹, Florian Buchholz¹, Lejo Joseph Koduvelikulathu¹
¹ International Solar Energy Research Center Konstanz , Konstanz, Germany
- 1BV.1.11 Gettering Effects of Topcon Processing on N-Type and P-Type CZ Silicon Substrates**
Nerea Dasilva Villanueva¹, Yiğit Mert Kaplan², Hisham Nasser², Rasit Turan², David Fuertes Marrón¹, Luis Jaime Caballero¹, Usman Shah¹, Andrés David Pardo¹, Cristian Miguel Luis Antoine¹, Özlem Coşkun³, Çağrı Taha Delikanlı³, Ece Çamkara³, Meriç Çalıřkan Arslan⁴, Carlos del Cañizo¹
¹ UPM, Madrid, Spain; ² ODTÜ-GÜNAM, Ankara, Türkiye; ³ Kalyon PV, Ankara, Türkiye; ⁴ Kalyon PV, Ankara, Spain
- 1BV.1.12 Suitability and Validation of Different Lignosulfonates for Silicon Wafer Texturing in Photovoltaic Applications**
Rocio Barrio Martín¹, Nieves González Peñalba¹, Ignacio Torres Almarza¹, Jose Javier Gandía Alabau¹, Rafael Benítez-Fernández², Francisco José Pérez-Zenteno², Enrique San Andrés², Rodrigo García-Hernansanz², Eric García-Hemme²
¹ CIEMAT, Madrid, Spain; ² UCM, Madrid, Spain
- 1BV.1.13 Improved Sustainability of Heterojunction Cells by Nanometer Pyramid Texturization for Silicon**
Sebastian Pingel¹, Katrin Krieg¹, Stefan Schmidt¹, Winfried Wolke¹, Andreas Wolf¹, Jonas De Rose¹, Benedikt Bläsi¹
¹ Fraunhofer ISE, Freiburg, Germany
- 1BV.1.14 Laser Annealing for the Crystallization of Amorphous Silicon Layers in TOPCon Solar Cells**
David Canteli¹, Rocio Barrio², Vladimir Garcia Rodriguez³, Nieves Gonzalez², David Munoz-Martin¹, Ignacio Torres², Jose Javier Gandia², Carlos Molpeceres¹
¹ UPM, Madrid, Spain; ² CIEMAT, Madrid, Spain; ³ National Polytechnic Institute, Mexico City, Mexico
- 1BV.1.15 In-situ Plasma-Grown Tunnel Oxides via Noble-Gas (He, Ar) Diluted CO₂ Precursors for TOPCon Silicon Solar Cells**
Ignacio Torres¹, Rocío Barrio¹, Nieves González¹, J. Javier Gandía¹, Rafael Benítez-Fernández², Francisco J. Pérez-Zenteno², Enrique San Andrés², Rodrigo García-Hernansanz², Eric García-Hemme²
¹ CIEMAT, Madrid, Spain; ² UCM, Madrid, Spain
- 1BV.1.16 Enhanced Light Trapping in Black Silicon: Comparative Study of Scalable Hybrid NaOH and H₂SO₄ Chemical Etching and Inductively Coupled Plasma Reactive Ion Etching (ICP-RIE)**
Aleena Nadeem¹, Ozan Aydin¹, Gokhan Altiner¹, Agageldi Muhammetgulyyev², Ayca Berfin Aydogdu², Rasit Turan¹, Hisham Nasser¹
¹ METU, Ankara, Türkiye; ² CW Energy Research and Development Center, Antalya, Türkiye
- 1BV.1.17 PECVD Preparation of Silicon Carbide Layers as Passivating Contacts for POLO Solar Cells**
Steffen Bömert¹, Frank Wunsch¹, Robby Peibst², Jan-Dirk Kähler³, Thomas Pernau³, Jan Krügener¹
¹ Leibniz University Hannover, Hannover, Germany; ² Leibniz University Hannover, Hamelin, Germany; ³ centrotherm international, Blaubeuren, Germany
- 1BV.1.18 Advanced TCAD Modelling of High-Efficiency Bifacial TOPCon Silicon Solar Cells**
Savita Kashyap¹, Adarsh Kumar Mishra¹, Sanjeev Kumar¹, Arun Kumar Singh¹
¹ Punjab Engineering College, Chandigarh, India
- 1BV.1.19 Laser-Assisted Doping of Crystalline Silicon Using Doped Amorphous Silicon Source for Local Electrical Property Control in Photovoltaic Applications**
Narendra Bandaru¹, Asbjørn Moltke², Ole Bang², Rasmus Schmidt Davidsen¹
¹ Aarhus University, Aarhus, Denmark; ² DTU, Lyngby, Denmark
- 1BV.1.20 Influence of Inkjet Deposition Temperature on the Passivation and Stability of PEDOT:PSS/Amorphous Silicon Hybrid Silicon Structures**
Narendra Bandaru¹, Devabharathi Nehru¹, Dheeraj Sah¹, Mohammadhossein Mohammadi¹, Roberto Boccardi², Rasmus Schmidt Davidsen¹
¹ Aarhus University, Aarhus, Denmark; ² DTU, Roskilde, Denmark
- 1BV.1.21 Interface Engineering of ALD-TiO_x Electron-Selective Contacts in Dopant-Free Silicon Heterojunction Solar Cells**
Liqi Cao¹, Roel Theeuwes², Leonard Simeonov², Yifeng Zhao¹, Paul Procel Moya¹, Luana Mazzarella¹, Erwin Kessels², Olindo Isabella¹
¹ Delft University of Technology, Delft, The Netherlands; ² Eindhoven University of Technology, Eindhoven, The Netherlands
- 1BV.1.22 Low-Cost Conversion of Existing TOPCon Production Lines Toward High-Efficiency Back-Contact Solar Cells**
Chun-Ping Lin¹, Han-Chen Chang¹, Sung-Yu Chen¹, Ying-Yuan Huang²
¹ Industrial Technology Research Institute, Tainan, Taiwan; ² National Cheng Kung University, Tainan, Taiwan



- 1BV.1.23 Stability of Indium-Free Antireflective Layer Based on Aluminum-Doped Zinc Oxide for Heterojunction Solar Cells**
Anthony Valla¹, Benjamin Thiriot¹, Frédéric Jay¹, Anne-Sophie Ozanne¹, Rémi Monna¹, Christine Denis¹, Florence Naudin¹, Wilfried Favre¹
¹ CEA / INES, Le Bourget-du-Lac, France
- 1BV.1.24 Transparent Conductive Electrodes with Reduced Indium Content Based on Ultra-Thin ITO/SnO₂/ITO Stacks for Silicon Heterojunction Solar Cells**
Emine Hande Ciftpinar¹, Corné Frijters², Astrid Gutjahr¹, Eric Kossen¹, Johannes Lambooi², L.J. (Bart) Geerligs¹
¹ TNO, Petten, The Netherlands; ² TNO, Eindhoven, The Netherlands
- 1BV.1.25 Synergistic Interface Engineering in Hybrid Silicon/Organic Solar Cells: the Role of 1D/2D Nanocomposites and Surface Texturing**
Sergii Mamykin¹, Tetiana Lunko¹, Iryna Mamontova¹, Olga Kondratenko¹, Volodymyr Romanyuk¹
¹ National Academy of Sciences of Ukraine, Kiev, Ukraine
- 1BV.1.26 Corona-Induced Field-Effect Passivation and Injection-Dependent Current Extraction in Carrier Selective Silicon Solar Cells**
Rameeja T. Abdul Rasheed¹, Ajmal Mon A.¹, Aldrin Antony¹
¹ Cochin University of Science and Technology, Ernakulam, India
- 1BV.1.27 Innovative Tin Oxide Deposition Solutions for In-free SHJ Solar Cells**
Adeline Lanterne¹, Frédéric Jay¹, Pia Javiera Vasquez Rivera², Virginie Brizé¹, Florence Naudin¹, David Muñoz-Rojas²
¹ CEA / INES, Le Bourget-du-Lac, France; ² CNRS, Grenoble, France
- 1BV.1.41 Reproducibility Challenges of Ultrathin Transparent Conductive Oxides in Perovskite–Silicon Tandem Solar Cells**
Nan Sun¹, Vahdet Özyahni¹, Gaosheng Huang¹, Bingbing Chen¹, Jürgen Hüpkes¹, Alexander Eberst¹, Karsten Bittkau¹, Thomas Kirchartz¹, Kaining Ding¹
¹ FZJ, Jülich, Germany
- 1BV.1.42 Direct Current Sputtered Ce-Doped In₂O₃ Thin Films for Silicon-Based Tandem Solar Cell Applications**
Hyunju Lee¹, Yoshio Ohshita², Atsushi Ogura¹
¹ Meiji University, Kanagawa, Japan; ² Toyota Technological Institute, Nagoya, Japan
- 1BV.1.43 Optimizing the Optoelectronic Trade-off in TOPCon2 Bottom Cells for High-Efficiency Tandem Applications**
Yiğit Mert Kaplan¹, Seda Kılıçkaya Ünver¹, Gökhan Altınır¹, Hisham Nasser¹, Raşit Turan¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye
- 1BV.1.44 Dopant Free Carrier Transport Layers for C-Si Heterojunction Solar Cells**
Laura Lancellotti¹, Eugenia Bobeico¹, Marco Della Noce¹, Giuseppe Nasti¹, Elena Santoro¹, Gennaro Vincenzo Sannino¹, Pietro Scognamiglio¹, Iurie Usatii¹, Paola Delli Veneri¹, Lucia Vittoria Mercaldo¹
¹ ENEA, Portici, Italy
- 1BV.1.45 Silver- and Indium-Free Half TBC IBC Silicon Bottom Cells for Tandem Applications**
Veysel Unsur¹, Melisa Korkmaz Arslan¹, Seda Kilickaya¹, Busra Altinsoy¹, Mustafa Buyukguzel¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye
- 1BV.1.46 Performance Comparison of TOPCon2 and Silicon Heterojunction Based Tandems from 1 to 60 cm² Scale**
Julien Humi¹, Kerem Artuk², Michele De Bastiani², Audrey Morisset², Quentin Jeangros², Bertrand Paviet-Salomon², Christian Wolff¹, Christophe Ballif¹, Franz-Josef Haug¹
¹ EPFL, Neuchâtel, Switzerland; ² CSEM, Neuchâtel, Switzerland
- 1BV.1.51 Plasma-Induced Control of Fixed Charges in PECVD SiN_x Films via N₂O Treatment**
Ayşe Can¹, Seda Kılıçkaya Ünver¹, Hasan Hüseyin Canar², Gökhan Altınır³, İlker Yıldız⁴, Hisham Nasser¹, Raşit Turan¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² Aselsan, Ankara, Türkiye; ³ Middle East Technical University, Center for Solar Energy Research and Applications (ODTU-GUNAM), Ankara, Türkiye; ⁴ ODTÜ Central Laboratory, Ankara, Türkiye
- 1BV.1.52 Microscopic Characterization of SHJ Interdigitated Back-Contacts**
Swarnendu Banerjee¹, Robert Hlaváč¹, Aleš Vlk¹, Roman Dvořák¹, Matěj Hývl¹, Antonín Fejfar¹, Boris Legradic², Loris Barraud², Niels Holm², Damien Lachenal², Martin Ledinský¹
¹ Czech Academy of Sciences, Prague, Czech Republic; ² Meyer Burger Research, Hauterive, Switzerland
- 1BV.1.53 Spatially Resolved Characterization of TOPCon Precursors and Copper-Plated Solar Cells via Photoluminescence Imaging**
Gisele Alves dos Reis Benatto¹, Roberto Boccardi¹, Rodrigo Del Prado Santamaria¹, Markus Babin¹, Peter Behrendorff Poulsen¹, Sune Thorsteinsson¹
¹ DTU, Roskilde, Denmark
- 1BV.1.54 Performance Evolution of Aged Mono-Crystalline Silicon Solar Cells under Outdoor, Thermal, and Combined Stress Conditions**
Jaeyoung Jang¹, Jeong-eun Jeon², Yoon-Sung Lee¹, Sumi Yang¹
¹ Far East University, Eumseong-gun, South Korea; ² Far East University, Eumseong-gun, CB, South Korea
- 1BV.1.55 A Reactive Molecular Dynamics Study of Oxygen Concentration Effects on Silicon Nanocrystal Growth**
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
- 1BV.1.56 The Effect of Front-Contacting Configurations on Measuring SMBB TOPCon Solar Cell Efficiency**
Yung-Tsung Liu¹, Yean-San Long¹, San-Yu Ting¹, Min-An Tsai¹, Cho-Fan Hsieh¹
¹ ITRI, Hsinchu, Taiwan



1BV.1.57 Modeling I-V and Luminescence Characteristics of Bifacial Solar Cells Affected by Potential Induced Degradation using Griddler

Aysha Mahmood¹, Sune Thorsteinsson¹, Rodrigo Del Prado Santamaria¹, Gisele Alves dos Reis Benatto¹, Peter B. Poulsen¹, Sergiu V. Spataru¹

¹ DTU, Roskilde, Denmark

1BV.1.58 Self-Calibrated Photoconductance Decay measurement: Application to TOPCon Precursor Structures

Gergely Havasi¹, David Krisztián¹, Ferenc Korsós¹, Saman Sharbat², Lejo Joseph Koduvelikulathu²

¹ SEMILAB, Budapest, Hungary; ² ISC Konstanz, Konstanz, Germany

1BV.1.60 Impact of the Intrinsic a-Si:H(i) Spacer Resistance on the Open Circuit Voltage and Temperature Coefficient of Heterojunction Silicon Solar Cells

Moustafa Y. Ghannam¹

¹ Kuwait University, Safat, Kuwait

1BV.1.61 Non-Destructive Evaluation of Surface Recombination and Interface States in Textured Solar Silicon via Spectral Surface Photovoltage

Beyza Durusoy¹, Maaz Soomro¹, Stefan Lange², Nadine Schüler³, Christian Hagedorf¹

¹ Anhalt University of Applied Sciences, Köthen, Germany; ² Fraunhofer CSP, Halle, Germany; ³ Freiberg Instruments, Freiberg, Germany

VISUAL PRESENTATIONS 2BV.2

10:30 - 12:00 Compound (Chalcogenide, Kesterite, III-V) and Organic Devices

2BV.2.1 Epitaxial 19.4% Efficient InGaP/GaAs/Si Triple-junction Solar Cell with 1.7 eV Wide Bandgap n-AlGaAs Buffer

Hyun-Beom Shin¹, Yeonhwa Kim², Yunki Min², In-Hwan Lee³, Won Jun Choi², Ho Kwan Kang¹, Daehwan Jung²

¹ KANC, Suwon, South Korea; ² KIST, Seoul, South Korea; ³ Korea University, Seoul, South Korea

2BV.2.2 Silver Introduction to Cu(In,Ga)Se₂ to overcome the Copper-rich Growth Stage

Oliver Klement¹, Christian A. Kaufmann², Daniel Schildhammer¹, Damilola Adeleye², Felix Mai³, Nikolaus Weinberger¹

¹ University of Innsbruck, Innsbruck, Austria; ² HZB, Berlin, Germany; ³ Berlin University of Applied Sciences, Berlin, Germany

2BV.2.3 Deposition and Characterization of High Mobility Titanium Doped Indium Oxide for Thin Film PV Devices

Ana Jurado Estrada¹, Kieran Curson¹, Samuel Machin¹, Luke Jones¹, Mustafa Togay¹, Jake Bowers¹, Michael Walls¹

¹ Loughborough University, Loughborough, United Kingdom

2BV.2.4 Comparative Degradation Behavior of Emerging Photovoltaic Technologies under Indoor Storage

Özcan Bazkir¹, Hatice İlhan²

¹ National Metrology Institute, Kocaeli, Türkiye; ² Izmir Institute of Technology, Izmir, Türkiye

2BV.2.5 Sustainable Magnetron-Sputtered Sub-Micrometre CIGS_{Se} Flexible Solar Cells Via H₂S Sulfurization and Inkjet Ag Grid Contacts

Ana R. Pires¹, André F. Violas¹, João B. Vilão¹, Rui Bastos¹, Andrés Perdomo¹, António J. N. Oliveira¹, Ricardo M. L. Silva¹, Xavier L. Pinheiro¹, Bárbara L. Sieira¹, Diogo Carvalho¹, Jennifer P. Teixeira¹, Paulo A. Fernandes¹, Pedro M. P. Salomé¹

¹ INL, Braga, Portugal

2BV.2.6 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.2.7 How the Molybdenum Process Influences the Growth of CZTS: a Comparative Study of Different Lab-Grown and Commercial Molybdenum Substrates

Alessandro Veneri¹, Ikram Anefnaf¹, Elisa Artegiani¹, Alessandro Romeo¹

¹ University of Verona, Verona, Italy

2BV.2.8 Numerical Simulation of CIGS/Si Tandem Solar Cells

Juan Carlos Jimeno¹, Alejandro Garcia¹, Nekane Azkona¹, Vanesa Fano¹, Aloña Otaegi¹, Eneko Cereceda Moris¹, Rubén Gutiérrez¹, Federico Recart¹

¹ EHU, Bilbao, Spain

2BV.2.9 Comparison of Sb₂Se₃ Thin Films Deposited by Vacuum Evaporation and Vapor Transport Deposition

Elisa Artegiani¹, Sharmiladevi Ramamoorthy¹, Alessandro Veneri¹, Mariyam Mukhtar¹, Alessandro Romeo¹

¹ University of Verona, Verona, Italy

2BV.2.10 CdCl₂ Treatment for Either Doping or Alloying Cu₂ZnSn(S,Se)₄ to Enhance the Solar Cell Performance

Alessandro Romeo¹, Prabeesh Punathil², Solidea Zanetti¹, Elisa Artegiani¹

¹ University of Verona, Verona, Italy; ² University of Northumbria, Newcastle, United Kingdom

2BV.2.11 Impact of AM1.5G Co-illumination on the Device Performance of Laser Power Converters

Sho Aonuki¹, Takaya Oshimo², Kotona Tabata², Takeru Yamada², Junichi Suzuki³, Reo Aoyama³, Shiro Uchida³, Kouichi Akahane⁴, Masato Suzuki¹, Natsuha Ochiai¹, Yukiko Suzuki¹, Kazuto Kashiwakura¹, Yuka Oshima¹, Kensuke Nishioka², Masakazu Arai², Yohei Toriumi¹, Madoka Takahashi¹

¹ NTT, Musashino, Japan; ² University of Miyazaki, Miyazaki, Japan; ³ Chiba Institute of Technology, Narashino, Japan; ⁴ National Institute of Information and Communications Technology, Koganei, Japan

2BV.2.12 Fabrication of High Efficient Alkali-Alloyed CZTSSe Solar Cells

Namunundari Ogtontamir¹, Md Matiur Rahman¹, Md Hamin Sharif¹, Haehoon Jeong¹, JunHo Kim¹

¹ Incheon National University, Incheon, South Korea

2BV.2.13 Enhanced Near-Infrared Photo-Absorption of Copper-Indium-Selenide Thin Film

Temujin Enkhbat¹, Hyun-Beom Shin², Ho Kwan Kang², Seongju Park¹, Jae-Hyung Jang¹

¹ Korea Institute of Energy Technology, Naju, South Korea; ² Korea Advanced Nanofab Center, Suwon, South Korea



2BV.2.14 Metallic Nanoparticles through Solid State Dewetting for Light Trapping in Ultrathin Solar Cells

Antonio J. N. Oliveira¹, Jennifer P. Teixeira¹, Bruna S. Tinoco¹, Enzo J. Ribeiro¹, André F. Violas¹, Vitor Lopes¹, Paulo A. Fernandes¹, Pedro M. P. Salomé¹

¹ INL, Braga, Portugal

2BV.2.15 Broad Spectrum Absorption Enhancement in GaAs-based Quantum Dot Solar Cells with the Two-Dimensional Photonic Crystal Trapping Layer

Xiaoling Chen¹, Yidi Bao¹, Chunxue Ji¹, Xiaoyang Zhao¹, Wen Liu¹, Xiaodong Wang¹

¹ Chinese Academy of Sciences, Beijing, China

2BV.2.16 New Approach to Enhance the Efficiency of Organic Solar Cells Using Azobenzene Derivatives

Beata Derkowska-Zielinska¹, Seyedeh Arasteh Jahani¹, Robert Czaplicki¹, Vitaliy Smokal², Oksana Krupka³, Dorota Kowalska¹

¹ Nicolaus Copernicus University in Toruń, Torun, Poland; ² Taras Shevchenko National University of Kyiv, Kyiv, Ukraine; ³ University of Angers, Angers, France

VISUAL PRESENTATIONS 4BV.3

13:30 - 15:00 Solar Resource and Forecasting

4BV.3.1 Ensemble Learning and Model Transfer in Machine Learning Algorithms for Photovoltaics Performance Prediction

Nina Sophie Sturm¹, Marcus Rennhofer², Bernhard Kubicek², Stefan Übermayer²

¹ University of Vienna, Vienna, Austria; ² AIT, Vienna, Austria

4BV.3.2 Diffuse Irradiance Modeling in Sub-Hourly PV System Yield Simulations

Michele Oliosi¹, Luca Antognini¹, Auriane Canesse¹, André Mermoud¹, Robin Vincent¹, Bruno Wittmer¹

¹ PVsyst SA, Satigny, Switzerland

4BV.3.3 Satellite-driven Convolutional Neural Network for Near-Term Irradiance Forecasting to Support PV Power Nowcasting Models

Jacopo Baldacci¹, Ciro Lanzetta¹, Antonio Piazzini¹

¹ I-EM, Livorno, Italy

4BV.3.4 Limitations of Typical Meteorological Year Datasets for High DC/AC PV Systems in Yield Assessments

Bassel Helmy¹, Scott McKecknie²

¹ Orsted, 2 Lochrin, United Kingdom; ² Orsted, 2 Lochrin Square, United Kingdom

4BV.3.5 Improving Data Quality in Solar Monitoring: An Automated Cleaning Approach for Pyranometers and All-Sky Imagers

Andreas Boschert¹, Lorenz Glonner¹, Paul Matteschk², Frank Buttinger¹, Martin Heigl¹

¹ Rosenheim Technical University of Applied Sciences, Rosenheim, Germany; ² Wematic FlexCo, Salzburg, Austria

4BV.3.6 Implementation of Uncertainty Information to the CAMS Radiation Service Irradiance Estimates

Jorge Lezaca¹, Arindam Roy¹, Marion Schrödter-Homscheidt¹

¹ DLR, Oldenburg, Germany

4BV.3.7 The Effect of Climatic Change on Austrian PV Production

Bernhard Kubicek¹, Marcus Rennhofer¹, Kristofer Hasel¹, Marianne

Bügelmayer-Blaschek¹, Nina Sturm¹, Kerstin Haslehner², Manfred Dorninger²

¹ AIT, Vienna, Austria; ² University of Vienna, Vienna, Austria

4BV.3.8 Vehicle Integrated PV Potential for Europe-Results of a European Wide Measurement Campaign

Christian Braun¹, Moditya Gupta¹, Barbaros Inak¹, Lenneke Slooff², Anna Carr²

¹ Fraunhofer ISE, Freiburg, Germany; ² TNO, Den Haag, The Netherlands

4BV.3.9 All-Sky Images Foundation Models for PV-relevant Cloud Analysis and Irradiance Nowcasting

Yassine Ribouh¹, Andreas Boschert², Grit Behrens¹, Mike Zehner²

¹ Bielefeld University of Applied Science and Art, Minden, Germany; ² Technical University of Applied Science, Rosenheim, Germany

4BV.3.10 Photovoltaic and Wind Power Forecasting Using Kernel Recursive Least Squares with WSN Based Data Acquisition

Sarvar Hussain Nengroo¹

¹ KFUPM, Dharan, Saudi Arabia

4BV.3.11 Zero-Shot Foundation Models for Solar Power Forecasting: a Systematic Benchmarking Study

Mohamed Abdelmagid¹

¹ Khalifa University, Abu Dhabi, United Arab Emirates

4BV.3.12 Short-Term PV Forecasting with Heterogeneous Sensor Data using Transfer Learning

Naheel Faisal Kamal¹, Amir Abdallah¹, Sertac Bayhan¹

¹ Qatar Environment and Energy Research Institute (QEERI), Hamad Bin Khalifa University, Doha, Qatar, Doha, Qatar

4BV.3.13 Physics-Conditioned PatchGAN Refinement for Long-Horizon All-Sky Nowcasting and PV Irradiance Uncertainty

Naoufal El Atmioui¹, Andreas Boschert², Grit Behrens¹, Mike Zehner²

¹ Bielefeld University of Applied Science and Art, Minden, Germany; ² Technical University of Applied Sciences, Rosenheim, Germany

4BV.3.14 SkyDiff: All Sky Scenario Nowcasting using Diffusion Models

Max Aragon¹, Quentin Paletta², Jose Gomez¹, Nicolas Courty³, Yves-Marie Saint-Drenan¹

¹ Mines Paris PSL, Sophia Antipolis, France; ² European Space Agency, Frascati, Italy; ³ University Bretagne Sud, Vannes, France

4BV.3.15 Short-Term Multistep PV Power Forecasting Using Deep Learning: Performance Comparison of CNN-LSTM and Transformer Architectures

Caixia Li¹, Ziheng Liu¹, Pengfei Zhang¹, Xiaojing Hao¹

¹ UNSW, Sydney, Australia



4BV.3.16 IEA PVPS Task 16 – Phase IV

Jan Remund¹, Manajit Sengupta², Stefan Wilbert³, Elke Lorenz⁴, Rodrigo Amaro e Silva⁵, Yehia Eissa⁶, Adam R. Jensen⁷

¹ Meteotest AG, Bern, Switzerland; ² NLR, Boulder, United States of America; ³ German Aerospace Center, Almeria, Spain; ⁴ Fraunhofer ISE, Freiburg, Germany; ⁵ University of Lisbon, Lisbon, Portugal; ⁶ Mines Paris - PSL, Sophia Antipolis, France; ⁷ Technical University of Denmark, Lyngby, Denmark

4BV.3.17 Deep Learning-based Sky Image Analysis for Solar Irradiance Prediction in Arid Regions

Nassma Mohands¹, Dunia Bachour¹, Daniel Perez-Astudillo¹

¹ Hamad Bin Khalifa University/Qatar Environment and Energy Research Institute, Doha, Qatar

4BV.3.18 Improving the National Solar Radiation Data Base using PSM V4

Manajit Sengupta¹, Yu-Konsta Xie¹, Aron Habte¹, Brandon Benton¹, Paul Edwards¹, Jaemo Yang¹, Michael Foster², Andy Heidinger³

¹ NLR, Golden, United States of America; ² University of Wisconsin, Madison, United States of America; ³ NOAA, Madison, United States of America

4BV.3.19 Characterizing Temporal and Spatial Variability of DNI and GHI in Moroccan Mining Sites: Insights from Ben Guerir

Abdellatif Ghennioui¹, Mounir Abraim¹, Mohamed Smouni¹

¹ Green Energy Park, Ben Guerir, Morocco

4BV.3.20 Evaluation of Data Augmentation Techniques for Overirradiance Event Detection in Photovoltaic Systems

Alan Rodrigues de Sousa¹, João Vitor Fonseca Mendonca¹, Lucio Carlos Pimentel Paiva², Samira de Azevedo Santos Emiliavaca¹

¹ SENAI, Natal, Brazil; ² Casa dos Ventos, Fortaleza, Brazil

4BV.3.21 Quantification of Alpine Irradiance Peaks on PV Modules under Consideration of Aggregation Windows

Christof Bucher¹, Matthias Hügi¹, Vincent Guerdat¹, Marcus Rennhofer², Bernhard Kubicek², Jan Remund³

¹ Bern University of Applied Science (BFH), Burgdorf, Switzerland; ² Austrian Institute of Technology (AIT), Wien, Austria; ³ Meteotest, Bern, Switzerland

4BV.3.22 Evaluating Pyranometer Uncertainties with Novel Tools

Bernhard Kubicek¹, Mariella Josefina Rivera Aguilar², Kazadzis Stelios³, Bert Herteleer⁴, Fredrik Edhborg⁵, Marko Jankovec⁶, Marcus Rennhofer¹

¹ AIT, Vienna, Austria; ² Fraunhofer ISE, Freiburg, Germany; ³ PMOD WRC, Davos, Switzerland; ⁴ SUPSI, Manno, Switzerland; ⁵ RISE, Borås, Sweden; ⁶ University of Ljubljana, Ljubljana, Slovenia

4BV.3.23 Temporal Downscaling of Solar Radiation at Different Spatial Scales: Larger Domains Ease the Task

Rodrigo Amaro e Silva¹

¹ University of Lisbon, Lisbon, Portugal

4BV.3.24 Data-driven Solar Irradiance Forecasting under Aerosol Variability: Performance Analysis in Semi-Arid Region

Samira Abousaid¹, Abdelatif Ghennioui¹

¹ Green Energy Park, Benguerir, Morocco

4BV.3.25 Impact of Multi-Instrument Quality Control on Reliability of Solar Measurements

Oliver Osvald¹, Peter Mihalik¹, Rastislav Hrnčirik¹, Tomas Cebecauer¹, Marketa Hulik Jansova¹, Assa Camara¹, Katarina Blstak Catlosova¹, Martin Jakubik¹

¹ Solargis, Bratislava, Slovakia

4BV.3.26 Analysis of Geographical Smoothing and Variability Reduction in a Cluster of Solar PV Plants

Rhythm Singh¹, Manoj Bisht¹

¹ IIT, Roorkee, India

4BV.3.27 Satellite-Based Nowcasting with U-Net for Improving Blended Solar Irradiance Forecasting: a Tropical Island Case Study

Anthony Voitus¹, Clément Caron¹, Benjamin Adrien¹, Mathieu Turpin¹, Nicolas Sébastien¹, Nicolas Schmutz¹

¹ Reuniwatt, Sainte-Clotilde, France

4BV.3.28 Joint Spatial and Temporal Modeling for Township-Level Photovoltaic Power Forecasting

Jhang Shuo Luo¹, Hsin Fu Huang¹, Ya-Ching Hsu², Winston H. Hsu²

¹ thingnario, Taipei, Taiwan; ² National Taiwan University, Taipei, Taiwan

4BV.3.29 Assessing the Impact of Cloud Parameters on Solar Irradiance for PV Systems Using Keogram- and ASI-Based Analysis

Mike Zehner¹, Konrad Randl¹, Blerim Zeka¹, Fabian Pauls¹, Grit Behrens², Bernhard Mayer³

¹ Rosenheim Technical University of Applied Sciences, Rosenheim, Germany; ² University of Applied Sciences Bielefeld, Minden, Germany; ³ LMU, Munich, Germany

VISUAL PRESENTATIONS 4BV.4**15:15 - 16:45 PV and Buildings****4BV.4.1 Vertical Photovoltaic Systems with Multi-Azimuth Orientation Integrated into Noise Barriers: Experimental, Modeling, and Economic Assessment**

Matas Rudzikas¹, Juras Ulbikas¹, Algirdas Baležentis¹, Aušra Brokė², Tomas Barakauskas², Vitas Mačiulis¹

¹ Applied Research Institute for Prospective Technologies, Vilnius, Lithuania; ² House Tech Construction Company, Klaipėda, Lithuania

4BV.4.2 Colored BIPV Panels By Multilayer Interference Coatings: Tailored Lab and Outdoor Performance Monitoring

Fallon Colberts¹, Mustafa Abed Alrhman¹, Raymond Dresens¹, Roberto Habets², Daniel Mann², Stefan Hiller¹, Stefan Consten¹, Peter van Nijnatten³, Serge Timmermans³, Jurgen de Wolf³, Chiraag Reddy⁴, Pascal Buskens², Zeger Vroon¹

¹ Zuyd University, Heerlen, The Netherlands; ² TNO, Geleen, The Netherlands; ³ OMT Solutons, Eindhoven, The Netherlands; ⁴ Kameleon Solar, Roosendaal, The Netherlands

4BV.4.3 Simulation-based Study of Building Photovoltaics and Passive Cooling Strategies on Indoor Heat Stress: Integration and Sensitivity Analysis

Yingxin Feng¹, Guang Hu¹, Roel Loonen¹, Angele Reinders¹

¹ Eindhoven University of Technology, Eindhoven, The Netherlands



- 4BV.4.4 Color Degradation of Wall-Mounted BIPV Modules in the Nordics Compared with Temperate Climates**
Sigrid Rønneberg¹, Chang Chuan You¹, Bent Thomassen¹, Nathan Roosloot¹, Gaute Otnes¹
¹ Institute for Energy Technology, Kjeller, Norway
- 4BV.4.5 Validation in Operation of Key Performance Indicators of BIPV Solutions for Decision-Makers**
Simon Boddart¹, Yoann Servant¹, Olaia Aurrekoetxea Arratibel², Julius Jacob³, Simone Germani⁴, Hervé Lamblot⁵, Tatjana Vavilkin⁶, Maria Jimenes⁷, Tonis Eelma⁸
¹ CSTB, Sophia Antipolis, France; ² TECNALIA, San Sebastián, Spain; ³ METABUILD, Berlin, Germany; ⁴ CEI, Milano, Italy; ⁵ SUNSTYLE, Paris, France; ⁶ SOLTECH, Genk, Belgium; ⁷ ONYX SOLAR, Avila, Spain; ⁸ IBS, Tartu, Estonia
- 4BV.4.6 Integrated Solar Roofing: Ceramic Tiles back with Style**
Alicia Buceta¹, Jaime Polo¹, Daniel Sánchez², Roberto Díaz³, María Martínez², Eugenia Zugasti¹, Jaione Bengoechea¹
¹ FUNDACION CENER, Sarriguren, Spain; ² ISFOC, Puertollano, Spain; ³ NOTIO, Toledo, Spain
- 4BV.4.7 Outdoor Performance Assessment of Aluminum-based PV-activated Façade Elements in Comparison to Glass-backsheet Photovoltaic Modules**
Kevin Meyer¹, Stefan Bordihn¹, Wiebke Wirtz¹, Iris Kunze¹, Jonas Bollermann¹, Michael Siebert¹, Christof Basener¹, Fynn Klopp², Danny Lorenz², Henning Schulte-Huxel¹
¹ ISFH, Emmerthal, Germany; ² MN Metall, Neustadt (Holstein), Germany
- 4BV.4.8 Significance of Product Diversity in Building-Integrated Photovoltaic (BIPV) Modules and Associated Manufacturing Challenges**
Thomas Friesen¹
¹ Megasol Energie, Deitingen, Switzerland
- 4BV.4.9 Wind-Driven Rain Tightness of Building-Integrated Photovoltaic Systems: Experimental Investigations and Design Recommendations**
Tom Melkert¹, Hedda Victoria Kielland¹, Gabriele Lobaccaro¹, Tao Gao¹, Bjørn Petter Jelle¹
¹ NTNU, Trondheim, Norway
- 4BV.4.10 Semi-Transparent Line-Pattern Photovoltaics for BIPV Windows**
Elias Peraticos¹, Vasiliki Paraskeva¹, Sumeet Santosh Mujumdar¹, Matthew Norton¹, Omur Bugra Gunduz², Ipek Gursei Dino², Francesco De Nicola³, Nuno Rodrigues⁴, Sascha Sadewasser⁴, Pedro Anacleto⁴, George E. Georgiou¹, Maria Hadjipanayi¹
¹ University of Cyprus, Lefkosia, Cyprus; ² METU, Ankara, Türkiye; ³ ISM-CNR, Roma, Italy; ⁴ International Iberian Nanotechnology Laboratory, Braga, Portugal
- 4BV.4.11 Study on Improvement of Power Generation for a Semi-transparent Photovoltaic Module Equally Arranged Linear Bifacial Solar Cells**
Kazuhiko Umeda¹, Nobusato Kobayashi¹, Akira Yamaguchi², Sadaaki Miyajima¹
¹ TAISEI, Tokyo, Japan; ² TAISEI, Tokyo, Japan
- 4BV.4.12 High-Resolution Urban Microclimate and Solar Potential Modeling: a Case Study of Strijp-S, Eindhoven**
Guang Hu¹, Roel Loonen¹, Angèle Reinders¹
¹ Eindhoven University of Technology, Eindhoven, The Netherlands
- 4BV.4.13 A Multi-Criteria Decision Framework for Early-Stage Feasibility Assessment of Building-Integrated Photovoltaics in India**
Shantanu Roy¹, Saptak Ghosh², Madhusree Bhattacharjee¹
¹ CSTEP, Noida, India; ² CSTEP, Bengaluru, India
- 4BV.4.14 Experimental Assessment of Power Optimizers in Small-String Vertical Façade BIPV**
Junyoung Lee¹, Dongsu Kim¹, Ruda Lee¹, Gyeong Yun¹, Jongho Yoon¹
¹ Hanbat National University, Daejeon, South Korea
- 4BV.4.15 A Design-driven Framework for Photovoltaic Integration in the Urban Built Environment**
Lucia Montoni¹, Yingxin Feng², Guang Hu³, Roel Loonen², Angele Reinders⁴, Antonella Trombadori¹
¹ University of Florence, Florence, Italy; ² Eindhoven University of Technology, Eindhoven, The Netherlands; ³ Eindhoven University of Technology, Eindhoven, The Netherlands; ⁴ Eindhoven University of Technology, Eindhoven, The Netherlands
- 4BV.4.16 From Modeling to Operation: Experimental Validation of Different Control Strategies for BAPV-T Ventilation**
Iñaki Cornago¹, Aritz Legarrea¹, Jaione Bengoechea¹, Mikel Ezquer¹
¹ FUNDACION CENER, Sarriguren, Spain
- 4BV.4.17 CALECHE: Performance Prediction of Photovoltaic Installations for Heritage Buildings Demonstrations**
Ya-Brigitte Assoa¹, Laure-Emmanuelle Perret², Keith Boxer³, Marco Larcher⁴, Dario Bottino⁴, Nina Hunter⁵, Virginie Renzi¹, Stephanie Petit⁶, Etienne Wurtz¹, Rickard Nygren³, Barbara Vogt³, Daniela Palomba⁷
¹ CEA / INES, Le Bourget-du-Lac, France; ² LMNT Consultancy, Neuchâtel, Switzerland; ³ White Arkitekter, Gothenburg, Sweden; ⁴ EURAC Research, Bolzano, Italy; ⁵ Munster Technological University, Cork, Ireland; ⁶ DOWEL Innovation, Valbonne Sophia Antipolis, France; ⁷ University of Napoli Federico II, Naples, Italy
- 4BV.4.18 Colour-Accurate, Angle-Resolved Visualisation of BIPV Installations**
Janina Willmann¹, Helen Rose Wilson¹, Bruno Bueno¹
¹ Fraunhofer ISE, Freiburg, Germany
- 4BV.4.19 Yield Optimization of Building-Integrated Photovoltaics: Integration of Realistic Shading Behavior Using a Digital Twin**
Fabian Gruber¹, Maximilian Engel¹, Dennis Huschenhöfer¹, Heiko Wirth¹
¹ ZSW, Stuttgart, Germany
- 4BV.4.20 Overloads in Building Electrical Installations caused by Plug-and-Play Photovoltaic Systems**
David Joss¹, Christof Bucher¹
¹ Berne University of Applied Science, Burgdorf, Switzerland
- 4BV.4.21 Performance-Color Trade-Off in Photonic-Glass-Based Colored PV Modules for BIPV Applications**
Parisa Sharif¹, Ilknur Ozbayrak², Sahin Coskun³, Husnu Emrah Unalan², Alpan Bek², Talat Ozden¹
¹ ODTU-GUNAM, Ankara, Türkiye; ² METU, Ankara, Türkiye; ³ ESOGU, Eskisehir, Türkiye



4BV.4.22 Performance Assessment of two Solar PV Power Plants at Cuenca University Campus

Aaron Ortiz-Pena¹, Mahamadou Abdou-Tankari², Andrés Honrubia-Escribano¹, Emilio Gómez-Lázaro¹

¹ University of Castilla-La Mancha, Albacete, Spain; ² UPEC, Creteil, France

4BV.4.23 Performance Loss Rates of a Vertical cBIPV Test Facade after 3.5 Years of Operation

Nanna Lysgaard Andersen¹, Yuli Ding¹, Markus Babin¹, Sune Thorsteinsson¹

¹ DTU, Roskilde, Denmark

4BV.4.24 Lightweight BIPV Façade Modules: Innovation and Performance Approach

Fabio Parolini¹, Leire Herrero², Francisco J. Cano², Giovanni Bellenda¹, Dominika Chudy¹, Jamal Abdul Ngoyaro¹, Claudio Pirotta³, Stefano Magaddino³, Francesco Frontini¹

¹ SUPSI, Mendrisio, Switzerland; ² Tecnalia, San Sebastián, Spain; ³ PIZ, Cosio Valtellino, Italy

4BV.4.25 Structural Durability and Performance Overview of PV Noise Barrier Projects in Lithuania

Paulius Laurikėnas¹, Julius Denafas¹, Povilas Lukinskas¹, Pascal Romer², Andreas Beinert²

¹ SoliTek R&D, Vilnius, Lithuania; ² Fraunhofer ISE, Freiburg, Germany

4BV.4.26 Abstract of Exploring Energy Efficiency Procurement Strategy (ESCO Model) @ Saudi Aramco NJBP Plant

Riyadh M. AL-Zahrani¹

¹ Saudi Aramco, Thuwal, Saudi Arabia

VISUAL PRESENTATIONS 1BV.5

17:00 - 18:30 Silicon Material Science and Technology | Manufacturing of Silicon Cells

1BV.5.1 Process-Engineered Nano-Silicon Particles from End-of-Life Photovoltaic Waste with Controlled Metal Impurities for High-Performance Lithium-Ion Batteries

Ju Hee Son¹, Jin-Seok Lee¹

¹ KIER, Daejeon, South Korea

1BV.5.2 Wafer Thermal Treatment: a Way to Improve Bulk Quality of Wafer made from Recycled Silicon from PV Module

Mickael Albaric¹, Etienne Pihan¹, Nicolas Enjalbert¹, Saliha Edouard¹

¹ CEA / INES, Le Bourget-du-Lac, France

1BV.5.3 Electron Irradiation-Induced Degradation of SHJ Cells for the Low Earth Orbit Constellation Application

Fanying Meng¹, Yue Yuan¹, Qiang Shi¹, Zhengxin Liu¹

¹ CAS, Shanghai, China

1BV.5.4 Defect Characterisation and Lifetime Stability in Gallium-Doped Crystalline Silicon for Stable High-Efficiency Solar Cells

Marija Demicoli¹, Aaron Piculo Perez¹, Nurhayat Yıldırım², Bülent Arkan³, Melisa Korkmaz Arslan³, Adela Veronica Gonzalez Perez¹, Ece Çamkara², Meriç Çalışkan Arslan², Raşit Turan³, Luciano Mule' Stagno¹

¹ University of Malta, Marsaxlokk, Malta; ² KalyonPV Research and Development Center, Ankara, Türkiye; ³ Middle East Technical University, Center for Solar Energy Research and Applications (ODTU-GUNAM) and Middle East Technical University, Ankara, Türkiye

1BV.5.5 Czochralski Crystal Puller for PV Ingot Production Including Machine Learning Driven Process Automation

Frank Mosel¹, Michael Haydn¹, Christoph Grammig¹, Peter Richert¹, Olli Anttila², Oyvind Nielsen²

¹ PVA Crystal Growing Systems, Wettenberg, Germany; ² CZ-Tech, Tarnasen, Norway

1BV.5.6 A Metal- and Ceramic-Impurity Controlled Silicon Material Recovery Process from Photovoltaic Waste and Its Conversion to Silicon Nitride

Jin-Seok Lee¹, Seong-Pyo Lee¹, Gi-Hwan Kang¹

¹ KIER, Daejeon, South Korea

1BV.5.7 A Theoretical-Experimental Model for High-Temperature Nitrogen Diffusion and Defect Suppression in Monocrystalline Silicon Wafers

Veronica Gonzalez¹, Marija Demicoli¹, Luciano Mule' Stagno¹

¹ University of Malta, Marsaxlokk, Malta

1BV.5.8 Reducing Kerf Loss in Industrial Wafering: Impact of Tungsten Diamond Wire on Yield and Cost

Çağrı Taha Delikanlı¹, Gamze Çekerek¹, Özlem Coskun¹, Kaan Görgisen¹, Yasemen Deniz¹, Runahi Altintas¹, Meriç Çalışkan Arslan¹

¹ KalyonPV, Ankara, Türkiye

1BV.5.9 Investigating the Role of Hydrogen in UV-induced Degradation and Recovery in p-type c-Si Structures

Aeron Johns¹, Muhammad Umair Khan¹, Alison Ciesla¹, Lahiruni

Ranasinghe¹, Chandany Sen¹, Bram Hoex¹

¹ UNSW, Sydney, Australia

1BV.5.10 Addressing UVID in TOPCon Solar Cells by Engineering the Front Surface Dielectric Stack

Muhammad Umair Khan¹, Xinyuan Wu¹, Aeron Johns¹, Chandany Sen¹, Baochen Liao², Alison Ciesla¹, Haoran Wang¹, Xutao Wang¹, Bram Hoex¹

¹ UNSW, Kensington, Australia; ² Nantong University, Nantong, China

1BV.5.25 Triangular Front Contacts on Heterojunction Solar Cells: Performance and Fabrication

Jonas Valentijn¹, Rebecca Saive¹

¹ University of Twente, Enschede, The Netherlands

1BV.5.26 Silane- and Phosphine-free PVD Process Technologies for Industrial TOPCon Solar Cells

Eric Schneiderlöchner¹, Volker Linß¹, Tina Dietsch¹, Uwe Graupner¹, Sebastian Gatz¹, Henning Nagel², Winfried Wolke², Pierre Saint-Cast², Sebastian Mack²

¹ VON ARDENNE, Dresden, Germany; ² Fraunhofer ISE, Freiburg, Germany



- 1BV.5.27 Process Optimization of Boron Diffusion via In-situ Central Gas Injection System to Eliminate B₂O₃ Byproducts and Enhance Cell Efficiency**
Cheng-Wen Kuo¹, Ta-Ming Kuan¹, Yung-Chih Li¹, Chun-Wei Lee¹, Wei-Lo Chueh¹, Li-Guo Wu¹, Cheng-Yeh Yu¹
¹ TSEC Corporation, Hsinchu, Taiwan
- 1BV.5.28 Achieving Module Ready Silver-lean TOPCon Cells with Copper Electroplating**
Jonas Eckert¹, René Haberstroh¹, Christian Schmiga¹, Damian Brunner², Mathias Kamp², Dirk Eberlein¹, Sven Kluska¹
¹ Fraunhofer ISE, Freiburg, Germany; ² RENA Technologies, Freiburg, Germany
- 1BV.5.29 Modeling the Influence of Bipolar Waveform Modulation on SiH₄-H₂ Plasmas for Amorphous Silicon Deposition**
Tim Gehring¹, Mateusz Wiosna², Mohammad Afaque Hossain¹, Daniel Loch¹, Michalina Perron², Wojciech Gajewski²
¹ TRUMPF Hüttinger, Freiburg, Germany; ² TRUMPF Hüttinger, Zielonka, Poland
- 1BV.5.30 Industrial-Compatible Selective Patterning of poly-Si/SiO_x Passivating Contacts Using Screen-Printed Etch-Resist Masking**
Eni Muka¹, Seda Kılıçkaya Ünver¹, Yiğit Mert Kaplan¹, Gökhan Altiner¹, Agageldi Muhammetgulyev², Ayca Berfin Aydogdu², Hisham Nasser¹, Raşit Turan¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² CW Energy Research and Development Center, Antalya, Türkiye
- 1BV.5.31 Laser Scribing of Semitransparent Amorphous Silicon Cells for Thin-Film Module Interconnection**
Fernando Anguiano¹, David Canteli², David Munoz-Martin², Gustavo Alvarez-Suarez³, Gerard Masmitja³, Pau Estarlich³, Cristobal Voz³, Gilberto Gomez Rosas¹, Miguel Morales², Carlos Molpeceres²
¹ University of Guadalajara, Guadalajara, Mexico; ² UPM, Madrid, Spain; ³ UPC, Barcelona, Spain
- 1BV.5.32 Selective Poly-Si Patterning via 532nm Picosecond Laser and Alkaline Etching**
Shojaa Abusakha¹, Bülent Arıkan¹, Yiğit Mert Kaplan¹, Gökhan Altiner¹, Hisham Nasser¹, Raşit Turan¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye
- 1BV.5.33 Seed Layer for Ni/Cu Plated Metallization of Wet Etch Opened TOPCon Solar Cells: Parameters Optimization and Nickel Silicide Formation**
Roberto Boccardi¹, Gisele Alves dos Reis Benatto¹, Clara Bolette Brendstrup Møller¹, Irene Tosi², Peter Torben Tang², Io Mizushima³, Rasmus Schmidt Davidsen⁴, Peter Behrendorff Poulsen¹, Sune Thorsteinsson¹
¹ DTU, Roskilde, Denmark; ² IPU, Virum, Denmark; ³ Elplatek, Esbjergærde, Denmark; ⁴ Aarhus University, Aarhus, Denmark
- 1BV.5.34 Evaluating Curing Mechanisms in Copper Based Low-Temperature Metallization Pastes for Solar Cells**
Oumaima Mhirsı¹, M. Noah Wengenmeyr¹, Jonas Bartsch¹
¹ Fraunhofer ISE, Freiburg, Germany

- 1BV.5.35 Busbarless TOPCon Solar Cell Design with Finger-Bypass Connections and Ribbon Composition Optimization**
Mert Kahraman¹, Halil Eldemir¹
¹ Kalyon Solar Technologies Production, Ankara, Türkiye



VISUAL PRESENTATIONS 4CV.1

13:30 - 15:00 Design, Engineering and Installation of PV Systems; BoS

- 4CV.1.1 Impact of Albedo Parameterization on Bifacial Gain Estimation: A Comparative Study on a Utility-Scale PV Plant in Sicily**
 Ida Bruno¹, Camilla Lops¹, Mariano Pierantozzi¹, Sergio Montelpare¹
¹ University "G. D'Annunzio" of Chieti-Pescara, Pescara, Italy
- 4CV.1.2 Simplified Methodology for Estimating the Shading Effect in Rooftop PV Potential in the Framework of a Web Platform for Energy Communities in Catalonia**
 Marina Calcagnotto¹, Jordi Pascual¹, Joana Ortiz¹, Jaume Salom¹
¹ IREC, Sant Adrià de Besòs, Spain
- 4CV.1.3 From Steady-State to Transient: Implications of Subhourly Temperature Modelling in PVsyst**
 Auriane Canese¹, Luca Antognini¹, André Mermoud¹, Michele Oliosi¹, Robin Vincent¹, Bruno Wittmer¹
¹ PVsyst, Satigny, Switzerland
- 4CV.1.4 Modeling Solar PV Glare and Its Implications for Aviation Operations at Marmul Airport, Oman**
 Mazin Al Shidhani¹, Waleed Al Washahi¹
¹ Petroleum Development Oman, Muscat, Oman
- 4CV.1.5 Proposal for Structural Serviceability Criteria for Single-Axis PV Tracker**
 Arianna di Mauro¹, Max Dinkelaker¹, Alf Oschatz¹
¹ sbp sonne, Stuttgart, Germany
- 4CV.1.6 First Standard for Plugin-PV and Further Development in Germany**
 Udo Siegfriedt¹, Ralf Haselhuhn¹
¹ Deutsche Gesellschaft für Sonnenenergie LV Berlin Brandenburg, Berlin, Germany
- 4CV.1.7 New Guideline for Critical Glare along German Highways and its Implication for Mitigation Measures**
 Anne Forstinger¹, Marvin Listl¹, Giorgio Bardizza², Magnus Herz¹
¹ TÜV Rheinland, Cologne, Germany; ² TÜV Rheinland, Milan, Italy
- 4CV.1.8 Smart Tracker Control: a new Autonomous Architecture Enabling Safer, Faster and More Resilient Solar Tracker**
 Giuseppe Demofonti¹, Andrea Monni¹, Matteo Frapparelli¹, Giammarco Andriulli¹
¹ Valmont Solar - Convert Italia, Rome, Italy
- 4CV.1.9 PV Balancer, the Ultimate Solution for High Performance Solar Modules Systems with and without Shade**
 Nicolaas J.J. Dekker¹, Simona Villa², Menno N. van den Donker³, Michiel Roelofs⁴
¹ TNO, Petten, The Netherlands; ² TNO, Eindhoven, The Netherlands; ³ Durin, Weert, The Netherlands; ⁴ Taylor Technologies, Eindhoven, The Netherlands

- 4CV.1.10 Inverter loading: A Regional Analysis**
 Rodrigo Amaro e Silva¹, Carolina Crespo²
¹ University of Lisbon, Faculty of Sciences, Instituto Dom Luiz, Lisboa, Portugal; ² University of Lisbon, Lisboa, Portugal
- 4CV.1.11 Solarfarmer Proven Accuracy for Bankable Energy Assessments**
 Luca Vignoni¹, Nathalia Ferrari²
¹ DNV, Barcelona, Spain; ² DNV, Porto Alegre, Brazil
- 4CV.1.12 Comprehensive Performance Assessment of Bifacial Photovoltaic Modules Considering Ground Albedo and Installation Conditions**
 Dongsu Kim¹, Junyoung Lee¹, Wonseok Choi¹, Hyunjoong Kim¹, Jongho Yoon¹
¹ Hanbat National University, Daejeon, South Korea

VISUAL PRESENTATIONS 2CV.2

15:15 - 16:45 New Materials, Devices and Conversion Concepts | New Modelling and Characterisation Techniques

- 2CV.2.1 Selective Laser Ablation of Copper Nitride Thin Films for Photovoltaic Applications**
 David Canteli¹, Andrés de Diego², Susana Fernández³, Orlando Guarneros⁴, Cristina Munoz-Garcia², Jose Javier Gandia³, Carlos Molpeceres²
¹ Technical University of Madrid, Madrid, Spain; ² Technical University of Madrid, Madrid, Spain; ³ CIEMAT, Madrid, Spain; ⁴ Autonomous University of San Luis Potosí, San Luis Potosí, Mexico
- 2CV.2.2 Wide-Bandgap p-Type BaCu₄S₃ Thin Films via Sputtering-Sulfurization**
 Younes Lablali¹, Olivier Donzel-Gargand², Jonathan J. Staaf Scragg², Mohammed Makha¹
¹ Mohammed VI Polytechnic University, Ben Guerir, Morocco; ² Uppsala University, Uppsala, Sweden
- 2CV.2.3 Van Der Waals Assembled Schottky-Junction Solar Cells Based on Substitutionally Doped p-Type MoS₂**
 Jorge Rodríguez-Muro¹, Elvira Cánovas¹, Inés Durán¹, Rafailia Rountou¹, Der-Yuh Lin², Elisa Antolín¹, Simon A. Svatek¹
¹ UPM, Madrid, Spain; ² National Changhua University of Education, Changhua, Taiwan
- 2CV.2.4 Synthesis of Zinc Oxide Quantum Dots as Downshifting Materials for Enhanced Photovoltaic Performance**
 Nazim Aslam¹, Valentina Diolatti¹, Leonardo Sollazzo¹, Donato Vincenzi¹
¹ University of Ferrara, Ferrara, Italy
- 2CV.2.5 Hyperuniform Nanopatterning by Polymer-blend Lithography for Light-trapping in Solar Cells**
 Simon Ryckaert¹, Sylvain Finot², Jeronimo Buencuerpo³, Inès Revol⁴, Stéphane Collin¹
¹ C2N, Palaiseau, France; ² IPVF, Palaiseau, France; ³ IMN-CSIC, Madrid, Spain; ⁴ LAAS, Toulouse, France



- 2CV.2.6 Plasmonic Enhancement of Perovskite Absorber Layers Using Stable Metal Nanoparticles**
 Mohammad Istiaque Hossain¹, Alaa Elsafi¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar
- 2CV.2.7 Resonant Nanostructures for Colored Photovoltaics**
 Tom Veeken¹, Cathalijne Hupkens¹, Evert Bende², Albert Polman¹
¹ AMOLF, Amsterdam, The Netherlands; ² Solarix, Weesp, The Netherlands
- 2CV.2.8 III-V Growth on Patterned Graphene for Transferable Thin-Films**
 Naomie Messudom¹, Carlos Macias¹, Antonella Cavanna¹, Ali Madouri¹, Gilles Patriarche¹, Nathaniel Findling¹, Stefano Pirota¹, Jean-Baptiste Rodriguez², Laurent Travers¹, Nathalie Bardou¹, Stéphane Collin¹, Jean-Christophe Harmand¹, Amaury Delamarre¹
¹ CNRS, Palaiseau, France; ² CNRS, Montpellier, France
- 2CV.2.9 Laser Patterning of MoO_x-Based DMD Electrodes for Photovoltaic Applications: Thresholds and Process Windows**
 Daniele Arduino¹, David Canteli², David Munoz-Martin², Umer Aziz³, Ana Luz Muñoz-Rosas³, Julià Lopez-Vidrier³, Joan Bertomeu³, Miguel Morales², Carlos Molpeceres²
¹ Polytechnic University of Turin, Torino, Italy; ² UPM, Madrid, Spain; ³ University of Barcelona, Barcelona, Spain
- 2CV.2.25 Dual-Chopping Spectral Responsivity System for Advanced Photovoltaic Device Calibration**
 Blago Mihaylov¹, Harald Müllejjans¹, Ewan D. Dunlop¹
¹ European Commission, Ispra, Italy
- 2CV.2.26 Interpretable Physics-informed Bayesian Optimization in Photovoltaic Materials Acceleration Platforms**
 Joseph Chakar¹, James Connolly², Stefania Cacovich³, Jean-Paul Kleider², Jean-François Guillemoles³, Jean-Baptiste Puel⁴, Philip Schulz³
¹ IPVF, Palaiseau, France; ² CentraleSupélec (GeePs), Gif-sur-Yvette, France; ³ CNRS, Palaiseau, France; ⁴ EDF, Palaiseau, France
- 2CV.2.27 Varied Intensity I-V Measurement of the Emerging PV under Indoor Lighting**
 Yean-San (Mickey) Long¹, Yung-Tsung Liu¹, San-Yu Ting¹, Min-An Tsai¹, Cho-Fan Hsieh¹
¹ ITRI, Hsinchu, Taiwan
- 2CV.2.28 First-Principles Investigation on the Influence of Molecular Orientation, Defects, and Doping on the Optical Properties of MAPbI₃**
 Engin Torun¹, Paul Procel Moya¹, Luana Mazzarella¹, Olindo Isabella¹, Ferdinand Grozema¹, Rudi Santbergen¹
¹ Delft University of Technology, Delft, The Netherlands
- 2CV.2.29 Materials Chemical Composition Impacts on the Band Alignments: the Case of the 3D/2D Perovskite Interfaces**
 Philippe Baranek¹
¹ EDF R&D, Palaiseau, France
- 2CV.2.30 Understanding the Role of Haze in Indoor Perovskite Solar Cells**
 Eugenia Zugasti¹, Alicia Buceta¹, Cristina Pinto¹, Iñaki Cornago¹, Asier Murillo¹, Jaione Bengoechea¹, Antonio Urbina²
¹ CENER, Sarriguren, Spain; ² UPNA, Pamplona, Spain
- 2CV.2.31 Advanced Synchrotron X-Ray and Neutron Techniques to Reveal Early-Stage Degradation Mechanisms in PV Devices**
 Hugo Lajoie¹, Tristan Gageot¹, Romain Couderc¹, Pierre Everaere², Thu Nhi Tran Caliste², Edward Mitchell², Thomas Saerbeck³, Mark Robert Johnson³, Ioannis (John) A. Tsanakas¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² ESRF, Grenoble, France; ³ ILL, Grenoble, France
- 2CV.2.32 Disentangling Ion Migration from Artifacts in High-Fidelity ToF-SIMS Depth Profiling of Perovskite Solar Cells**
 Nico Fransaert¹, Jean V. Manca¹, Shabnam Ahadzadeh¹, Bart Ruttens², Jan D'Haen¹, Dirk Valkenborg¹, Bart Cleuren¹, Bart Vermang¹, Aslihan H. Babayigit¹
¹ Hasselt University, Diepenbeek, Belgium; ² Imec, Diepenbeek, Belgium
- 2CV.2.33 Spatial and Spectral Analysis of Short-Term Changes in Perovskite Photoluminescence Signal via Hyperspectral Imaging**
 Ivar Loland Råheim¹, Åsmund Cornelius Hamre¹, Espen Olsen¹
¹ NMBU, Ås, Norway
- 2CV.2.34 Quantifying the Mobile Ion Density and Mobility in Perovskite Solar Cells with Impedance Spectroscopy**
 Fransien Elhorst¹, Yieon Park¹, Patricia Martin Fernandez¹, Javier Sebastián Alonso², Henk Bolink², Jan Anton Koster¹
¹ University of Groningen, Groningen, The Netherlands; ² University of Valencia, Valencia, Spain
- 2CV.2.35 Impedance Spectroscopy on Perovskite Solar Cells: Why is Short-Circuit Better than Open-Circuit?**
 Sander Heester¹, Natália P. Neme¹, L. Jan Anton Koster¹
¹ University of Groningen, Groningen, The Netherlands
- 2CV.2.36 Improving Surface Photovoltage Measurements in Photovoltaic Materials by Synchronized Modulation KPFM**
 Zeinab Eftekhari¹, Ariane Ufer², Ursula Wurstbauer², Rebecca Saive¹
¹ University of Twente, Enschede, The Netherlands; ² University of Münster, Münster, Germany
- 2CV.2.37 Multisource LED Solar Simulation for Accurate and Wavelength-Resolved Photovoltaic Characterization**
 Reza Khodabakhsh¹
¹ G2V Optics, Edmonton, Canada
- 2CV.2.38 Mapping Carrier Dynamics: Combining Time-Resolved Photoluminescence and Spatial Imaging for Advanced Semiconductor Research**
 Emilio Gutierrez-Partida¹, Eugeny Ermilov¹, Volker Buschmann¹, Christian Oelsner¹, Felix Koberling¹, Jürgen Breitlow¹, Rainer Erdmann¹
¹ PicoQuant, Berlin, Germany



VISUAL PRESENTATIONS 2CV.3

17:00 - 18:30 Perovskite-based Tandem and Multijunction Devices | Perovskites

2CV.3.1 All-Perovskite Tandem Solar Cells

Dewei Zhao¹

¹ Sichuan University, Chengdu, China

2CV.3.2 Up-Scaling Perovskite Growth using Hybrid Methods for Silicon/Perovskite Tandem Solar Cells

Kristell Carreric¹, Polyxeni Tsoulka¹, Louis Grenet², Elodie Gerente², Solenn Berson¹

¹ CEA / INES, Bourget du Lac, France; ² CEA, Grenoble, France

2CV.3.3 Comparative Studies of III-V/Si and Perovskite/Si Tandem Solar Cells for Solar-powered Vehicle Applications

Masafumi Yamaguchi¹, Tatsuya Takamoto², Takashi Mabuchi³, Seira Yamaguchi³, Kenichi Okumura³, Ryo Ozaki¹, Nobuaki Kojima¹, Yoshio Ohshita¹

¹ Toyota Technological Institute, Nagoya, Japan; ² University of Miyazaki, Miyazaki, Japan; ³ Toyota Motor Corporation, Toyota, Japan

2CV.3.4 Two-Step Crystallization Modulation of Wide-Bandgap Perovskite Films on Commercially Compatible Crystalline Silicon for High-Efficiency Perovskite-Silicon Tandem Solar Cells

Lin Wu¹, Jiawei Zhang¹, Jiawen Li¹, Haowen Luo¹, Yifeng Zhang¹, Yuchao Hu¹

¹ Tongwei Solar, Chengdu, China

2CV.3.5 High Volume Manufacturing of Perovskite Cell Stacks using Linear Evaporators

Jens Baumann¹, Frank Löffler¹, Bruno Heimke¹, Martin Fischer¹

¹ VON ARDENNE, Dresden, Germany

2CV.3.6 Enhancing the Electrical Properties of nc-Si:H / NiOx Interfaces in Perovskite-Silicon Tandem Cells using Aluminum doped Nickel Oxide Deposited by ALD

Yann Pinal¹, Chandralina Patra², Damien Coutancier¹, Solène Béchu³, Muriel Bouttemy³, Jose Alvarez⁴, Erik Johnson², Nathanaelle Schneider¹

¹ IPVF, Palaiseau, France; ² LPICM, Palaiseau, France; ³ ILV-UVSQ, Versailles, France; ⁴ GEEPS, Gif sur Yvette, France

2CV.3.7 Perovskite Coating Process Control: from Laboratory Diagnostics to Industrial Scale Metrology Systems

Jens Baumann¹, Jona Kurpiers², Christian Camus³, Löffler Frank¹, Heimke Bruno¹

¹ VON ARDENNE, Dresden, Germany; ² HZB, Berlin, Germany; ³ LayTec, Berlin, Germany

2CV.3.8 Methylammonium Free Perovskite Top Cell via 2-step Hybrid Method for Perovskite/Si Tandem Application

Anna De Girolamo Del Mauro¹, Manuela Ferrara¹, Gennaro V. Sannino¹, Maria Federica Caso¹, Marco Della Noce¹, Eugenia Bobeico¹, Pietro Scognamiglio¹, Iurie Usatii¹, Paola Delli Veneri¹, Lucia V. Mercaldo¹

¹ ENEA, Portici, Italy

2CV.3.9 Scalable Low Damage PVD Methods for TCOs for Perovskite Solar Cells

Martin Dimer¹, Barbara Gebhardt¹, Boris Rivkin², Vishnupriya Rajukumar Hegden², Yana Vaynzof², Oliver Haustein¹, Holger Pröhl¹

¹ VON ARDENNE, Dresden, Germany; ² IFW, Dresden, Germany

2CV.3.10 A Curated, AI-Extracted Database for Accelerating the Development of Perovskite-Silicon Tandem Solar Cells

Mohammad Moaddeli¹, Branoosh Afshari¹, Negin Nezamloo², Mansour Kanani¹, Mohammadreza Aghaei³

¹ Shiraz University, Shiraz, Iran; ² Imam Khomeini International University, Qazvin, Iran; ³ Norwegian University of Science and Technology, Aalesund, Norway

2CV.3.11 Back-Contact 2-Terminal Perovskite-Silicon Tandem Solar Cells and Modules by Metal Wrap-Through Technology

Melvin ten Kate¹, Yu Wu¹, Eric Kossen¹, Nicolas Guillevin¹, Eelko Hoek¹, Martijn Ronchetti¹, Victor Rosca¹, Johan Bosman², Anne Biezemans², Marcel Simor², Giulia Lucarelli², Valerio Zardetto², Bart Geerligns¹

¹ TNO, Petten, The Netherlands; ² TNO, Eindhoven, The Netherlands

2CV.3.12 Fast Reverse Bias Characterization of Perovskite-Silicon Tandem Solar Cells

Ivanoli Jaurece Djeukeu¹, Jonas Horn², Michael Meixner², Enno Wagner³, Stefan W. Glunz⁴, Klaus Rampseck²

¹ halm elektronik / Albert-Ludwigs-University Freiburg, Frankfurt am Main/Freiburg, Germany; ² halm elektronik, Frankfurt am Main, Germany; ³ Frankfurt University of Applied Sciences, Frankfurt am Main, Germany; ⁴ Fraunhofer ISE/Albert-Ludwigs-University Freiburg, Freiburg, Germany

2CV.3.13 Scalable Perovskite/Silicon Tandems for Mass Production – Critical Cell Processes and Module Design

Jiawei Zhang¹, Lin Wu¹, Jiawen Li¹, Haowen Luo¹, Yuchao Hu¹, Yifeng Zhang¹, Wei Long¹

¹ Tongwei Solar, Chengdu, China

2CV.3.14 Laser Processes for Perovskite and Organic Solar Cells and Modules for Large Substrates with Multi-Wavelength at Film Side and Glass Side Processing

Stefan Bergfeld¹, Tsvetelina Merdzhanova²

¹ Aachen University of Applied Science, Jülich, Germany; ² FZJ, Jülich, Germany

2CV.3.15 Upscaling of the Perovskite Top Cell for 2T Perovskite-CIGS Tandem Cells

Denise Kreugel¹, Radha Krishnan Kothandaraman¹, Corné Frijters¹, Sinclair Ryle Ratnasingham¹, Marcel Simor¹, Drishya Rajan Pillai¹, Chandu Mohan¹, Johannes Lambooi¹, Hero 't Mannetje¹, Damilola Adeleye², Guillermo Farias Basulto², Reiner Klenk², Christian A. Kaufmann², Kousumi Mukherjee³, Mariadriana Creatore³, Veronique Gevaerts¹, Valerio Zardetto¹

¹ TNO, Eindhoven, The Netherlands; ² HZB, Berlin, Germany; ³ Eindhoven University of Technology, Eindhoven, The Netherlands

2CV.3.16 Energy Yield Modelling of Tandem Monofacial and Bifacial Modules in the IEC 61853-4 Standard Climates

James Blakesley¹, Emily O'Connor¹, Lavanya Malarkannan¹, George Koutsourakis¹

¹ National Physical Laboratory, Teddington, United Kingdom



- 2CV.3.17 Influence of Dimethyl Sulfoxide Additives on Inkjet-Printed Perovskite-Silicon Tandem Solar Cells**
Parisa Aktepe¹, Leon Brenner¹, Raphael Efinger¹, Roman Keding¹
¹ Fraunhofer ISE, Freiburg, Germany
- 2CV.3.18 Passivation-Induced Interfacial Reconstruction Probed by Cross-sectional TEM in 2T Perovskite/Silicon Tandem Solar Cells**
Chandralina Patra¹, Anna Capitaine¹, Van-Son Nguyen¹, Junkang Wang², Kassiogé Dembélé², Pavel Bulkin², Jean Rousset³, Pere Roca i Cabarrocas², Erik V. Johnson²
¹ IPVF, Palaiseau, France; ² LPICM - CNRS, Palaiseau, France; ³ EDF R&D, Palaiseau, France
- 2CV.3.19 The Difference Between Stabilized Power Point and Swept Power Point with Various JV Sweep Parameters**
Sercan Aslan¹, Sercan Aslan², Amir Afshord Zarean¹, Samah Akel¹, Thomas Kirchartz¹, Thomas Kirchartz³, Uwe Rau¹, Uwe Rau², Kaining Ding¹, Kaining Ding²
¹ FZJ, Jülich, Germany; ² Aachen University, Aachen, Germany; ³ University of Duisburg-Essen, Duisburg, Germany
- 2CV.3.20 Unravelling Perovskite Degradation Mechanisms on Textured Silicon for Tandem Photovoltaics**
Mingrui He¹, Hongjae Shim¹, Xiaojing Hao¹
¹ UNSW, Sydney, Australia
- 2CV.3.21 Laser Annealing-Assisted Perovskite Thin Film Preparation and Tandem Device Fabrication**
Jianbo Liu¹, Meng Zhang², Chunlan Zhou³, Ke Xin⁴, Yue Ma⁵, Yuelong Huang⁵
¹ Huzhou Phoenixolar, Huzhou, China; ² University of New South Wales, Sydney, Australia; ³ Chinese Academy of Sciences, Beijing, China; ⁴ Huzhou Phoenixolar, Huzhou, China; ⁵ Huzhou Phoenixolar, Huzhou, China
- 2CV.3.22 Ambient-air Processed Slot-die Coated 2T Perovskite-Silicon Tandem Solar Cells with Green Solvent Formulations and Non-Fullerene Transport Layers**
Radha Krishnan Kothandaraman¹, Denise Kreugel¹, Felipe Vinocour Pacheco¹, Sinclair Ryley Ratnasingham¹, Marcel Simor¹, Manvika Singh¹, Corné Frijters¹, Johannes Lambooi¹, Giulia Lucarelli¹, Ilker Dogan¹, Bart (L.J.) Geerligs², Valerio Zardetto¹
¹ TNO, Eindhoven, The Netherlands; ² TNO, Petten, The Netherlands
- 2CV.3.37 Crystallization Control using Molecular Additives for High-Efficiency, Large-Area Perovskite Modules**
Zi-Fan He¹, Amit Kumar Harit¹, Anurag Krishna¹
¹ IMEC, Genk, Belgium
- 2CV.3.38 Interplay of Cross-Reading, Pressure and Co-evaporation Speed on Triple-Source FA-Based Perovskite Films and Devices**
Reinder K. Boekhof¹, Lara M. van der Poll¹, Jin Yan¹, Aidan le Roux¹, Daan Bakker¹, Judah Robson¹, Arno H.M. Smets¹, Tom J. Savenije¹, Luana Mazzarella¹
¹ TU Delft, Delft, The Netherlands
- 2CV.3.39 Dual Vapor-Phase Treatment Driven Subsurface Reorganization for 3D Passivation Networks towards Ultralow Interfacial Energy Loss in Perovskite Photovoltaics**
Xianzhao Wang¹, Han He¹, Ying Zhao¹, Xiaodan Zhang¹
¹ Nankai University, Tianjin, China
- 2CV.3.40 Stability under Illumination of FAPbBr₃ Perovskite Cells and Modules: Effects of Device Upscaling and Different Operating Conditions**
Noah Tormena¹, Andrea Quagliotto¹, Alessandro Caria¹, Matteo Buffolo¹, Carlo De Santi¹, Andrea Cester¹, Gaudenzio Meneghesso¹, Enrico Zanoni¹, Jessica Barichello², Fabio Matteocci², Aldo Di Carlo², Nicola Trivellin¹, Matteo Meneghini¹
¹ University of Padova, Padova, Italy; ² University of Rome, Rome, Italy
- 2CV.3.41 Metal-Organic Framework-Assisted Buried Interface Engineering for Stabilization of Perovskite-Based Solar Cells**
Nicolas Pernès¹, Thomas Gomes¹, Yifan Xu², Farid Nouar², Stéphane Cros¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² ESPCI, Paris, France
- 2CV.3.42 Tin-Lead Perovskite Solar Cells with Outstanding Stability**
Andrea Arreola Vargas¹, Qianshan Feng¹, David Garcia Romero¹, Maria Antonietta Loi¹
¹ University of Groningen, Groningen, The Netherlands
- 2CV.3.43 Understanding the Electronic Consequences of Geometry: Nanotexturing in Perovskite Solar Cells**
Klaus Jäger¹, Dilara Abdel², Jacob Relle¹, Thomas Kirchartz³, Patrick Jaap², Jürgen Fuhrmann², Sven Burger⁴, Christiane Becker¹, Patricio Farrell²
¹ HZB, Berlin, Germany; ² Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany; ³ FZJ, Jülich, Germany; ⁴ Zuse Institute Berlin, Berlin, Germany
- 2CV.3.44 Anti-Soiling Electrodes in Extreme Operating Conditions**
Mohammad Istiaque Hossain¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar
- 2CV.3.45 Achieving High Open-Circuit Voltage in Wide-Bandgap Bromide Perovskite Solar Cells through Hole Transport Material Engineering**
Mohammad Istiaque Hossain¹, Brahim Aissa¹
¹ QEERI, Doha, Qatar
- 2CV.3.46 2D Perovskite Formation at the EDAl₂-passivated Surface of a Triple-cation Triple-halide Perovskite Resulting in High Efficiencies**
Johannes Löhr¹, Hannah Genath², Robby Peibst¹, Jan Schmidt¹
¹ ISFH, Emmerthal, Germany; ² Leibniz University, Hannover, Germany
- 2CV.3.47 Durability of Mixed-Halide Aziridinium Perovskite Thin films under Environmental Stress**
Witchaya Arpavate¹, Young Un Jin¹, Lars Leander Schaberg², Mariana Escobar-Castillo¹, Niels Benson², Doru C. Lupascu¹
¹ University of Duisburg-Essen, Essen, Germany; ² University of Duisburg-Essen, Duisburg, Germany



- 2CV.3.48 Roll-to-Roll Slot-Die Coating of Flexible n-i-p Perovskite Devices**
Giulia Lucarelli¹, Felipe Vinocour Pacheco¹, Drishya Rajan Pillai¹, Harrie Gorter¹, Thomas Exlager¹, Chandu Mohan¹, Johannes Lambooi², Ilker Dogan¹, Sjoerd Veenstra¹
¹ TNO, Eindhoven, The Netherlands; ² TNO, Eindhoven, United States of America
- 2CV.3.49 Mechanisms of Crystallization in Sequentially Evaporated Tin-Lead Perovskite**
Niels van Silfhout¹, Lara van der Poll¹, Reinder Boekhoff¹, Luana Mazzarella¹, Tom Savenije¹, Arno Smets¹
¹ Delft University of Technology, Delft, The Netherlands
- 2CV.3.50 Insights into the Degradation of Hybrid Lead Halide Perovskite Thin Films and Solar Cell Devices During Outdoor Exposure**
Maria Hadjipanayi¹, Vasiliki Paraskeva², Aliko Souzou², Modestos Athanasiou², Aranzazu Aguirre³, Anurag Krishna³, Tamara Merckx³, Alexandros Themistokleous², Sophia Hayes², Grigorios Itskos², Sumeet Mujumdar², Elias Peraticos², Tom Aernouts³
¹ University of Cyprus, Nicosia, Cyprus; ² University of Cyprus, Nicosia, Cyprus; ³ IMEC, Genk, Belgium
- 2CV.3.51 Impact of Water Ingress and Damp Heat on POE-Encapsulated Perovskite Solar Cells**
Arslan Ali¹, Marko Jošt¹, Kristijan Brecl¹, Marko Topič¹, Marko Jankovec¹
¹ University of Ljubljana, Ljubljana, Slovenia
- 2CV.3.52 Functional PEAI-Based Salts for Interface Passivation in Inverted Perovskite Solar Cells**
Sude Çebi¹, Gül Simge Özdemir¹, Cem Maden¹, Figen Varlıoğlu Yaylalı¹, Mustafa Yaşa¹, Görkem Günbaş¹, Selçuk Yerci¹
¹ ODTÜ-GÜNAM, Ankara, Türkiye
- 2CV.3.53 Thermally Evaporated Self-Assembled Monolayers for Fully Evaporated Perovskite Solar Cells**
Niels Uythoven¹, Huagui Lai¹, Rui-Tung Kuo², Ioanna Vareli¹, Frank Nüesch¹, Tzu-Ying Lin², Fan Fu¹
¹ Empa, Dübendorf, Switzerland; ² National Tsing Hua University, Hsinchu, Taiwan
- 2CV.3.54 A Layer-by-Layer Investigation of the Sensitivity to Processing Atmosphere on Characteristics of Slot Die-Coated Perovskite Solar Cells**
Tina Wahl¹, Jonas Hanisch¹, Stefanie Spiering¹, Oliver Salomon¹, Erik Ahlswede¹, Eva-Maria Hammer¹
¹ ZSW, Stuttgart, Germany
- 2CV.3.55 Polymerized SAMs for Improved Charge Extraction and Improved Fabrication Process Robustness in Perovskite Single Junction and Silicon/Perovskite Tandem Solar Cells**
Sandra Glocker¹, Wolfram Hempel¹, Erik Ahlswede¹, Michael Powalla¹
¹ ZSW, Stuttgart, Germany
- 2CV.3.56 Hyperspectral Photoluminescence Imaging for Process Optimisation of DMF-free, Slot-die Coated, Vacuum-quenched Perovskite Solar Cells**
Toshimitsu Mochizuki¹, Shota Araki¹, Hidetaka Takato¹, Katsuto Tanahashi¹
¹ AIST, Koriyama, Japan
- 2CV.3.57 Near-field Effects on Cathodoluminescence Outcoupling in Perovskite Thin Films**
Robin Schot¹, Imme Schuringa², Álvaro Rodríguez Echarri¹, Lars Sonneveld¹, Tom Veeken¹, Yang Lu³, Samuel Stranks³, Albert Polman¹, Bruno Ehrler¹, Saskia Fiedler¹
¹ AMOLF, Amsterdam, The Netherlands; ² AMOLF, Amsterdam, The Netherlands; ³ University of Cambridge, Cambridge, United Kingdom
- 2CV.3.58 Passivation Strategies of Methylammonium Free Tin-Lead Perovskites**
Michela Cecconi¹, Antonio Abate¹, Giuseppe Nasti², Paola Delli Veneri³, Lucia V. Mercaldo²
¹ University of Naples Federico II, Naples, Italy; ² ENEA, Portici, Italy; ³ ENEA, Portici, Italy
- 2CV.3.59 Experimental and DFT Studies on the Kesterite-CZTS Nanoparticles as Hole Transport Material for Perovskite Solar Cells**
Mehr Un Nisa¹, Giorgio Tseberlidis¹, Simona Olga Binetti¹, Adriana Pecoraro², Michael Zambrano², Ana Belén Muñoz García², Michele Pavone²
¹ University of Milano-Bicocca, Milan, Italy; ² University of Naples Federico II, Naples, Italy
- 2CV.3.60 Data-Driven Optimization of HTL-free Graded Heterojunction Solar Cells through Numerical Simulations and Machine Learning**
Savita Kashyap¹, Sanjeev Kumar¹, Arun Kumar Singh¹
¹ Punjab Engineering College, Chandigarh, India



Thursday, 17. September 2026

VISUAL PRESENTATIONS 4DV.1

08:30 - 10:00 **Agri-PV | Other PV Applications (Floating, Infrastructure, etc.); CPV; PV in Space | Hybrid Systems and Storage; Direct Uses of PV Generated Electricity**

4DV.1.1 **Reduced-Order Models for Bifacial PV and Ground Insolation in Agrivoltaics Applications**

Jennifer L. Braid¹, Isaiah H. Deane¹, Norman R. Jost¹

¹ Sandia National Laboratories, Albuquerque, United States of America

4DV.1.2 **Sustainable Agrivoltaics: Utilizing Down-Conversion Dyes to Harmonize Solar Energy and Crop Growth**

Fabio Silva¹, Arthur Maufort¹, Anna Karamysheva¹, Frédéric Peilleron¹, Kristof Proost¹

¹ IP FAB, Mechelen, Belgium

4DV.1.3 **Development of a Digital Calculation Tool for Optimising the Row Spacing of Agri-Photovoltaic Systems Considering Variable Machinery Widths**

Hendrik Zerkowski¹, Simon Lahr¹, Yannick Kloos¹

¹ Next2Sun Technology, Dillingen, Germany

4DV.1.4 **Image-based Phenology Monitoring to Optimize Agrivoltaic System Design and Tracker Operation in Vneyards**

Dennis Kniel¹, Tamara Bretzel¹, Hannes Engler², Sergio Vélez Martín³, Matthew Berwind¹

¹ Fraunhofer ISE, Freiburg, Germany; ² Staatliches Weinbauinstitut Freiburg, Freiburg, Germany; ³ University of Burgos, Burgos, Spain

4DV.1.5 **Evaluating the Viability of Agrivoltaic Systems in Türkiye: An Analytical Examination across Three Distinct Regions**

Duygu Kuzyaka¹, Ömer Yalçın¹, Atilla Polat², Mehmet Yüksel², Zeynep Demir², Talat Özden¹

¹ ODTÜ-GÜNAM, Ankara, Türkiye; ² Soil, Fertilizer, and Water Resources Central Research Institute, Ankara, Türkiye

4DV.1.6 **A Simulation-Driven Multicriteria Framework for Agri-PV Configuration Optimization**

Nada ElRhazouani¹, Said Elhamaoui², Khadija El Ainaoui², Paula Sanchez-Friera³, Achraf Sounni², Abdellatif Ghennioui², Ahmed Chebak¹, Khalid Radouane¹

¹ UM6P, Ben Guerir, Morocco; ² Green Energy Park, Ben Guerir, Morocco; ³ Solkeys, Gijón, Spain

4DV.1.7 **Voltiris Greenhouse Concentrator: Practical Concentration Ratios and Array Performance**

Antonius R. (Teun) Burgers¹, Lauriane Gugnot², Jonas Roch², Seymour Lubbers³, Bas van Aken⁴

¹ TNO Energy Transition, Petten, The Netherlands; ² Voltiris, Epalinges, Switzerland; ³ TNO Digital Built Environment, Delft, The Netherlands; ⁴ TTNO Energy Transition, Petten, The Netherlands

4DV.1.8 **From Concept to Field: an Overhead Agrivoltaic System with Adaptive Tracking for Olive Groves**

Iñaki Cornago¹, Aritz Legarrea¹, Gregorio Olivares¹, Ana María Gracia Amillo¹, Gillen Abrego², Eusebio Gainza², Ildelfonso Muñoz¹

¹ FUNDACION CENER, Sarriguren, Spain; ² ALLOTARRA, Allo, Spain

4DV.1.9 **Design, Implementation and Early Performance of Crop-Compatible Agri-PV Systems with Spectral Management**

Ramona Davoudnezhad¹, Selin Cansu Gölboylu¹, Merve Tan¹, Ümran Dilmaç¹, Ömer Yalçın², Duygu Kuzyaka², Ali Erçin Ersundu³, Miray Çelikbilek Ersundu³, Colin Osborne⁴, Holly Croft⁴, Zeynep Dilan Deniz⁵, Talat Özden², Selçuk Yerci², Meriç Çalışkan Arslan¹

¹ Kalyon PV Solar Technology Factory, Research and Development Center, Ankara, Türkiye; ² METU, Ankara, Türkiye; ³ Yıldız Technical University, İstanbul, Türkiye; ⁴ University of Sheffield, Sheffield, United Kingdom; ⁵ Tat Gıda Sanayi, Bursa, Türkiye

4DV.1.10 **Tracing Rays from Leaves to Sky: Validation of an Irradiance Modelling Framework for Agrivoltaic Orchards**

Odysseas Alexandros Katsikogiannis¹, Ebe Coomans¹, Olindo Isabella¹, Rudi Santbergen¹, Hesam Ziar¹

¹ TU Delft, Delft, The Netherlands

4DV.1.11 **A High Resolution, Forecast-Enhanced Digital Twin for Agrivoltaic Trackers: Implementation and Orchard Trials**

Bilal Abdul-Qayyoom Khalid¹, Maddalena Bruno¹, Tamara Bretzel¹, Leonhard Gfüllner¹, Matthew Berwind¹

¹ Fraunhofer ISE, Freiburg, Germany

4DV.1.12 **First Parametric Studies for the Optimization of PV Electrical Performance in Crop Agrivoltaics**

Corentin Coutellier¹, Ya Brigitte Assoa¹, Christophe Ménézo², Rémi Vézy³, Didier Combes⁴

¹ CEA, Le Bourget du Lac, France; ² University of Savoie Mont Blanc, Le Bourget du Lac, France; ³ CIRAD, Montpellier, France; ⁴ INRAE, Lusignan, France

4DV.1.13 **Peatland-PV - First Research in Germany**

Carl Pump¹, Hanna Martens¹, Cordula Gutekunst¹, Monika Hohlbein¹

¹ University of Greifswald, Greifswald, Germany

4DV.1.14 **Effectively Communicating of the Environmental Impacts of Agri-PV Systems: why Life Cycle Assessment and Parameterized Models are Great Tools**

Alejandra Cue Gonzalez¹, Pierre Jouannais², Mathilde Marchand-Lasserre¹

¹ Mines Paris, Valbonne, France; ² University of Montpellier, Montpellier, France



- 4DV.1.15 From Competition to Integration: Soybean-based Agrivoltaics as a new Land-use Paradigm in Brazil**
Bruno Jacomel Vieira¹, Alex Manito¹, Marcelo Pinho Almeida¹, Rafael Braghieri Menillo², George Lambais², Mauricio Cherubin², Roberto Zilles¹
¹ USP, São Paulo, Brazil; ² USP, Piracicaba, Brazil
- 4DV.1.16 From Roots to Rays - Holistic and Integrated Life Cycle Sustainability Assessment of Agrivoltaics**
Raphaela Ari Kießler¹, Matthew Berwind¹, Daniela Thrän², Walther Zeug², Enrique A. Perdomo E.², Christina Zinke²
¹ Fraunhofer ISE, Freiburg, Germany; ² Helmholtz Centre for Environmental Research, Leipzig, Germany
- 4DV.1.31 Implementation and Optimisation of Floating PV in Dutch Offshore Wind Farms**
Laurens Huisman¹, Annanta Kaul¹, Sara Golroodbari¹, Wilfried van Sark¹
¹ Utrecht University, Utrecht, The Netherlands
- 4DV.1.32 Systemic Barriers to Scaling Floating Photovoltaics in Europe: an Expert-based Assessment of Technical Maturity and Deployment Constraints**
Sara Mirbagheri Golroodbari¹, Nabih Cherradi²
¹ UU, Utrecht, The Netherlands; ² EmpowerSun, Pully, Switzerland
- 4DV.1.34 PV2Float: Comparative Thermal and Performance Analysis of Three Floating PV Demonstrators and a Land Reference**
Monica Nicola¹, Matthew Berwind¹
¹ Fraunhofer ISE, Freiburg, Germany
- 4DV.1.35 Development of a 1.12 kW Photovoltaic-Integrated Electric Vehicle Prototype and Its Evaluation as a Community Bus**
Hidenori Mizuno¹, Katsuto Tanahashi¹, Takashi Oozeki¹
¹ AIST, Koriyama, Japan
- 4DV.1.36 Reliability Evaluation and Accelerated Environmental Stress Testing (CASS & HF10) of Solar Inverters for Offshore and Coastal Environments**
Hsiu-Ming Chang¹, San-Yu Ting¹, Syh-Hong Chen¹, Ren-Jie Guo¹, Min-An Tsai¹, Cho-Fan Hsieh¹
¹ ITRI, Hsinchu, Taiwan
- 4DV.1.37 Transparent Solar Pond Prototype: Preliminary Stratification Tests Using Water and a Salt Gradient**
Sedong Kim¹
¹ Korea Institute of Industrial Technology, Chungcheongnam-do, South Korea
- 4DV.1.38 Optimal Design and Demonstration for Application of Bi-facial PV Modules on Floating PV**
Hyunsik Jo¹, Jieun Lee¹, Sunghyun Lee¹, Donggun Yang¹, Changsub Won², Youngshin Lim²
¹ Korea Water Resources, Daejeon-Si, South Korea; ² MIRAE, Seoul-Si, South Korea
- 4DV.1.39 Methodology for Small-Scale Tests on Floating Photovoltaic Systems Subjected to Waves**
Jesus Florido Ortega¹, Maria Clavero Gilbert¹, Edgar Gerardo Mendoza Baldwin²
¹ University of Granada, Granada, Spain; ² National Autonomous University of Mexico, Mexico City, Mexico
- 4DV.1.40 Performance Evaluation and Degradation Assessment of Perovskite Solar Cells for LEO Space Missions**
Abdullah Alsubaihi¹, Ahmad Albakri¹, Meteb Ali¹
¹ King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia
- 4DV.1.41 Floating Photovoltaic Systems Impact on the Water Quality: a Study for an Urban Area in Brazil**
Vicente Diniz de Carvalho¹, Janine Brandao de Farias Mesquita¹, José Carlos de Araújo², Paulo C. M. Carvalho², Breno Bezerra Freitas²
¹ Federal University of Ceará, Crateús, Brazil; ² Federal University of Ceará, Fortaleza, Brazil
- 4DV.1.42 Vehicle-Mounted Photovoltaic Systems: Empirical Data Acquisition in Malta**
Vlad Costea¹, Brian Bartolo¹, Carmel Azzopardi¹, Austeja Mockeviciute-Azzopardi¹, Brian Azzopardi¹
¹ FiR.mt, Birkirkara, Malta
- 4DV.1.43 Floating Photovoltaic Systems and Water Surface Coverage: A Simulation of Technical, Environmental, and Economic Assumptions for Bourget Lake**
Hosam Mahmod¹
¹ University Savoie Mont Blanc, Chambéry, France
- 4DV.1.44 Impact of Installation Site and Plant Configuration on the Energy Yield of Floating PV Systems and the Thermal Loading of Grid-connected PV Inverters**
Sara Bouguerra¹, Richard De Jong², Jens Moschner³, Arnaud Morlier⁴, Michael Daenen¹, Patrizio Manganiello¹
¹ UHasselt, Diepenbeek, Belgium; ² imec, Leuven, Belgium; ³ KU Leuven, Leuven, Belgium; ⁴ imec, Diepenbeek, Belgium
- 4DV.1.45 Lithium-Gallium Co-Doped Silicon Heterojunction Solar Cells for Irradiation-Induced Defects Mitigation**
Charles Seron¹, Nicolas Enjalbert¹, Samuel Harrison¹, Hélène Lignier¹, Sébastien Dubois¹
¹ CEA / INES, Le Bourget-du-Lac, France
- 4DV.1.60 Enhancing Stability in Photovoltaic Direct-Coupled Green Hydrogen Systems**
Jieun Lee¹, Hyunsik Jo¹, Sung Hyun Lee¹, Donggeon Yang¹
¹ K-water, Yuseong-gu, South Korea
- 4DV.1.61 Titanium Based HIPIMS Films for CdTe Photovoltaic-Photoelectrochemical Integration**
Daniel A. L. Loch¹, Anna Kindvall², Ivan Rimmaudo², Anna Oniszcuk³, Robert Arndt², Tim Gehring¹, Uwe Heydenreich¹
¹ TRUMPF Hüttinger, Freiburg, Germany; ² CTF Solar, Dresden, Germany; ³ TRUMPF Huettinger, Warsaw, Poland



- 4DV.1.62 Performance Assessment of a Grid-Connected Bifacial PV–Flywheel Hybrid System for Level 3 Electric Vehicle Fast Charging**
Yosoon Choi¹, Shubhashish Bhakta¹
¹ Sejong University, Seoul, South Korea
- 4DV.1.63 Impact of PV Power Profiles on Lithium-Ion Battery Aging in Hybrid PV–Battery Systems**
Nassima Ait Said ouhammou¹
¹ Cadi Ayyad University, Marrakech, Morocco
- 4DV.1.64 System Design Change in Grid-Connected PV Plants with Battery Energy Storage**
Djaber Berrian¹, Gaurang Chhappia¹, Johannes Linder¹
¹ BELECTRIC Holding, Kolitzheim, Germany
- 4DV.1.65 Storage Solutions for PV Curtailment: A Life-Cycle Costing Approach**
Elvan Burcu Kosma¹, Olga Kanz¹, Oleksandr Astakhov¹, Tsvetelina Merdzhanova¹, Sergey Shcherbachenko¹, Gerhard Mütter², Petra Zapp¹
¹ FZJ, Jülich, Germany; ² Gerhard Mütter e.U., Waldneukirchen, Austria
- 4DV.1.66 Beyond Grid Constraints: Integrating Energy Storage Directly into Photovoltaic Modules**
Oleksandr Astakhov¹, Uwe Rau¹, Egbert Figgemeier¹, Peter Strasser², Christoph Brabec¹, Tsvetelina Merdzhanova¹
¹ FZJ, Jülich, Germany; ² Technical University of Berlin, Berlin, Germany

VISUAL PRESENTATIONS 5DV.2

10:30 - 12:00 Sustainability of PV

- 5DV.2.1 Design-Resolved Cabling Material Demand, Copper-Aluminium Substitution, and Criticality Impacts in Utility-Scale Photovoltaic Systems**
Nithin Vakeri Perunthottathil¹, Mohammad Abdelbaky¹, David Peck¹, Olindo Isabella¹, Malte Ruben Vogt¹
¹ TU Delft, Delft, The Netherlands
- 5DV.2.2 A Single-Step Silver Recovery Process from Photovoltaic Waste via Direct Electrodeposition**
Alejandra Vázquez-Adán¹, Eduardo Diez¹, Salvador Cotillas¹, Luis Jaime Caballero², Nerea Dasilva-Villanueva², David Fuertes Marrón², Carlos del Cañizo², Araceli Rodriguez¹
¹ Complutense University of Madrid, Madrid, Spain; ² UPM, Madrid, Spain
- 5DV.2.3 Efficient Recycling of Solar PV: Multi-faceted Strategy**
Romain Duwald¹, Agathe Vaché¹, Youcef Karar¹, Joshua Vauloup¹, Lison Marthey², Fabrice Coustier³, Emmanuel Billy¹
¹ CEA, Grenoble, France; ² CSEM, Neuchâtel, Switzerland; ³ CEA / INES, Le Bourget-du-Lac, France
- 5DV.2.4 Closing the Loop of Module Recycling, Integration of Recovered Glass and Backsheet into new Modules**
Xavier Mackré-Delannoy¹, Fabrice Coustier¹, Roland Riva¹, Philippe Thony¹, Jérémie Aimé¹
¹ CEA / INES, Le Bourget du Lac, France

- 5DV.2.5 Improving Particle Separation and Recovery of Valuable Materials from End-of-life Solar Panels**
Chengsun He¹, Yuting Zhuo¹, Yansong Shen¹
¹ UNSW, Sydney, Australia
- 5DV.2.6 From Rapid Growth to Preparedness: Charting PV End-of-life Flows in the Nordics**
Atse Louwen¹, Mattias Lindh¹, Michiel van Noord², Cecilia Wästerlid²
¹ RISE, Umeå, Sweden; ² RISE, Stockholm, Sweden
- 5DV.2.7 Upcycling of Silicon Recovered from End-of-Life Photovoltaic Modules into Functional Energy Materials**
Katsumichi Hanzawa¹, Shinya Kato², Kengo Yamanaka², Tomoharu Tokunaga¹, Taisuke Doi³, Ryoji Katsube¹, Yasuyoshi Kurokawa¹, Takashi Itoh¹, Noritaka Usami¹
¹ Nagoya University, Nagoya, Japan; ² Nagoya Institute of Technology, Nagoya, Japan; ³ NPC, Matsuyama, Japan
- 5DV.2.8 Evaluating the Possible Utilization Strategies for End-of-Life PV-modules Regarding the Increasing demand for Cullet in the European Glass Industry**
Lukas Spindler¹, Dominic Walter², Petra Boehm², Andreas Rosin³, Harald Zmmernann¹
¹ TAZ Spiegelau, Spiegelau, Germany; ² HVG, Offenbach, Germany; ³ University of Bayreuth, Bayreuth, Germany
- 5DV.2.9 Choosing the Right Encapsulant for the Environment, LCA based Comparison of Perovskite Solar Cell Encapsulation**
Simon Jech¹, Li Shen², Sara Golroodbari³, Annukka Santasalo-Aarnio¹
¹ Aalto University, Espoo, Finland; ² Utrecht University, Utrecht, The Netherlands; ³ Utrecht University, Utrecht, The Netherlands
- 5DV.2.10 Operationalizing the Digital Product Passport for Photovoltaics: Platform Development and Early Industry Validation**
Ässia Boukhatmi¹, Rafael Burkhalter¹, Stefan Groesser¹
¹ Bern University of Applied Sciences, Biel/Bienne, Switzerland
- 5DV.2.11 AI & Robotics for the Reuse of Used PV Modules**
Rita Ebner¹, Bernhard Kubicek¹, Nicole Brosch¹, Laurin Ginner¹, Simon Prüller², Simon Schuppenlehner², Markus Ikeda³, Johann Mitteramskogler³, Daniel Forstner⁴, Thomas Nigl⁵, Ferozan Azizi⁵, Therese Bouvier-Schwarz⁵, Barbara Brune⁶, Polina Malyhina⁶, Xaver Paul Stadlbauer⁶
¹ AIT, Vienna, Austria; ² 2ndCycle, Amstetten, Austria; ³ Profactor, Steyr-Gleink, Austria; ⁴ METRAN Rohstoff-Handel, Amstetten, Austria; ⁵ Montanuniversität Leoben, Leoben, Austria; ⁶ TÜV Austria Data Intelligence, Vienna, Austria
- 5DV.2.12 Understanding the Current State and Needs of PV Modules EOL: Survey for PV Recyclers and Repair/Reuse Companies**
Alberto Pico¹, Cara Libby², Nicolás Marx³, Martin Wilke⁴
¹ EPRI, Santiago de Compostela, Spain; ² EPRI, Charlotte, United States of America; ³ EPRI, Barcelona, Spain; ⁴ Buhck Re.Energy, Hamburg, Germany
- 5DV.2.13 Utilising Continuous Wave Lasers to Separate Solar Panels for Recycling**
Olivia Bowen¹, Matthew Murphy¹, Zibo Zhou¹, Rong Deng¹, Michael Nielsen¹
¹ University of New South Wales, Sydney, Australia



- 5DV.2.14 Recyclability and Circular Design Assessment of Mass-Customized Building-Integrated Photovoltaic Modules**
Gernot Oreski¹, Petra Christoeff², Cristina Polacchi³
¹ Polymer Competence Center Leoben, Leoben, Austria; ² Polymer Competence Center Leoben, Leoben, Austria; ³ EURAC Research, Bolzano, Italy
- 5DV.2.15 Responsible Procurement in Solar**
Stacey McKinney¹, Sarah Albert²
¹ Nextpower, Fremont, United States of America; ² Nextpower, Madrid, Spain
- 5DV.2.16 Verification of Carbon Reduction and Economic Effects via On-site Processing of End-of-Life PV Panels using a Mobile Recycling System**
Sang-Hun Lee¹, Cheong-Min Noh¹, Kwang-Min Seo¹, Yeon-Ju Kim¹
¹ Won Kwang S&T, Seo-gu, South Korea
- 5DV.2.17 Demonstration of High Purity and Scaling-free Reclamation of TOPCon Solar Cell Production Rinse Water**
Jascha Reich¹, Kaya Schlössler¹, Peter Brailovsky², Tobias Dannenberg³, Martin Zimmer², Sebastian Nold², Sven-Uwe Geißen¹
¹ TU Berlin, Berlin, Germany; ² Fraunhofer ISE, Freiburg, Germany; ³ RENA Technologies, Gütenbach, Germany
- 5DV.2.18 Life Cycle Assessment: Perovskite-TOPCon vs. All-Perovskite Tandems**
Sohel Abbas Chungikar¹, Olga Kanz¹, Christina Wulf¹, Kaining Ding¹, Karsten Bittkau¹
¹ FZJ, Institute of Climate & Energy Systems, Jülich, Germany
- 5DV.2.19 Scalable Nanosecond-pulsed Laser Ablation for Solar Panels Recycling**
Remi Aninat¹, Maarten van der Vleuten¹, Quentin Mottet¹, Quan Keijsers¹, Mirjam Theelen¹
¹ TNO, Eindhoven, The Netherlands
- 5DV.2.20 PV Waste: the Urban Silver Mine**
Mirjam Theelen¹, Maarten van der Vleuten¹, Bart Geerligs², Kahya Engler³, Joris de Riet¹, Busra Kucuk², Remi Aninat¹
¹ TNO, Eindhoven, The Netherlands; ² TNO, Petten, The Netherlands; ³ TNO, Rijswijk, The Netherlands
- 5DV.2.21 Multidimensional Aspects of Photovoltaic Module Repair with a Focus on Backsheet Failures**
Sonja Feldbacher¹, Anika Gassner², Gabriele Eder², Yuliya Voronko², Simon Prüller³, Gernot Becker⁴, Markus Feichtner⁵, Gernot Oreski¹
¹ PCCL, Leoben, Austria; ² OFI, Vienna, Austria; ³ 2nd cycle, Amstetten, Austria; ⁴ ATB-Becker, Absam, Austria; ⁵ Sonnenkraft, St. Veit/Glan, Austria
- 5DV.2.22 Net-Zero Assessment of Diverse Building Types Powered with PV System under Time-Varying Emissions**
Mohamad Koubar¹, Sin-Yi Li¹, Santiago Valencia Gonzalez², Xingxing Zhang², Farshid Shadram¹, Joakim Munkhammar¹
¹ Uppsala University, Uppsala, Sweden; ² Dalarna University, Falun, Sweden
- 5DV.2.23 Creation of a Reuse-oriented Testing and Repair Protocol for End-of-life Photovoltaic Modules within FORESi, an EU-funded Horizon Project**
Marie Mignot¹, Jérémy Sarantou¹, Marielle Perrin¹, Sébastien Mawet², Albert Aliu², Sophie Deprez², Ints Viksna³, Juris Launznis³, Agnese Kore³, Martins Viksna³, Thomas Peccavet⁴
¹ Hespul, Lyon, France; ² Recma, Seraing, Belgium; ³ LTC, Riga, Latvia; ⁴ Mondragon Assembly, Orange, France
- 5DV.2.24 BIMPV Project – Retrospective BIM Approach to the Life Cycle-oriented Integration of BIPV Systems in the Building Envelope**
Rene Peche¹, Thorsten Pitschke¹, Victor Aigbeghian¹
¹ bifa Umweltinstitut, Augsburg, Germany
- 5DV.2.25 Scalable Recycling of Fully Encapsulated Perovskite Mini-modules**
Balazs Imre¹, Mykhailo Sytnyk¹, Zhenni Wu¹, Yanxue Wang¹, Christian Göllner¹, Maria Hadjipanayi², Vasiliki Paraskeva², Sumeet Santosh Mujumdar², Stéphanie Narbey³, Cécile Kalk³, Ian Marius Peters¹
¹ FZJ, Jülich, Germany; ² University of Cyprus, Nicosia, Cyprus; ³ Solaronix, Aubonne, Switzerland
- 5DV.2.26 Failure Rate of PV Modules and their Collection Numbers for Recycling**
E. Busra Kucuk¹, Remi Aninat², Kahya Engler³, Mirjam J. Theelen², Jan M. Kroon¹, Martin Späth¹
¹ TNO, Petten, The Netherlands; ² TNO, Eindhoven, The Netherlands; ³ TNO, Rijswijk, The Netherlands
- 5DV.2.27 Bottom-up Ecodesign and Circularity for Photovoltaic Modules: Solidarity-based Supply-chain Mapping and a Lightweight Multi-Criteria Framework from the GFF Reindustrialisation Case**
Daniele Bricca¹, Pietro Rista²
¹ Sapienza University of Rome, Rome, Italy; ² Free University of Bolzano, Bolzano, Italy
- 5DV.2.28 Characterization of Photovoltaic Module Waste to Optimize the Recycling Processes of Polymer Components**
Robert Heidrich¹, Michael Wendt¹, Stefanie Wahl¹, Susanne Richter¹
¹ Fraunhofer CSP, Halle (Saale), Germany
- 5DV.2.29 Ecodesign Guidelines for Tin-based Perovskite PV Modules**
Matthias Hämmer¹, Kerstin Baumann¹, Victor Aigbeghian¹, Béatrice Drevet², Markus Schönheits¹
¹ bifa Umweltinstitut, Augsburg, Germany; ² CEA LITEN, Le Bourget du Lac, France
- 5DV.2.30 From Disposal to Circularity: A Comparative Framework for PV Module End-of-Life Management Including Testing-Based Second Life and Final Recycling**
Javier Ramírez-Cantero¹, Marinna Pivatto², Guillermo Garcia¹, Lais Vidotto², Sabrina Elbert², Mónica Calero¹, Ricardo Ruther²
¹ University of Granada, Granada, Spain; ² UFSC, Florianopolis, Brazil
- 5DV.2.31 Environmental Risk Assessment of Hazardous Substance Release Potential and Toxicity of Flexible Lead- and Tin-Based Perovskite PV Modules**
Matthias Hämmer¹, Victor Aigbeghian¹, Kerstin Baumann¹, Markus Schönheits¹
¹ bifa Umweltinstitut, Augsburg, Germany



- 5DV.2.32 Life Cycle Assessment and Local Marine Impacts of an Offshore Floating Photovoltaics Concept: Is It Worth the Effort?**
Maximilian Breyer¹, Heiko Keller¹, Guido Reinhardt¹
¹ IFEU, Heidelberg, Germany
- 5DV.2.33 How Photovoltaic Systems Change: the Importance of the Inventory Life Cycle Data**
Elisabetta Brivio¹, Andrea Danelli¹, Sofia Spagnolo¹, Pierpaolo Girardi¹
¹ RSE, Milano, Italy
- 5DV.2.34 Life Cycle Assessment of Scalable R2R-Manufactured Flexible Perovskite Solar Cells**
Mae Xerzel Ouano¹, Erica Magliano², Ilker Dogan³, Sebastien Lizin¹
¹ Hasselt University, Hasselt, Belgium; ² CNR-ISM, Rome, Italy; ³ TNO, Eindhoven, The Netherlands
- 5DV.2.35 Barriers, Opportunities and Economic Viability of Reuse of PV Modules**
Cristina Leyre Pinto¹, Ana María Gracia¹, Paola Federica Albizzati², Gillian Foster², Enrica Leccisi³, Mattia Gianvincenzi³, Concetta Lodato³, Jaione Bengoechea¹
¹ FUNDACION CENER, Sarriguren-Navarra, Spain; ² Joint Research Centre, Directorate S, Seville, Spain; ³ Joint Research Centre, Directorate D, Ispra, Italy
- 5DV.2.36 SOLARIS – Building together a Roadmap for PV Resource Efficiency and Sustainability**
Karl-Anders Weiß¹, Estelle Gervais¹, Sina Herceg¹, Elsen Aydin², Alexis Barrou³, Yijiang Xu⁴, Claire Agraffeil⁵, José María Medianero Martín⁶, Tayfun Hiz², Alessandro Virtuani⁷
¹ Fraunhofer ISE, Freiburg, Germany; ² ODTÜ-GÜNAM, Ankara, Türkiye; ³ CSEM, Neuchâtel, Switzerland; ⁴ SINTEF, Trondheim, Norway; ⁵ CEA, Le Bourget du Lac, France; ⁶ IDENER AI, Seville, Spain; ⁷ CSEM, Neuchâtel, Switzerland
- 5DV.2.37 Formerly Recycled Pellworm Island Modules: A 3rd Life Opportunity**
Karsten Wambach¹, Tom Reiling², Malte Fislake², Radovan Kopecek³, Rudolf Harney³, Malte Wesenberg⁴, Anna-Katharina Schnatmann⁴
¹ Wambach-Consulting, Petersdorf, Germany; ² Reiling PV-Recycling, Münster, Germany; ³ ISC Konstanz, Konstanz, Germany; ⁴ ITES, Bielefeld, Germany
- 5DV.2.38 Spatial and Temporal Optimization of PV Recycling Facility Locations**
Celine Broghammer¹
¹ FZJ, Jülich, Germany

VISUAL PRESENTATIONS 5DV.3

13:30 - 15:00 Grid Integration and Flexibility Enablers | Scenarios for Renewables, Policy, Resilience, Global Challenges | Costs, Economics, Finance and Markets | Societal Challenges; Citizens' Participation, Awareness

- 5DV.3.1 Technoeconomic Analysis of Demand-side Management (DSM) Strategies for Cyprus**
Demetris Marangis¹, Andreas Livera¹, Niclas Rhein², Rabea Sandherr², George E. Georghiou¹
¹ University of Cyprus, Aglantzia, Cyprus; ² Energynautics, Darmstadt, Germany

- 5DV.3.2 PV and Energy Storage Capacity needed to Replace other Electricity Sources in Finland**
Evgenia Okhotnikova¹, Kari Lappalainen¹
¹ Tampere University, Tampere, Finland
- 5DV.3.3 Design and Implementation of a Low-Cost Solar-Powered Smart Microgrid System for Rural Electrification in Burundi**
Remy Niyibimpa¹
¹ Independent Researcher, Bujumbura, Burundi
- 5DV.3.4 Charge-on-Solar: Customer Savings and Grid Impacts from EV Co-Adoption with Residential PV across the US**
Emily Tansey¹, Thomas Haley¹, Marc Perez¹
¹ Clean Power Research, Bellevue, United States of America
- 5DV.3.5 E-Mobility Infrastructure Planning, Observability, and Management Toolset for Smart Cities**
Andreas Livera¹, Demetris Marangis¹, Georgios Tziolis¹, George E. Georghiou¹
¹ University of Cyprus, Nicosia, Cyprus
- 5DV.3.7 Novel Ramp-Rate-Based Energy Storage System Power Smoothing Method for Photovoltaic Power Plants**
Micke Talvi¹, Kari Lappalainen¹
¹ Tampere University, Tampere, Finland
- 5DV.3.8 Ontology-based Framework for Fault Detection, Performance Assessment and Energy Management in PV Energy Communities**
Laura Palomino¹, Ana Belén Cristóbal¹, Luis Miguel Carrasco¹, Luis Narvarte¹
¹ UPM, Madrid, Spain
- 5DV.3.9 Renewable Energy Penetration and Flexibility Costs in European Power Systems: a Cross-Country Analysis using Imbalance Prices**
Santiago Valencia Gonzalez¹, Johan Heier¹, Rehman Zafar¹
¹ Dalarna University, Borlänge, Sweden
- 5DV.3.25 Risk-Oriented Spatial Suitability Modelling for Utility-Scale PV Deployment in Emerging Markets: A Case Study in Colombia**
Sebastian Acosta¹, Luis Rangel²
¹ ICREA SAS, Bogotá, Colombia; ² ICREA SAS, Bogotá, Colombia
- 5DV.3.26 How to Win the PV Race in the Perovskites- Results from an Open Survey**
Philipp Kratzert¹, Balizioan Puzant², Christian Breyer³, Chris Case⁴, Thomas Dalibor⁵, Claire Morin⁶, Delfina Munoz⁷, Ralf Preu⁸, Pere Roca⁹, Charles Roux⁷
¹ Holyvolt, München, Germany; ² VDMA, Frankfurt, Germany; ³ LUT, Lappeenranta, Finland; ⁴ Oxford PV, Oxford, United Kingdom; ⁵ Avancis, München, Germany; ⁶ Solar Power Europe, Brussel, Belgium; ⁷ CEA, Grenoble, France; ⁸ Fraunhofer ISE, Freiburg, Germany; ⁹ IPVF, Ile de France, France
- 5DV.3.27 Zero Energy Buildings in the Nordics – What Is the Role of PV?**
Magda Szarek¹, Sami Jouttijarvi¹, Kati Miettunen¹
¹ University of Turku, Turku, Finland



- 5DV.3.28 Results of a Survey on Integrated Perovskite PV Applications**
Angele Reinders¹, Antonin Faes², Christophe Ballif³
¹ Eindhoven University of Technology, Eindhoven, The Netherlands; ² CSEM, Neuchatel, Switzerland; ³ EPFL, Neuchatel, Switzerland
- 5DV.3.29 Deriving a Single Reduction Factor for Large-Scale Rooftop Photovoltaic Potential Assessment**
Alex Tro-Cabrera¹, Estitxu Villamor², Rosa Lago Aurrekoetxea¹, Leire Sainz García¹, Itziar Martínez de Alegría¹
¹ UPV/EHU, Bilbao, Spain; ² UPV/EHU, Vitoria-Gasteiz, Spain
- 5DV.3.30 Solar Employment Dynamics in Transition: Workforce Challenges and 2035 Strategies in Türkiye**
Tayfun Hiz¹, Onur Bursalı², Esen Erkan Yıldız², Hande Eryılmaz¹, Pınar Derin Güre³
¹ ODTU-GUNAM, Ankara, Türkiye; ² GÜNDER, Ankara, Türkiye; ³ METU, Ankara, Türkiye
- 5DV.3.31 Reindustrializing Europe: the Role of Industrial Policy in Reviving PV Module Manufacturing**
Sandra Gallmetzer¹, Lukas Koester¹, Luis Fialho¹
¹ EURAC Research, Bolzano, Italy
- 5DV.3.32 Urban Rooftop Solar PV Potential: Static and Dynamic Cadaster Approaches**
Dunia Bachour¹, Daniel Perez-Astudillo¹, Abdulwahab Ziaullah¹
¹ QEERI, Doha, Qatar
- 5DV.3.33 Informing Policy to Achieve Reductions in Air Conditioning Loads Through Energy Efficiency and Onsite PV Supply in Middle-Income Households in KSA**
Abeer Alshehri¹, AbuBakr Bahaj¹, Patrick James¹
¹ University of Southampton, Southampton, United Kingdom
- 5DV.3.34 Historical and Future Development of the PV Specific Yield Indicator and the Contribution of PV to Renewable Energy Production in the Netherlands**
Wilfried G.J.H.M. van Sark¹, Anton Driesse², Pierre Gerrissen³, Lex Schiebaan⁴, Anton Boonstra⁵
¹ Utrecht University, Utrecht, The Netherlands; ² PV Performance Labs, Freiburg, Germany; ³ SolarCare, Breda, The Netherlands; ⁴ Sundata, Utrecht, The Netherlands; ⁵ Boonstra, Groningen, The Netherlands
- 5DV.3.35 BIPV Market Status: Cross-country Analysis of Methodologies for Data Collection and Market Monitoring**
Juan Ignacio Martínez¹, Philippe Macé², Véronique Delisle³, Claudio Del Pero⁴, Francesca Tilli⁵, Nuria Martín Chivelet⁶, Paolo Corti⁷
¹ Becquerel Institute, San Sebastian, Spain; ² Becquerel Institute, Brussels, Belgium; ³ Natural Resources Canada, Montreal, Canada; ⁴ Polytechnic University of Milan, Milan, Italy; ⁵ GSE, Rome, Italy; ⁶ CIEMAT, Madrid, Spain; ⁷ SUPSI, Mendrisio, Spain
- 5DV.3.36 A Grid-Based Spatial Forecasting Framework for Photovoltaic Deployment Using Multi-Factor Geospatial Data**
ChangYeol Yun¹, Myeongchan Oh¹, Changki Kim¹, Yongil Kim²
¹ KIER, Daejeon, South Korea; ² Seoul National University, Seoul, South Korea
- 5DV.3.37 Beyond Potential: Hourly PV Production and Demand Matching for Building-Integrated Solar PV in Europe – a Case-Study Analysis using High-Resolution Time-Series Data**
Ana Maria Gracia Amillo¹, Georgia Kakoulaki², Diego Pavanello², Robert Kenny²
¹ Fundacion CENER, Sarriguren, Spain; ² European Commission JRC, Ispra, Italy
- 5DV.3.38 Maximising Solar PV Deployment in European Buildings: Understanding Potential and Addressing Barriers in the Implementation of the EPBD**
Thomas Garabetian¹, Duygu Celik², Johannes Stierstorfer², Alexandra Michaelsen², Cristian Pozza³, Francesco Babich³, Akshit Gupta³, Gioberti Raul Morantes Quintana³, Laura Maturi³, Gabriella Gonella³, Ulrich Oberegger Filippi³, Daniele Antonucci³, Pawel Wargocki⁴, Mariya Petrova Bivolarova⁴, Andrei Vladimir Litiu⁵, Nicolandrea Calabrese⁶, Giovanni Murano⁶, Francesca Caffari⁶, Jerzy Kwiatkowski⁷, Aleksandra Dudek⁷, Olivier Greslou⁸, Dominique Caccavell⁸
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- 5DV.3.39 New Digital Tool Linking European Solar/Storage Market and Policy Data in a Single Platform**
Leah Le Pénuizic¹, Christophe Lits¹
¹ SolarPower Europe, Brussels, Belgium
- 5DV.3.40 PV Policy Changes and How They Could Impact Technology Uptake: Costa Rican Case Study**
Victor Vega-Garita¹, Oscar Núñez-Mata²
¹ University of Costa Rica, Cartago, Costa Rica; ² University of Costa Rica, San Jose, Costa Rica
- 5DV.3.41 Measuring the Impact of Obstacles When Setting Up Renewable Energy Communities**
Kiane Alves e Silva¹, Laura Palomino¹, Luis Miguel Carrasco¹, Ana Belen Cristóbal¹
¹ UPM, Madrid, Spain
- 5DV.3.42 Photovoltaics as a Socio-Economic Transformation Pathway in Energy Transitions**
Esin Yazici¹, Erkan Erdil¹, Pınar Derin Gure¹
¹ Middle East Technical University, Ankara, Türkiye
- 5DV.3.56 Evaluation of Location Factors for Photovoltaic Module Factories**
Max Mittag¹, Sebastian Nold¹, Christian Reichel¹, Holger Neuhaus¹
¹ Fraunhofer ISE, Freiburg, Germany
- 5DV.3.57 A Sustainable Path for Solar in EU: Modeling Photovoltaic Glass Recycling Costs and Impacts**
Umer Shahzad¹, Ian Marius Peters¹
¹ FZJ, Erlangen, Germany
- 5DV.3.58 Current Level and Development of Solar Photovoltaic Electricity Market Value in Finland**
Sami Jouttijärvi¹, Kati Miettunen¹
¹ University of Turku, Turku, Finland



- 5DV.3.59 Urban Energy Resilience in the Built Environment: a Socio-Technical Framework for Hazard-Contingent PV–Storage Integration**
Parisa Hosseini¹
¹ The University of Texas at San Antonio, San Antonio, United States of America
- 5DV.3.60 Revenue Distribution in Hybrid Plants: Comparing Hourly and 15-minute Day-ahead Outcomes for PV+BESS**
Elina Bosch¹, Philippe Macé¹, Caroline Plaza², Gaëtan Masson¹
¹ Becquerel Institute, Brussels, Belgium; ² Becquerel Institute France, Perpignan, France
- 5DV.3.61 Optimal Operation of Grid-Connected PV Using Multi-Energy Storage Systems**
Sarvar Hussain Nengroo¹
¹ KFUPM, Dharan, Saudi Arabia
- 5DV.3.75 Low-Income Native Hawaiian Energy Equity Projects With Internet Access Leads To Social Equity (3-Year Update)**
John Borland¹, Takahiro Tanaka², Todd Yamashita³, Liliana Napoleon⁴, Bruce Yamashita⁵
¹ J.O.B. Technologies, Aiea, United States of America; ² T&T Energy Solutions, Honolulu, United States of America; ³ Sun Farmers, Molokai, United States of America; ⁴ MAHA, Molokai, United States of America; ⁵ Computer, LLC, Molokai, United States of America
- 5DV.3.76 Analysis of Peatland-PV: an Insight into the Perspective of Photovoltaic Project Planning**
Carl Pump¹, Carola Kiene¹, Volker Beckmann¹
¹ University of Greifswald, Greifswald, Germany
- 5DV.3.77 Identifying Factors for Social Acceptance of Photovoltaic Systems on Rewetted Peatlands**
Carola Kiene¹, Carl Pump¹, Volker Beckmann¹
¹ University of Greifswald, Greifswald, Germany
- 5DV.3.78 Promoting Innovation Excellence in Transformation of Coal Regions to Climate-Neutral, Thriving Economies**
Rita Mergner¹, Rainer Janssen¹
¹ WIP Renewable Energies, Munich, Germany
- 5DV.3.79 From Nano to the Neighbourhood Scale: The Development of Colour Coated Photovoltaics from the Laboratory to Social Acceptance**
Alexander N. Skinner¹, Clara E. Schreck¹, Phillip J. Dale¹, Catherine E. Jones¹
¹ University of Luxembourg, Belval, Luxembourg
- 5DV.3.80 Between Panels and Pastures: Socio-Ecological Impacts of Large-Scale Solar Development on Land Use and Rural Livelihoods**
Ayşe Ayda Gerçek¹
¹ Middle East Technical University, Yenimahalle, Türkiye
- 5DV.3.81 Generating Equity, Nurturing Diversity, Energising Resilience for Power Against Energy Poverty**
Rita Mergner¹
¹ WIP Renewable Energy, Munich, Germany

- 5DV.3.82 Understanding Agrivoltaic Systems from a Cooperative Perspective: A Case Study in Türkiye**
Betül Ergun¹, Bilge Senturk², Cisel Ekiz Gokmen¹
¹ Mugla Sitki Kocman University, Mugla, Türkiye; ² ODTÜ-GÜNAM, Ankara, Türkiye
- 5DV.3.83 Assessing the Value of Digital Feedback Tools in Energy-efficient Housing: Evidence from two ProLight Demonstrations**
Elina Bosch¹, Philippe Macé¹, Caroline Plaza², Gaëtan Masson¹
¹ Becquerel Institute, Brussels, Belgium; ² Becquerel Institute France, Perpignan, France

VISUAL PRESENTATIONS 4DV.4

15:15 - 16:45 Advances in PV Performance and O&M: Bridging Research with Field Practices

- 4DV.4.1 Probabilistic Estimation of Unknown Tracker Angles for Sub-hourly Loss Quantification**
Thore Müller¹, Franco Clandestino¹, Kostiantyn Pogorelov¹
¹ PVRADAR Labs, Ebersberg, Germany
- 4DV.4.2 De-Icing-Box for Photovoltaic Systems**
Adrian Jäggi¹, Matthias Burri¹, Christof Bucher¹
¹ Bern University of Applied Science, Burgdorf, Switzerland
- 4DV.4.3 DC Loss Prediction for PV Systems from Measured Energy Time Series and Numerical Weather Predictions**
Thomas Haley¹, Emily Tansey¹, Kyle Seymour¹
¹ Clean Power Research, Bellevue, United States of America
- 4DV.4.4 The Cost of Waiting: Modelling Metocean-Driven O&M Delays in Offshore Floating Photovoltaic Systems**
Manu Centeno-Telleria¹, Ane Elizetxea¹, Yeraí Pena¹, Mingxin Li², Markel Penalba¹
¹ Mondragon University, Arrasate, Spain; ² Tokyo University, Tokyo, Japan
- 4DV.4.5 Towards Optimal Energy Production: a Hybrid Analysis of Stow Trigger**
Kerman Lopez de Calle-Etxabe¹, David Olasolo¹, Diego Gonzalez¹
¹ Fundacion TEKNIKER, Eibar, Spain
- 4DV.4.6 Experimental Assessment of Soiling Losses in Agrivoltaic Systems: Insights from Field Data in Denmark and Spain**
Álvaro Fernández Solas¹, Nicholas Riedel-Lyngskær², Natalie Hanrieder¹, Stefan Wilbert¹, Carmen Alonso García³, Rolando Cabrera Dalés³, Estefanía Sánchez Vizcaíno⁴
¹ DLR, Almería, Spain; ² European Energy, Søborg, Denmark; ³ CIEMAT, Madrid, Spain; ⁴ Cortijo El Cura Eco-Bodega, Laujar de Andarax, Spain
- 4DV.4.7 Robustness of the Photovoltaic Output Models with Varying Levels of Filtering**
Väinö Anttalainen¹, Lauri Karttunen¹, Sami Jouttijärvi¹, Anders V. Lindfors², Juha A. Karhu², Hugo Huerta³, Samuli Ranta³, Kati Miettunen¹
¹ University of Turku, Turku, Finland; ² Finnish Meteorological Institute, Helsinki, Finland; ³ Turku University of Applied Sciences, Turku, Finland



- 4DV.4.8 Large-Scale Degradation Analysis of PV Modules on Operational Sites using DC Timeseries**
Houria Cheikh Ahmed¹, Andreas Wabbes¹, Quentin Van Nieuwenhoven¹, Cheikhna Talebmoustaph¹
¹ ENGIE LABORELEC, Linkebeek, Belgium
- 4DV.4.9 From Fault Prediction to Action: a Conversational LLM-based Tool for PV Asset Management**
Yasaman Ahmdi¹, Lukas Koester¹, Sandra Gallmetzer¹, Luís Fialho¹
¹ EURAC Research, Bolzano, Italy
- 4DV.4.10 Long-term Field Analysis of Fine Dust Impact on a 100 kW PV Plant with new and Reused Modules**
Jeong-eun Jeon¹, Ji-Hyun Yoo¹, Gyeong-Jun Min¹, Jae-Hyeok Hur¹, Seok-Jae Lee¹, Su-Mi Yang²
¹ Far East University, Eumseong-gun, CB, South Korea; ² Far East University, Eumseong-gun, South Korea
- 4DV.4.11 Structure-Locked Shadow Overlay GAN PV for Data Augmentation in Thermography**
JungMin Moon¹, Ju-Hee Kim¹, Yonghyun Kim¹, Changheon Kim¹
¹ Korea Photonics Technology Institute, Gwangju, South Korea
- 4DV.4.12 Learning Vector Quantization and K-Means Clustering based Ensemble Model for Line-to-Line Fault Detection and Classification in PV Arrays**
Peyman Ghaedi¹, Aref Eskandari², Mohammadreza Aghaei³
¹ AUT, Tehran, Norway; ² IUST, Tehran, Norway; ³ NTNU, Ålesund, Norway
- 4DV.4.13 Anomaly Detection and Diagnostics for PV Systems Based on Image Segmentation of Power Residuals and on Bayesian Networks**
Corentin Tissier¹, Baptiste Schubnel¹, Jelena Simeunovic¹, Pierre-Jean Alet¹
¹ CSEM, Neuchâtel, Switzerland
- 4DV.4.14 Estimation of PV System Degradation using Data from Clipping Periods**
Mari B. Øgaard¹, Marie Syre Wiig¹, Vilde S. Nysted¹, Nathan Roosloot¹, Josefine Selj¹
¹ IFE, Kjeller, Norway
- 4DV.4.15 Physics-Informed Graph-Based Modelling to Support Performance Monitoring and Degradation Analysis of PV Systems**
Srijani Mukherjee¹, Liliane Bou Nassif², Hervé Colin¹, Stephanie Giroux-Julien³, Hervé Pabiou², Denys Dutykh⁴, Laurent Vuillon⁵, Ioannis (John) A. Tsanakas¹
¹ CEA / INES, Le Bourget-du-Lac, France; ² INSA, Lyon, France; ³ CNRS, Lyon, France; ⁴ Khalifa University, Abu Dhabi, United Arab Emirates; ⁵ Savoie Mont Blanc University, Chambéry, France
- 4DV.4.16 The Ineffectiveness of Cooling Systems on PV Efficiency Across Climate Zones: A Climate Variability-Focused Statistical Analysis**
Mohamed Einbhani Ismail¹
¹ Sudan University of Science and Technology, Khartoum, Sudan
- 4DV.4.17 Beyond the State of the Art: A Metadata Analysis and Result Comparison of Model and Lighthouse Photovoltaic Projects in Austria**
Alexander Erber¹, Marcus Rennhofer¹, Christoph Mayr¹
¹ AIT, Vienna, Austria
- 4DV.4.18 Unlock your hidden Solar Losses with SUPER (Solar Utilization, Performance and Reliability benchmarking tool)**
Daniel Fregosi¹, Wayne Li¹, Alberto Pico²
¹ EPRI, Charlotte, United States of America; ² EPRI, Santiago de Compostela, Spain
- 4DV.4.19 High-Resolution, Automated On-Rack Photovoltaic Module Imaging Using a Multi-Camera Array**
Matthew T. Sivewright¹, E. Ernest Van Dyk¹, Frederik J. Vorster¹
¹ Nelson Mandela University, Port Elizabeth, South Africa
- 4DV.4.20 Comparative Analysis for Solar Single Axis Tracker Fault Detection on DC Power Timeseries**
Cheikhna Talebmoustaph¹, Andreas Wabbes¹, Aquin Magnus¹, Quentin Van Nieuwenhoven¹
¹ Engie Laborelec, Linkebeek, Belgium
- 4DV.4.21 Convolutional Variational Auto-encoder-based Classifier for PV Panel-Level Anomaly Detection**
Walid M'Zough¹, Yousra Sidqi¹, Benoit Delinchant²
¹ Lucerne University of Applied Sciences and Arts, Horw, Switzerland; ² G2ELab, Grenoble, France
- 4DV.4.22 Using Large Language Models to Convert Fault Logbooks into a Labeled Dataset**
Mücahid Candan¹, David Melgar¹
¹ Fraunhofer ISE, Freiburg, Germany
- 4DV.4.23 Dust Impact on a 14.17 kW Rooftop PV System in Oman: Field Validation and Economic Analysis**
Mazin Al Shidhani¹, Waleed Al Washahi¹
¹ Petroleum Development Oman, Muscat, Oman
- 4DV.4.24 The Influence of Angle of Incidence on Soiling Losses in Photovoltaic Modules under Arid Conditions**
Rolando Cabrera-Dalés¹, Aránzazu Fernández-García², Stefan Wilbert³, Manuel Pérez-García⁴, María del Carmen Alonso-García⁵
¹ CIEMAT, Tabernas, Spain; ² CIEMAT, Almería, Spain; ³ DLR, Almería, Spain; ⁴ CIESOL-University of Almería, Almería, Spain; ⁵ CIEMAT, Madrid, Spain
- 4DV.4.25 Assessing Small-Scale Photovoltaic System Performance Using Field Irradiance Data and Utility Billing Records**
Brian Bartolo¹, Brian Azzopardi², Carmel Azzopardi², Austeja Mockeviciute-Azzopardi²
¹ The Foundation for Innovation and Research - Malta, Birkirkara, Malta; ² The Foundation for Innovation and Research, Birkirkara, Malta
- 4DV.4.26 Photovoltaic Anomaly Diagnosis using a Classification Model Based on the Maximum Power Point of I-V Curves**
Woogyun Shin¹, Youngchul Ju¹, Hyemi Hwang¹, Jinseok Lee¹, Sukwhan Ko¹
¹ KIER, Yuseong-gu, South Korea
- 4DV.4.27 Comparative Analysis of Cleaning Schemes for Bifacial PV Modules in a Single-axis Tracking System**
Rodrigo P. Maruyama¹, Bruno J. Vieira¹, Givaldo dos Reis¹, Renzo Vargas¹, Alex Renan A. Manito¹, Marcelo P. Almeida¹, Adnei Melges de Andrade¹, Roberto Zilles¹
¹ USP, São Paulo, Brazil



- 4DV.4.28 Ground-based Inspection-robot for Autonomous Daylight Photoluminescence Inspection**
Lukas Koester¹, Irfan Haider¹, Luis Fialho¹
¹ Eurac Research, Bolzano, Italy
- 4DV.4.29 A new Indexing Algorithm for Photovoltaic Data**
Zhu Wang¹, Bo Qiu², Xingxing Wu¹
¹ Sany Group, Zhuzhou, China; ² China Mobile, Guangzhou, China
- 4DV.4.30 Thermal Impact of Curtailment on PV Panels: A Case Study in Brazil**
Lucas T. Silva¹, Juliana C. Alencar¹, José Rhuan M. Frota¹, Rodrigo S. Queiroz¹
¹ Delfos Energy, Barcelona, Spain
- 4DV.4.31 Identification of Burnout Failure Conditions in Rapid Shutdown Devices for Photovoltaic Systems**
Tensei Akinaga¹, Tosiuyuki Hamada¹, Ikuo Nanno², Norio Ishikura³, Masayuki Fujii⁴, Shinichiro Oke⁵
¹ Osaka Electro-Communication University, Neyagawa, Japan; ² St. Andrew's University, Izumi, Japan; ³ National Institute of Technology, Yonago, Japan; ⁴ National Institute of Technology, Imabari, Japan; ⁵ National Institute of Technology, Tsuyama, Japan
- 4DV.4.32 Modeling and Mapping of Soiling Losses in Morocco for Different Photovoltaic System Configurations**
Mounir Abraim¹, Fatima Zahra Ouchani¹, Abdellatif Ghennioui¹, Leonardo Micheli²
¹ Green Energy Park, BenGuerir, Morocco; ² Sapienza University of Rome, Rome, Italy
- 4DV.4.33 Data-Driven Power-Loss Modelling of Photovoltaic Cells Using Physically Based Syntehtic EL-IV Data**
Rodrigo del Prado Santamaría¹, Aysha Mahmood¹, Luca Oneto², Antonio Sgorbissa², Gisele Alves dos Reis Benatto¹, Thøger Kari¹, Mahmoud Dhimish¹, Peter B. Poulsen¹, Sergiu V. Spataru¹
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- 4DV.4.34 Intense Mid-level Wind Speeds and Flat Tracker Tilts during Rear Glass Breakages on Non-Large-Format Bifacial PV Modules on Trackers**
Kee Soon (Darryl) Wang¹
¹ DNV Singapore, Singapore, Singapore
- 4DV.4.35 Benchmarking PV Simulation Software Against Operational Data: A 100 MW Bifacial TOPCon Case Study in Brazil**
Joel Pontes¹, Leticia Vasconcelos¹, Lucas Colares¹, Luiz Reis¹, Lucio Paiva¹, Luis Guilherme Castro¹, Rodrigo Santos¹
¹ Casa dos Ventos, Fortaleza, Brazil
- 4DV.4.36 Enhancing Insurability: Preventive Strategies and Security Solutions to Combat Copper Theft**
Oliver Strecke¹, Malia Cobb¹
¹ viamon, Kaiserslautern, Germany
- 4DV.4.37 Benchmarking of Image Normalization Techniques in dEL and dPL Images for Field PV Module Inspections**
Kabir Paul Sulca Buitrón¹, Rodrigo del Prado Santamaría², Julian Anaya Calvo¹, Sergiu Viorel Spataru², Oscar Martínez Sacristan¹
¹ University of Valladolid, Valladolid, Spain; ² DTU, Roskilde, Denmark
- 4DV.4.38 A Multiple String Current-Modulated Switching Device for Daylight Electroluminescence Imaging of Photovoltaic Modules**
Kabir Paul Sulca Buitrón¹, Cristian Terrados Lopez², Julian Anaya Calvo¹, Victor Alonso Gomez¹, Oscar Martinez Sacristan¹
¹ University of Valladolid, Valladolid, Spain; ² University of Burgos, Burgos, Spain
- 4DV.4.39 Reliability of Ideality Factor Determination from Electroluminescence Quantification According to IEC TS 63109:2022**
Gorka Torre¹, Jose Domingo Santos Rodriguez¹, Joseba Ormaetxea¹, Eneko Setien¹, Aritz Villodas¹, Alberto Del Pozo¹, Ainhoa Pereda¹, Eneko Ortega², Ricardo Alonso¹
¹ TECNALIA, Derio, Spain; ² UPV/EHU, Leioa, Spain
- 4DV.4.40 Predictive Maintenance: a Must use Technology**
Pau Mercade Ruiz¹, Gerardo Guerra¹, Gaetana Anamiati¹, Lars Landberg²
¹ GreenPowerMonitor a DNV company, Barcelona, Spain; ² DNV Denmark, Hellerup, Denmark
- 4DV.4.41 Open Source Hardware for Mobile String Power Acquisition of Solar Parks**
Stefan Grünsteidl¹
¹ GRN.Solar, Grafing, Germany
- 4DV.4.42 A Simple Statistical Modelling Approach for Evaluating Diverse PV Module Performance under Nordic Environments**
Huilan Zheng¹, Maryna Waszak², An Ngoc Lam², Astrid Marthinsen¹, Alexander G. Ulyashin¹, Xiang Ma¹
¹ SINTEF Industry, Oslo, Norway; ² SINTEF Digital, Oslo, Norway
- 4DV.4.43 Performance Analysis and Design Implications of Bifacial PV Systems in an Industrial Complex**
Jinho Choi¹, Wonwook Oh²
¹ Chungbuk Technopark Next Energy Center, Jincheon-gun, South Korea; ² Chungbuk Technopark, Jincheon-gun, South Korea
- 4DV.4.44 Comparative Study of Machine Learning Algorithms for Fault Diagnosis in PV Systems Specifically under low Irradiance Conditions**
Norio Ishikura¹, Kaima Yamada¹, Toshiyuki Hamada², Ikuo Nanno³, Shinichiro Oke⁴, Masayuki Fujii⁵
¹ National Institute of Technology, Yonago College, Yonago, Japan; ² Osaka Electro-Communication University, Osaka, Japan; ³ Yamaguchi Gakugei University and Yamaguchi College of Arts, Osaka, Japan; ⁴ National Institute of Technology, Tsuyama College, Tsuyama, Japan; ⁵ National Institute of Technology, Oshima College, Suo-osima, Japan
- 4DV.4.45 Effect of PV Module Azimuth Angle on Revenue of PV Systems in Different Locations in Europe**
Heidi Kalliojärvi¹, Kari Lappalainen¹
¹ Tampere University, Tampere, Finland
- 4DV.4.46 Development of Failure Diagnosis Algorithms for PV Plants and Analysis in Over 6GW**
Jorge Solórzano del Moral¹, Monica Quiroz², Alberto Valcarcel²
¹ Qualifying PhotoVoltaics, Madrid, Spain; ² Qualifying Photovoltaics, Madrid, Spain

