EU PVSEC

EU PVSEC 2024

41st European
Photovoltaic Solar Energy
Conference and Exhibition

23 — 27
September

ACV —
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Conference Programme —

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41st European Photovoltaic Solar Energy Conference and Exhibition

Conference Program

Monday, 23. September 2024

OPENING
08:30 - 12:00

PLENARY PRESENTATIONS AP.1

08:30 - 09:30 **Manufacturing**

Chairpersons: Gabriele C. Eder
OFI, Vienna, Austria
Robert P. Kenny
European Commission JRC, Ispra, Italy

1AP.1.1 **Invited Presentation**

1AP.1.2 **Invited Presentation**

1AP.1.3 **Invited Presentation**

10:30 - 12:00 **Becquerel Prize Ceremony**
Opening Addresses
Moderated Panel Discussion

ORAL PRESENTATIONS 2AO.1

13:30 - 15:00 **Inorganic and Organic Compound Solar Cells and Tandems**

Chairpersons: Mirjam Theelen
TNO/Solliance, Eindhoven, The Netherlands
Ayodhya Nath Tiwari
EMPA, Dübendorf, Switzerland

2AO.1.1 In-depth Analysis of Ag Alloying in Metallic Precursor for Efficient Kesterite Solar Cells
Mingrui He[1], Xiaojing Hao[1]
[1] UNSW, Sydney, Australia

2AO.1.2 Li-doping and Ag-alloying Interplay Shows the Pathway for Kesterite Solar Cells with Efficiency over 14%
Alex Jimenez-Arguijo[1], Yuancai Gong[1], Jialiang Huang[2], Kaiwen Sun[2], Sergio Giraldo[1], Xiaojing Hao[2], Edgardo Saucedo[1]
[1] UPC, Barcelona, Spain; [2] UNSW, Sydney, Australia

2AO.1.3 Rear Surface Passivation for Molecular Ink-Based, Submicron CuIn(S, Se)2 Solar Cells
Sunil Suresh[1], Abraha Gidey Tadese[1], Towhid H. Chowdhury[1], Sachin R. Rondiya[2], Li Tao[1], Jian Liu[1], Bart Vermang[3], Alexander R. Uhl[1]
[1] University of British Columbia, Kelowna, Canada; [2] Indian Institute of Science, Bengaluru, India; [3] Hasselt University, Genk, Belgium

2AO.1.4 Design Considerations of Cu(In,Ga)Se2 as a Bottom Cell in a Tandem Structure
Ana Kanevce[1], Rico Gutzler[1], Stefan Paetel[1], Dominik Bagrowski[1], Dimitrios Hariskos[1], Theresa Magorian Friedlmeier[1]
[1] ZSW, Stuttgart, Germany

2AO.1.5 GaAs//CuInGaSe-Based Multijunction Solar Cells with 30% Efficiency under Low Concentrated Sunlight
Kikuo Makita[1], Yukiko Kamikawa[1], Hidenori Mizuno[1], Ryuji Oshima[1], Yasushi Shoji[1], Shogo Ishizuka[1], Ralph Müller[2], David Lackner[2], Frank Dimroth[2], Takeyoshi Sugaya[1]
[1] AIST, Tsukuba, Japan; [2] Fraunhofer ISE, Freiburg, Germany

2AO.1.6 Antimony Selenide Solar Cells with an Inverted Superstrate Configuration
Chen Qian[1], Kaiwen Sun[1], Martin Green[1], Xiaojing Hao[1]
[1] UNSW, Sydney, Australia

ORAL PRESENTATIONS 1AO.4

13:30 - 15:00 **Silicon Material for Solar Cells: Growth, Stability and Reuse**

Chairpersons: Ruy Sebastian Bonilla
University of Oxford, United Kingdom

Alison Ciesla *(i)*
UNSW, Sydney, Australia

1AO.4.1 Potential for Recycled Silicon Solar Cells as Feedstock for New Ingot Growth
L.J.(Bart) Geerligs[1], Ando D. Kuypers[1], Mirjam J. Theelen[1]
[1] TNO Energy Transition, Petten, The Netherlands

1AO.4.2 Epitaxially Grown Si Wafers Without Kerf-loss Ready for Efficiencies above 24 % After High Temperature Solar Cell Processing
Marion Drießen[1], Armin Richter[1], Clara Rittmann[1], Pascal Messmer[1], Giuliano Vescovi[2], Maxi Richter[2], Florian Schindler[1], Jan Benick[1], Charlotte Weiss[1], Stefan Janz[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] NexWafe, Freiburg, Germany

1AO.4.3 Impact of High-Temperature Processing Steps on the Long-Term Stability in n-Type FZ-Silicon
Melanie Mehler[1], Nicolas Weinert[1], Giso Hahn[1], Fabian Geml[1]
[1] University of Konstanz, Konstanz, Germany

1AO.4.4 Impact of Rapid Thermal Processing on Bulk Lifetime and Surface Recombination Velocity of Crystalline Silicon with Passivating Tunnel Oxide Contacts
Franz-Josef Haug[1], Audrey Morisset[1], Sofia Libraro[1], Ezgi Genç[1], Julien Hurni[1], Christophe Ballif[1]
[1] EPFL, Neuchâtel, Switzerland

1AO.4.5 LeTID in Industrial Ga-doped Cz-Si with Melt Recharging
Joshua Kamphues[1], Juri Miech[1], Xueqi Bai[2], Yichun Wang[2], Giso Hahn[1], Fabian Geml[1]
[1] University of Konstanz, Konstanz, Germany; [2] LONGI Green Energy Technology, Xi'An, China

1AO.4.6 Rapid Healing: How Hydrogenation Supercharges Full Recovery of Electron-Irradiation Defects in Ga-doped PERC Solar Cells
Guo Li[1], Zhuangyi Zhou[1], Chukwuka Madumelu[1], Peter Toth[2], Lennart van den Hengel[3], Ferdinand Grozema[3], Gavin Conibeer[1], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] Extraterrestrial Power, Sydney, Australia; [3] TU Delft, Delft, The Netherlands

ORAL PRESENTATIONS 4AO.7

13:30 - 15:00 **Advanced O&M Strategies and Methods**

Chairpersons: Franz P. Baumgartner
ZHAW, Winterthur, Switzerland

Anne Migan-Dubois *(i)*
GeePs, Gif-sur-Yvette, France

4AO.7.1 Best Practice Guidelines for the Use of Technical and Economic Key Performance Indicators
Sascha Lindig[1], Magnus Herz[2], Julien Deckx[3], Julián Ascencio-Vásquez[4], Karel De Brabandere[3], Marios Theristis[5], Bert Herteleer[6], Erik Stensrud Marstein[7]
[1] UNIVERS, Munich, Germany; [2] TÜV Rheinland, Cologne, Germany; [3] 3E, Brussels, Belgium; [4] UNIVERS, Redwood, United States of America; [5] Sandia, Albuquerque, United States of America; [6] KU Leuven, Leuven, Belgium; [7] IFE, Lillestrøm, Norway

4AO.7.2 Enhancing Photovoltaic Systems Decision Support System: A Framework for Data-driven Troubleshooting and Reporting
Mousa Sondoqah[1], Sandra Gallmetzer[1], Pablo Sebastian Enriquez Paez[2], Atse Louwen[1], David Moser[1]
[1] EURAC Research, Bolzano, Italy; [2] BayWa r.e., Rome, Italy

4AO.7.3 Identifying Distinct Performance Patterns in Utility-Scale Photovoltaic Plants Using an Unsupervised Machine Learning Model
Ali Shakiba[1], Brendan Wright[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia

4AO.7.4 Recovering LeTID in PV Power Plants - A Feasibility Study
Esther Fokuhl[1], Paul Gebhardt[1], Alexander Kleinhans[1], Erdmut Schnabel[1], Cornelius Armbruster[1], Thomas Mikolajick[2], Viktor Wesselak[3], Ingrid Hädrich[1], Daniel Philipp[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Dresden University of Technology, Dresden, Germany; [3] Institute for Renewable Energy Technologies, Nordhausen, Germany

4AO.7.5 Enhancing Fault Diagnosis in Photovoltaic Plants: A Comprehensive Approach to Simultaneous Failures
Giosué Maugeri[1], Salvatore Guastella[1], Andrea Rossetti[1]
[1] RSE, Milan, Italy

4AO.7.6 Design and Application of Intelligent Scalable Automatic Fault Detector for Commercial Photovoltaic Systems
Mücahid Candan[1], David Melgar[1], Christian Schill[1], Mete Çubukçu[2]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Solar Energy Institute of Ege University, Bornova, Turkey

VISUAL PRESENTATIONS 3AV.1

13:30 - 15:00 **PV Module Design and Manufacturing | BoS Components, Operation and Aging**

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 2AO.2

15:15 - 16:45 **Solar Cells based on CIGS and its Alloys**

Chairpersons: Alejandro Pérez-Rodríguez
IREC, Sant Adria de Besos, Spain
Invited

2AO.2.1 Special Introductory Presentation: A Comparison of Light Soaking Effects in High Efficiency Cu(In,Ga)Se2 and (Ag,Cu)(In,Ga)Se2 Solar Cells
Klara Kiselman[1], Jan Keller[1], Patrick Pearson[1], Erik Wallin[2], Marika Edoff[1]
[1] Uppsala University, Uppsala, Sweden; [2] First Solar European Technology Center, Uppsala, Sweden

2AO.2.2 Towards 1 V Open-Circuit Voltage with 1.5 eV Band Gap (Ag,Cu)(In,Ga)Se2
Rico Gutzler[1], Dimitrios Hariskos[1], Ana Kanevce[1], Stephanie Spiering[1], Stefan Paetel[1], Wolfram Witte[1]
[1] ZSW, Stuttgart, Germany

2AO.2.3 Modification Technique of Back Junction for Cu(In,Ga)Se2 Solar Cells
Takahito Nishimura[1], Akira Yamada[1]
[1] Tokyo Institute of Technology, Meguro-ku, Japan

2AO.2.4 Development of Wide-Bandgap Cu(In,Ga)Se2 Solar Cells and Modules on Transparent Back Contacts
Wolfram Witte[1], Stefan Paetel[1], Dimitrios Hariskos[1], Angelika Demling[2], Regan G. Wilks[2], Marcus Bär[2], Cristiana F. Almeida Alves[3], Rafael Cerqueira[3], Sascha Sadewasser[3], Nina Kochel[4], Joanna Maciejewska[4], Ajay Narasimhamurthy[4], Marcin Morawski[4], Andrzej Miszczuk[4], Marek Basta[4], Rico Gutzler[1]
[1] ZSW, Stuttgart, Germany; [2] HZB, Berlin, Germany; [3] INL, Braga, Portugal; [4] ROL, Poznań, Poland

2AO.2.5 A Comparison of the Environmental Impact of Integrated Flexible CIGS with Rigid CIGS and x-Si Modules
Mirjam Theelen[1], Lia de Simon[2], Mitchell Van der Hulst[3], Diana Bizarro[2], Josco Kester[4], Ando Kuypers[1], Mara Hauck[2]
[1] TNO partner in Solliance, Eindhoven, The Netherlands; [2] TNO Circularity & Sustainability Impact, Utrecht, The Netherlands; [3] Radboud University, Nijmegen, The Netherlands; [4] TNO partner in Solliance, Petten, The Netherlands

ORAL PRESENTATIONS 1AO.5

15:15 - 16:45 **Processes for Highly Efficient Si Solar Cells**

Chairpersons: Francesca Menchini
ENEA, Rome, Italy
Invited

1AO.5.1 Thermal Pre-treatment of as Cut Wafers for High Efficiency Silicon Heterojunction Solar Cells
Adrien Danel[1], Sebastiano Caccamo[2], Gustavo Rodrigues Lopes[1], Etienne Pihan[1], Mickael Albaric[1], Alessandro Fucile[2], Giulia Enrica Digeronimo[2], Bianca Passarella[2], Marcello Scuito[2], Cosimo Gerardi[2]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] ENEL, Catania, Italy

1AO.5.2 Wet-Chemically Grown Interfacial Oxide for Passivating Contacts Fabricated with an Industrial Inline Processing System
Byungsul Min[1], Philipp Noack[2], Bianca Wattenberg[2], Torsten Dippell[2], Henning Schulte-Huxel[1], Robby Peibst[1], Rolf Brendel[1]
[1] ISFH, Emmerthal, Germany; [2] Singulus Technologies, Kahl a. Main, Germany

1AO.5.3 Towards Leaner (Double Side) TOPCon Fabrication
Julien Hurni[1], Audrey Morisset[1], Ezgi Genç[1], Sofia Libraro[1], Christophe Allebé[2], Antoine Descoeudres[2], Bertrand Paviet-Salomon[2], Franz-Josef Haug[1], Christophe Ballif[1]
[1] EPFL, Neuchâtel, Switzerland; [2] CSEM, Neuchâtel, Switzerland

1AO.5.4 Local p+ Poly-Si Passivating Contacts Realized by Direct FlexTrail Printing of Boron Ink and Selective Alkaline Etching for High Efficiency TOPCon Based Solar Cells
Berkay Uygun[1], Sven Kluska[2], Jana Isabelle Polzin[2], Jörg Schube[2], Katrin Krieg[2], Mike Jahn[2], Raşit Turan[1], Hisham Nasser[1]
[1] ODTÜ-GÜNAM, Ankara, Turkey; [2] Fraunhofer ISE, Freiburg, Germany

1AO.5.5 Phosphorus- and Boron-Doped Poly-Si Passivating Contacts via Inkjet Printing
Jiali Wang[1], Sieu Pheng Phang[1], Thein N. Truong[1], Jinlei Ren[2], Marie Adier[2], Laura Creon[2], Paula Peres[2], Rene Chemnitzer[2], Pierre-Yves Corre[2], Zhuofeng Li[1], Hieu T. Nguyen[1], Daniel Macdonald[1], Josua Stuckelberger[3]
[1] Australian National University, Canberra, Australia; [2] CAMECA, Gennevilliers, France; [3] LAPLACE Renewable Energy Technology, Shenzhen, China

1AO.5.6 Copper-based Metallization Approaches for Drastic Reduction of Silver Content in Heterojunction Solar Cells
Adeline Lanterne[1], Johann Jourdan[1], Agata Lachowicz[2], Laurie-Lou Senaud[2], Julien Diaz[1], Wilfried Favre[1]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] CSEM, Neuchâtel, Switzerland

ORAL PRESENTATIONS 4AO.8

15:15 - 16:45 PV Plant Performance, Analysis, Monitoring and Fault Detection in Inverters

Chairpersons: Anna Heimsath *(i)*
Fraunhofer ISE, Freiburg, Germany
Marios Theristis
Sandia National Laboratories, Albuquerque, United States of America

4AO.8.1 Uncertainty-Aware Estimation of Inverter Field Efficiency Using Bayesian Neural Networks in Solar Photovoltaic Plants
Gerardo Guerra[1], Pau Mercade Ruiz[1], Gaetana Anamiati[1], Lars Landberg[2]
[1] GreenPowerMonitor a DNV Company, Barcelona, Spain; [2] DNV Denmark, Hellerup, Denmark

4AO.8.2 Analysis of Fault Detection and Defect Categorization in Photovoltaic Inverters for Enhanced Reliability and Efficiency in Large-scale Solar Energy Systems
Stephanie Malik[1], David Daßler[1], Dharm Patel[1], Carola Klute[1], Robert Klengel[1], Andreas Dietrich[2], Kai Kaufmann[3], Carsten Hennig[4], Leonard Kraft[5], Matthias Ebert[1]
[1] Fraunhofer IMWS, Halle (Saale), Germany; [2] Deutsche Solarservice, Werder (Havel), Germany; [3] DENKweit, Halle (Saale), Germany; [4] saferay holding, Berlin, Germany; [5] Leipziger Energie, Leipzig, Germany

4AO.8.3 Anomaly Detection in Similarly Behaving Solar Inverters
Pau Mercade Ruiz[1], Gerardo Guerra[1], Gaetana Anamiati[1], Lars Landberg[2]
[1] GreenPowerMonitor, Barcelona, Spain; [2] DNV Denmark, Copenhagen, Denmark

4AO.8.4 Loss Breakdown Analysis in PV Plants: Estimation of Curtailment Loss
Karel De Brabandere[1], Maitheli Nikam[1], Julien Deckx[1], Gofran Chowdhury[1]
[1] 3E, Brussels, Belgium

4AO.8.5 Geospatial Referencing for Monitoring Data
Bernhard Kubicek[1], Evgenii Sovetkin[2], Marcus Rennhofer[1]
[1] Austrian Institute of Technology, Vienna, Austria; [2] IEK5-Photovoltaics, Guelich, Austria

4AO.8.6 Towards Higher Efficiency: Data Analysis and Optimization of PV String Wiring in a Long-Running Solar Power Plant
Žiga Miklič[1], Janez Krč[1], Marko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia

VISUAL PRESENTATIONS 3AV.2

15:15 - 16:45 PV Modules Reliability: Components, Failure Mechanisms, Testing & Modelling

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 2AO.3

17:00 - 18:30 III-V Solar Cells & Space PV

Chairpersons: Gianluca Timò
RSE, Piacenza, Italy
Emily Warren *(i)*
NREL, Golden, United States of America

2AO.3.1 Direct Growth of InGaP/GaAs/Si Triple-Junction Solar Cells with InAlGaAs Digital Alloy Filter Layers
Yeonhwa Kim[1], Hyunbeom Shin[2], Eunkyo Ju[1], May Angelu Madarang[1], Rafael Jumar Chu[1], Tsimafei Laryn[1], Taehee Kim[1], Younghyun Kim[1], Inho Kim[1], In-Hwan Lee[3], Ho Kwan Kang[2], Won Jun Choi[1], Daehwan Jung[1]
[1] KAIST, Seoul, South Korea; [2] KANC, Suwon, South Korea; [3] Korea University, Seoul, South Korea

2AO.3.2 Thermal Modeling of Triple-Junction Solar Cells Fan Out Wafer Level Packaging for Concentrated Photovoltaic
Konan Kouame[1], Abdul Rehman[1], Médérick Marcotte[1], Mylana Ney[1], Artur Turala[1], Mohamed Najah[1], Serge Ecoffey[1], Gwenaelle Hamon[1]
[1] University of Sherbrooke, Sherbrooke, Canada

2AO.3.3 Overview for Tandem Solar Cell R&D Activities in Japan
Masafumi Yamaguchi[1], Tatsuya Takamoto[2], Kyotaro Nakamura[1], Ryo Ozaki[1], Hiroyuki Juso[2], Nobuaki Kojima[1], Yoshio Ohshita[1]
[1] Toyota Technological Institute, Nagoya, Japan; [2] Sharp Corporation, Nara, Japan

2AO.3.4 Towards a Robust Silicon PV Technology for Space
Romain Cariou[1], Nicolas Enjalbert[1], Clément Jamin[1], Océane Guillot[1], Adrien Danel[1], Samuel Harrison[1], Philippe Voarino[1], Jean-Baptiste Charpentier[1], Louis Perrotin[1], Thibaut Desrues[1], Vincent Barth[1], Romain Feilleux-Anginieur[1], Sébastien Dubois[1]
[1] CEA, Le Bourget-du-Lac, France

2AO.3.5 Space Applications for a Variety of Solar Cell Technologies
Stephen Taylor[1]
[1] European Space Agency, Noordwijk, The Netherlands

2AO.3.6 Carrier Recombination in Ga-doped Silicon with Space Representative Electron Irradiations: Influence of the Material Composition
Océane Guillot[1], Romain Cariou[1], Nicolas Enjalbert[1], Adrien Danel[1], Corinne Aicardi[2], Sébastien Dubois[1]
[1] CEA, Le Bourget du Lac, France; [2] CNES, Toulouse, France

ORAL PRESENTATIONS 1AO.6

17:00 - 18:30 **Highly Efficient Si Solar Cells**

Chairpersons: Audrey Morisset
EPFL, Neuchâtel, Switzerland

Rasit Turan
METU - Middle East Technical University, Ankara, Turkey

1AO.6.1 A Stability Study of Silicon Heterojunction Solar Cells Exposed to Ultraviolet Light
Jinli Yang[1], Chunlan Zhou[1], Wang Wenjing[2], Su Zhou[2], Xiaohua Xu[2], Jihong Xiao[2], Wenwen Wei[2]
[1] CAS, Beijing, China; [2] Anhui Huasun Energy, Xuancheng, China

1AO.6.2 Shedding a Light on UV-Induced Degradation of TOPCon Solar Cells
Muhammad Umair Khan[1], Chandany Sen[1], Michael Pollard[1], Yutong Wu[2], Ruirui Lv[2], Xinyuan Wu[1], Haoran Wang[1], Xutao Wang[1], Guangchun Zhang[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] Canadian Solar, Jiangsu, China

1AO.6.3 Understanding the Electron Transport Mechanisms in MoOx-Based Layer Stack for Application in Simplified IBC-SHJ Solar Cells
Katarina Kovacevic[1], Yifeng Zhao[1], Paul Procel[1], Liqi Cao[1], Luana Mazzarella[1], Olindo Isabella[1]
[1] TU Delft, Delft, The Netherlands

1AO.6.4 High Efficiency Solar Cells with Epitaxially Grown Silicon Wafers and TOPCon Passivating Contacts
Armin Richter[1], Clara Rittmann[1], Marion Drießen[1], Florian Schindler[1], Charlotte Weiss[1], Jan Benick[1], Stefan Janz[1]
[1] Fraunhofer ISE, Freiburg, Germany

1AO.6.5 >24% Efficient Tunnel Back Contacted polyZEBRA Solar Cells
Jonathan Linke[1], Christoph Peter[1], Jan Hoß[1], Saman Sharbaf Kalaghichi[1], Valentin Mihailetchi[1], Jan Lossen[1], Florian Buchholz[1]
[1] ISC Konstanz, Konstanz, Germany

1AO.6.6 Optimized Ga-Doped Cz Wafers for POLO IBC Solar Cells with High Efficiency and Minimal LeTID Degradation
Thorsten Dullweber[1], Verena Mertens[1], Michael Winter[1], Sabrina Schimanke[1], Silke Dorn[1], Yevgeniya Larionova[1], Jan Schmidt[1], Rolf Brendel[1], Arne K. Dahle[2]
[1] ISFH, Emmerthal, Germany; [2] NorSun, Årdalstangen, Norway

ORAL PRESENTATIONS 4AO.9

17:00 - 18:30 **The Impact of Soiling on PV Systems**

Chairpersons: João M. Almeida Serra
University of Lisbon, Portugal

Mari Øgaard
IFE, Kjeller, Norway

4AO.9.1 Modelling Performance and Maximum Allowed Costs for Anti-Soiling Coatings in Europe
Leonardo Micheli[1], Greg P. Smestad[2], Diego L. Talavera[3]
[1] Sapienza University of Rome, Rome, Italy; [2] Sol Ideas Technology Development, San José, United States of America; [3] University of Jaén, Jaén, Spain

4AO.9.2 Mapping PV Soiling Losses in Europe through an Environmental-Based Model
Álvaro Fernández-Solas[1], Nicholas C. Riedel-Lyngskær[2], Fernanda Norde Santos[1], Mari Øgaard[3], Jesús Polo[4], Diego López Talavera[5], Leonardo Micheli[6]
[1] DLR, Almería, Spain; [2] European Energy, Søborg, Denmark; [3] Institute for Energy Technology, Kjeller, Norway; [4] CIEMAT, Madrid, Spain; [5] University of Jaén, Jaén, Spain; [6] Sapienza University of Rome, Rome, Italy

4AO.9.3 Qatar Dust Atlas Project: Deployment of a National Field Soiling and Environmental Parameters Monitoring Network
Brahim Aissa[1], Mohamed Abdelrahim[2], Mosab Kareem Subeh[1], Amir Abdallah[1], Benjamin Figgis[1], Juan Lopez Garcia[1], Veronica Bermudez Benito[1]
[1] QEERI, Doha, Qatar; [2] Bin Omran Trading & Telecommunications, Doha, Qatar

4AO.9.4 Quality Assurance from Laboratory to Field: Novel Test Solutions for Soiling-Prone PV Systems
Ioannis (John) Tsanakas[1], Rodrigo Moretón[2], Eric Pilat[1], Jorge Solórzano[3], Jorge Veludo[4], Kévin Garcia[5]
[1] CEA - INES, Le Bourget-du-Lac, France; [2] QPV, Madrid, Spain; [3] Entec Solar, Madrid, Spain; [4] Galp Energia, Lisbon, Portugal; [5] CNR, Lyon, France

4AO.9.5 Cleaning of PV Through Rain: Experimental Study and Modelling Approaches
Fernanda Norde Santos[1], Elena Ruiz Donoso[1], Julie El Dik[1], Stefan Wilbert[1], Laura Campos Guzman[1], Natalie Hanrieder[1], Aránzazu Fernández García[2], Carmen Alonso García[2], Jesús Polo[2], Anne Forstinger[3], Roman Affolter[4], Robert Pitz-Paal[5]
[1] DLR, Almeria, Spain; [2] CIEMAT, Madrid, Spain; [3] CSP Services, Cologne, Germany; [4] CSP Services, Almeria, Spain; [5] DLR, Cologne, Germany

4AO.9.6 Degradation Root-Cause Numerical Analysis of around 100 PV Modules Installed in Hot and Arid Desert Environment
Shahzada Pamir Aly[1], Kaushal Chapaneri [1], Baloji Adothu[1], Jim Joseph John[1], Gerhard Mathiak[1], Vivian Alberts[1]
[1] DEWA, Dubai, United Arab Emirates

VISUAL PRESENTATIONS 3AV.3

17:00 - 18:30 PV Modules Performance: Testing, Modelling Techniques and Outdoor Performance

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

Tuesday, 24. September 2024

ORAL PRESENTATIONS 1BO.1

08:30 - 10:00 Silicon Bottom Cells for Tandem Photovoltaics | Dielectric Layer Related Defect Characterisation

Chairpersons: Giso Hahn
University of Konstanz, Germany

Invited

1BO.1.1 Towards TOPCon Based Bottom Cells: Current Challenges and Perspectives
Mario Hanser[1], Henning Nagel[1], Johannes Gry[1], Jana Polzin[1], Armin Richter[1], Jan Benick[1], Martin Bivour[1], Martin Hermle[1], Stefan Glunz[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BO.1.2 Thin Silicon Heterojunction Solar Cells in Perovskite Shadow: Bottom Cell Prospective
Ugochi Chime[1], Weiyuan Duan[1], Andreas Lambertz[1], Karsten Bittkau[1], Volker Lauterbach[1], Kaining Ding[1], Uwe Rau[1], Tsevetelina Merdzhanova[1], Oleksandr Astakhov[1]
[1] FZJ, Jülich, Germany

1BO.1.3 Review on In-Free Recombination Junction Approaches for Two-Terminal Silicon / Perovskite Tandem Solar Cells
Pia Vasquez[1], Perrine Carroy[1], Batiste Marteau[1], Thibaut Desrues[1], Nathalie Nguyen[1], Muriel Matheron[1], Sofia Chozas[2], Federico Ventosinos[2], Henk J. Bolink[2], Delfina Muñoz[1]
[1] CEA-INES, Le Bourget du Lac, France; [2] University of Valencia, Valencia, Spain

1BO.1.4 Understanding Interface States in TiOx/Si Heterostructure by Analysing Temperature Dependence of Effective Carrier Lifetime
Yuto Michishita[1], Kazuhiro Gotoh[2], Shohei Fukaya[1], Yasuyoshi Kurokawa[1], Noritaka Usami[1]
[1] Nagoya University, Nagoya, Japan; [2] Niigata University, Niigata, Japan

1BO.1.5 Three Dimensional DLTS Analysis on Defects in Si Crystal Induced by a-Si Deposition
Yoshio Ohshita[1], Subhash Chand Yadav[1], Tomohiko Hara[2]
[1] Toyota Technological Institute, Nagoya, Japan; [2] Ritsumeikan University, Kusatsu, Japan

1BO.1.6 Development and Characterization of N2O-plasma Oxide Layers for High-Temperature Passivating Contacts
Sofia Libraro[1], Lars Bannenberg[2], Theodosios Famprikis[2], David Reyes[3], Julien Hurni[1], Christophe Ballif[1], Aicha Hessler-Wyser[1], Franz-Josef Haug[1], Audrey Morisset[1]
[1] EPFL, Neuchâtel, Switzerland; [2] TU Delft, Delft, The Netherlands; [3] EPFL, Lausanne, Switzerland

ORAL PRESENTATIONS 4BO.6

08:30 - 10:00 Performance and Degradation of PV Systems

Chairpersons: Sandra Gallmetzer
Eurac Research, Bolzano, Italy
Joshua S. Stein
Sandia National Laboratories, Albuquerque, United States of America

4BO.6.1 Estimating Photovoltaic System Degradation Using Limited Data
Anastasios Kladas[1], Ruben Menu[1], Bert Herteleer[1], Jan Cappelle[1]
[1] KU Leuven, Leuven, Belgium

4BO.6.2 30+ Years of Operation – A Comprehensive Review of the Long-Term Performance of the Mont-Soleil PV System and its Peers
Hugo Quest[1], Christof Bucher[2], Matthias Burri[2], Christophe Ballif[3], Alessandro Virtuani[4]
[1] 3S Swiss Solar Solutions, Thun, Switzerland; [2] BFH, Burgdorf, Switzerland; [3] EPFL, Neuchâtel, Switzerland; [4] CSEM, Neuchâtel, Switzerland

4BO.6.3 High-Precision Thermal Modelling of Ground-Mounted PV and Implications for Degradation
Phillip Hamer[1], Moonyong Kim[1], Jack Petrapsch[2], Mattias Juhl[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] 5B Solar, Mascot, Australia

4BO.6.4 Trend-Based Predictive Maintenance and Fault Detection Analytics for Photovoltaic Power Plants
Demetris Marangis[1], Panayiotis Michaelides[1], Andreas Livera[1], George Makrides[1], George E. Georghiou[1]
[1] University of Cyprus, Nicosia, Cyprus

4BO.6.5 Utilizing Machine Learning for PV Climate Classification
Francisco Javier Triana de las Heras[1], Olindo Isabella[1], Malte Ruben Vogt[1]
[1] TU Delft, Delft, The Netherlands

4BO.6.6 PV Module Operating Temperature: Reliable Extraction of Parameters from Dynamic Field Data
Anton Driesse[1], Jesus Polo[2]
[1] PV Performance Labs, Freiburg, Germany; [2] CIEMAT, Madrid, Spain

ORAL PRESENTATIONS 3BO.11

08:30 - 10:00 Reliability of PV Modules: The Impact of Solar Cell Technology

Chairpersons: Eve Krassowski
CE Cell Engineering, Kabelsketal, Germany
Tony Sample *(i)*
European Commission JRC, Ispra, Italy

3BO.11.1 Special Introductory Presentation: Reliability of Commercial TOPCon PV Modules – An Extensive Comparative Study
Paul Gebhardt[1], Jochen Markert[1], Ulli Kräling[1], Esther Fokuhl[1], Ingrid Haedrich[1], Daniel Philipp[1]
[1] Fraunhofer ISE, Freiburg, Germany

3BO.11.2 Assessing Soldering Flux-Induced Corrosion on TOPCon Solar Cell
Jiexi Fu[1], Chandany Sen[1], Haoran Wang[1], Muhammad Umair Khan[1], Yutong Wu[2], Hao Song[2], Ruirui Lv[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] CSI Solar, Jiangsu, China

3BO.11.3 Mitigation Strategies of Moisture-Induced Degradation in Silicon Heterojunction Solar Modules
Lucie Pirot-Berson[1], Romain Couderc[1], Romain Bodeux[2], Frédéric Jay[1], Julien Dupuis[3]
[1] CEA-INES, Le Bourget Du Lac, France; [2] EDF R&D-IPVF, Palaiseau, France; [3] EDF R&D, Moret Loing et Orvanne, France

3BO.11.4 Investigation of Potential-induced Degradation and Recovery in Perovskite Minimodules
Junchuan Zhang[1], Haodong Wu[1], Yi Zhang[2], Fangfang Cao[1], Zhiheng Qiu[1], Minghui Li[1], Xiting Lang[1], Yongjie Jiang[1], Yangyang Gou[1], Xirui Liu[1], Abdullah M. Asiri[3], Paul J. Dyson[2], Mohammad Khaja Nazeeruddin[2], Jichun Ye[1], Chuanxiao Xiao[1]
[1] CAS, Ningbo, China; [2] EPFL, Lausanne, Switzerland; [3] CEAMR, Jeddah, Saudi Arabia

3BO.11.5 Partial Shading Degradation Mapping in Monolithically Integrated Perovskite Modules
Klaas Bakker[1], Remi Aninat[1], Jonathan Henzel[1], Ilker Dogan[1], Valerio Zardetto[1], Sjoerd Veenstra[1], Mirjam Theelen[1]
[1] TNO, Eindhoven, The Netherlands

ORAL PRESENTATIONS 4BO.16

08:30 - 10:00 Technology, Performance and Economics of PV in/on Buildings

Chairpersons: Simon Boddaert *(i)*
CSTB, Sophia Antipolis, France
Nuria Martín-Chivelet *(i)*
CIEMAT, Madrid, Spain

4BO.16.1 A Systematic Approach for the Integration of BIPV Planning into the Construction Value Chain
Frank Ensslen[1], Mona Mühlich[1], Jan-Bleicke Eggers[1], Bruno Bueno[1]
[1] Fraunhofer ISE, Freiburg, Germany

4BO.16.2 Boosting the Performance of Semi-Transparent PV Windows
Simona Villa[1], David Out[1], Nicolas Guillevin[2], Marcel Ribberink[3], Roland Valckenborg[1]
[1] TNO, Eindhoven, The Netherlands; [2] TNO, Petten, The Netherlands; [3] Pilkington, Enschede, The Netherlands

4BO.16.3 Cost-Effective Energy Transition: Rooftop PV in European Union Buildings
Carmen Maduta[1], Delia D'Agostino[1], Sofia Tsemekidi-Tzeiranaki[2], Luca Castellazzi[1]
[1] European Commission JRC, Ispra, Italy; [2] Network Research Belgium, Herstal, Belgium

4BO.16.4 Integrated Agri-BIPV Facade System: A Holistic Approach for Sustainable Built Environments
Dilara Güney[1], Talat Özden[1], İpek Gürsel Dino[1]
[1] METU, Ankara, Turkey

4BO.16.5 Dynamic BIPV Shading Systems: Performance Analysis for High TRL Validation and Market Transfer
Tian Shen Liang[1], Paolo Corti[1], Pierluigi Bonomo[1], Francesco Frontini[1]
[1] SUPSI, Mendrisio, Switzerland

4BO.16.6 Study on Improvement of Power Generation for a Window by Solar Radiation Reflected from the Low-E Coating of a Semi Transparent Photovoltaic Module that is Equally Arranged Linear Double-Sided Solar Cells
Kazuhiko Umeda[1], Nobusato Kobayashi[1], Akira Yamaguchi[1], Akihiko Nakajima[2], Kengo Maeda[2], Akihiro Kuraoka[2], Naoki Kadota[2]
[1] TAISEI, Tokyo, Japan; [2] KANEKA, Tokyo, Japan

VISUAL PRESENTATIONS 2BV.1

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

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 1BO.2

10:30 - 12:00 Advanced Silicon Solar Cell Characterisation in Laboratory and Production

Chairpersons: Karsten Bothe
ISFH, Emmerthal, Germany
Ronald Sinton
Sinton Instruments, Boulder, United States of America

1BO.2.1 Identification of Performance-relevant Optically Detected Defects by Correlative Data Analysis Approaches in Solar Cell Production
Manuel Meusel[1], Marko Turek[1]
[1] Fraunhofer CSP, Halle (Saale), Germany

1BO.2.2 Analysis of Electroluminescence Data Imaging Using Physical Models and Machine Learning
Erell Laot[1], Jean-François Guillemoles[2], Daniel Ory[1], Jean-Baptiste Puel[1]
[1] EDF R&D, Palaiseau, France; [2] IPVF, Palaiseau, France

1BO.2.3 Integrated Inline Characterization Techniques for Improved Silicon Heterojunction Solar Cell Production
Christian Diestel[1], Saravana Kumar[1], Jonas Haunschild[1], Sebastian Pingel[1], Stefan Rein[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BO.2.4 Contactless Quantitative Imaging of Series Resistance of Solar Cells
Yan Zhu[1], Thorsten Trupke[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia

1BO.2.5 Expert Knowledge, AI, and Simulation: Integrative Approaches for Quality Assurance in Solar Cell Manufacturing
Matthias Demant[1], Alexandra Woernhoer[1], Philipp Kunze[1], Wilkin Woehler[1], Leslie Kurumundayil[1], Johannes Greulich[1], Andreas Fell[1], Stefan Rein[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BO.2.6 Charge Manipulation in SiNx Layers Grown for a Better Passivation of High Efficiency Solar Cell with N2O Plasma Treatment
Hasan Hüseyin Canar[1], Raşit Turan[1]
[1] ODTÜ GÜNAM, Ankara, Turkey

ORAL PRESENTATIONS 4BO.7

10:30 - 12:00 Data Driven Field Inspection based on Imaging

Chairpersons: Gisele A. dos Reis Benatto
Technical University of Denmark, Roskilde, Denmark
Marcus Rennhofer *(i)*
AIT, Vienna, Austria

4BO.7.1 From Pixels to Insights: A Software Prototype for AI-Driven Complete Diagnostics of PV Plants
Ioannis (John) Tsanakas[1], Murielle Stepec[1], Duy-Long Ha[1], Rodrigo Moretón[2], Jorge Veludo[3]
[1] CEA - INES, Le Bourget du Lac, France; [2] QPV, Madrid, Spain; [3] Galp Energia, Lisbon, Portugal

4BO.7.2 Quantitative Assessment of Solar Module Degradation from Daylight Photoluminescence Imaging
Oliver Kunz[1], Juergen W. Weber[1], Hugh Gottlieb[1], Alexander Slade[1], Ouyang Zi[1], Thorsten Trupke[1]
[1] UNSW, Sydney, Australia

4BO.7.3 Redefining Failure Detection in PV Systems: A Comparative Study of GPT-4V(ision) and ResNet's Computer Vision in Aerial Infrared Imagery Analysis
Sandra Gallmetzer[1], Mousa Sondoqah[1], Lukas Koester[1], Atse Louwen[1], David Moser[1]
[1] EURAC, Bolzano, Italy

4BO.7.4 Evaluation of Field Measurements on Hail Damage to Photovoltaic Modules
Evelyn Bamberger[1], Alexandre Voirol[1]
[1] OST, Rapperswil, Switzerland

4BO.7.5 Evaluation of Daylight Filters for Electroluminescence Imaging of PV Modules Using Artificial Light as Controlled Image Noise
Gisele Alves dos Reis Benatto[1], Rodrigo Del Prado Santamaria [1], Thøger Kari[1], Liviu Stoicescu[2], Sergiu V. Spataru[1]
[1] DTU, Roskilde, Denmark; [2] Solarzentrum Stuttgart, Stuttgart, Germany

4BO.7.6 Enhancing UV-Fluorescence Imagery Analysis: Lessons from Extensive PV Module Inspection in Multi-MWp PV Power Stations
Claudia Buerhop-Lutz[1], Oleksandr Stroyuk[1], Oleksandr Mashkov[1], Jens Hauch[1], Marius Peters[1]
[1] HI ERN, Erlangen, Germany

ORAL PRESENTATIONS 3BO.12

10:30 - 12:00	**Reliability of PV Modules: The Impact of Polymers**
Chairpersons:	Teresa M. Barnes *(i)* NREL, Evergreen, United States of America
	Matthieu Despeisse CSEM, Neuchâtel, Switzerland

3BO.12.1 Crosslinking Behavior of Ethylene Vinyl Acetate Copolymer Encapsulants in Dependence of the Additive Composition
Michael Wendt[1], Robert Heidrich[1], Patrick Wessel[1], Ralph Gottschalg[1], Anton Mordvinkin[1]
[1] Fraunhofer CSP, Halle, Germany

3BO.12.2 Performance and Reliability of PV Modules Made with Novel Co-Extruded Encapsulant Containing UV Down-Shifting Compound
Maxime Babics[1], Romain Soulas[1], Marion Serasset[1], Timea Bejat[1], Amandine Boulanger[1], Vincent Barth[1], Eszter Voroshazi[1], Gabriele Bianca[2], Sebastiano Caccamo[2], Alessandro Fucile[2], Antonino Ragonesi[2], Cosimo Gerardi[2]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] 3SUN, Catania, Italy

3BO.12.3 How Does the Material Combination of Encapsulant and Rear Side Cover Influence the Degradation Behavior of Solar Modules?
Robert Heidrich[1], Patrick Wessel[1], Bengt Jäckel[1], Anton Mordvinkin[1], Marko Jankovec[2], Marko Topič[2], Ralph Gottschalg[1]
[1] Fraunhofer CSP, Halle, Germany; [2] University of Ljubljana, Ljubljana, Slovenia

3BO.12.4 Recent Developments in PV Module Backsheets - What Do We Really Know About Them?
Gernot Oreski[1], Chiara Barretta[1], Karl-Anders Weiß[2]
[1] PCCL, Leoben, Austria; [2] Fraunhofer ISE, Freiburg, Germany

3BO.12.5 Evaluation of Degradation and Cracking Propensity of Emerging PV Backsheets after Accelerated Laboratory Weathering
Xiaohong Gu[1], Karissa Jensen[1], Stefan Mitterhofer[1], Ashlee Aiello[1], Hsin-Hsin Hsieh[2], Anabel Kadri[3], Christopher Jin[4], Joseph Moses[5], Chiara Barretta[6], Gernot Oreski[6], Liang Ji[7]
[1] NIST, Gaithersburg, United States of America; [2] ITRI, Hsinchu, Taiwan; [3] Tulane University, New Orleans, United States of America; [4] Montgomery Blair High School, Silver Spring, United States of America; [5] Morgan State University, Baltimore, United States of America; [6] PCCL, Leoben, Austria; [7] UL Solutions, Northbrook, United States of America

3BO.12.6 Damp Heat Stability of Lightweight Silicon Heterojunction Solar Modules with Various Encapsulation Materials and Architectures
Kai Zhang[1], Andreas Lambertz[1], Karsten Bittkau[1], Kaining Ding[1], Uwe Rau[1]
[1] Forschungszentrum Jülich, Jülich, Germany

ORAL PRESENTATIONS 4BO.17

10:30 - 12:00 Characterisation, Reliability and Safety of PV in/on Buildings

Chairpersons: Simona Villa
TNO, Eindhoven, The Netherlands

Francesco Frontini
SUPSI, Mendrisio, Switzerland

4BO.17.1 Optimizing Urban Photovoltaic Systems: Small-Area High-Voltage Modules Assisted with Bypass-Diode
Luthfan Fauzan[1], Yeon Hyang Sim[2], Min Ju Yun[2], Hyek Young Choi[2], Dong Yoon Lee[2], Seung I. Cha[3]
[1] University of Science and Technology & Korea Electrotechnology Research Institute, Changwon, South Korea; [2] Korea Electrotechnology Research Institute, Changwon, South Korea; [3] University of Science and Technology, Changwon, South Korea

4BO.17.2 Mechanically Robust and Environmentally Stable Novel Lightweight PV Modules for Building Integration Based on Polymeric Honeycomb
Umang Desai[1], Jonathan Govaerts[2], Bin Luo[2], Yuliya Voronko[3], Gabriele Eder[3], Jarne Saelens[4], Wouter Winant[4], Nikolina Pervan[5], Gernot Oreski[5], Antonin Faes[6], Christophe Ballif[6]
[1] EPFL, Neuchatel, Switzerland; [2] imec, Genk, Belgium; [3] OFI, Vienna, Austria; [4] Econcore, Leuven, Belgium; [5] PCCL, Leoben, Austria; [6] EPFL, CSEM, Neuchatel, Switzerland

4BO.17.3 Experimental Investigation of the Temperature Distribution in a BIPV Facade
Nanna Lysgaard Andersen[1], Markus Babin[1], Sune Thorsteinsson[1]
[1] DTU Fotonik, Roskilde, Denmark

4BO.17.4 One Year of PV Related Fires: Analysis
Lenneke H. Slooff[1], Martina Duyvis[2], Roy Weghorst[3], Marc Mergeay[3]
[1] TNO Energy Transition, Petten, The Netherlands; [2] NIPV, Arnhem, The Netherlands; [3] NEN, Delft, The Netherlands

4BO.17.5 Bending of Building-Integrated PV (BIPV) Modules Based on Aluminum under Changing Temperature Conditions
Kevin Meyer[1], Wiebke Wirtz[1], Susanne Blankemeyer[1], Danny Lorenz[2], Fynn Klopp[2], Henning Schulte-Huxel[1]
[1] ISFH, Emmerthal, Germany; [2] MN Metall, Neustadt, Germany

4BO.17.6 Rooftop PV Potential Using a Digital Building Stock Model
Georgia Kakoulaki[1], Ana Martinez[1], Nigel Taylor[1], Szabo Sandor[1], Robert Kenny[1]
[1] European Commission JRC, Ispra, Italy

VISUAL PRESENTATIONS 2BV.2

10:30 - 12:00 Compound and Organic Semiconductors

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 1BO.3

13:30 - 15:00 Optimised Processes for the Manufacturing of TOPCon Solar Cells

Chairpersons: Elise Bruhat
HOLOSOLIS, Grenoble, France

Pierre Verlinden *(i)*
AMROCK, McLaren Vale, Australia

1BO.3.1 Exploring the Impact and Challenges of Using Emerging Wafer Sizes in PV Manufacturing
Julian Reichle[1], Hardik Gohil[1], Avinash Kumar[1], Mehul Raval[1], Wolfgang Jooß[1], Peter Fath[1]
[1] RCT Solutions, Konstanz, Germany

1BO.3.2 A Horizontal Double-Sided Copper Plating Technology Designed for Solar Cell Mass-Production
Lu Wang[1], Yusen Qin[1], Xiang Wang[2], Yibo Lu[1], Wenping Xu[2], Chengming Song[2], Meilin Peng[3], Meixian Huang[3], Jinning Li[2], Guohua Zhou[1], Jingjia Ji[1]
[1] Jiangsu Xianghuan Technology, Wuxi, China; [2] Shenzhen Mingchuang Intelligent Equipment, Shenzhen, China; [3] Jiangnan University, Wuxi, China

1BO.3.3 Comprehensive Analysis and Process Optimization for Wet-Chemical Alkaline Edge Isolation for Industrial TOPCon Solar Cells
Tobias Dannenberg[1], Jan Vollmer[1], Philipp Schmid[1], Katrin Krieg[2], Mert Isik[2], Martin Zimmer[2], Damian Brunner[1]
[1] RENA, Freiburg, Germany; [2] Fraunhofer ISE, Freiburg, Germany

1BO.3.4 High-Throughput Inline PVD- Tunnel-Oxide Layers for High Efficiency i-TOPCon Solar Cells
Eric Schneiderlöchner[1], Tina Dietsch[1], Henning Nagel[2], Winfried Wolke[2], Jana-Isabelle Polzin[2], Sebastian Mack[2], Volker Linß[1]
[1] VON ARDENNE, Dresden, Germany; [2] Fraunhofer ISE, Freiburg, Germany

1BO.3.5 Laser-Assisted Firing in High Volume Production: A Game Changer for Industrial TOPCon Solar Cells
Xutao Wang[1], Jing Yuan[2], Xinyuan Wu[1], Jianjun Nie[2], Yanyan Zhang[2], Xiaoyan Zhang[2], Weiguang Yang[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] Jolywood (Taizhou) Solar Technology, Taizhou, China

1BO.3.6 Comprehensive Optimization of Glass Stencil Printing, Demonstrating Ultrafine Metal Fingers Below 10 µm
Tadeo Schweigstill[1], Niko Mielich[1], Aaron Vogt[2], Malte Schulz-Ruhtenberg[2], Jonas D. Huyeng[1], Florian Clement[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] LPKF Laser & Electronics, Garbsen, Germany

ORAL PRESENTATIONS 2BO.8

13:30 - 15:00 Novel PV Material and Conversion Concepts

Chairpersons: Christoph J. Brabec
FAU, Erlangen, Germany
Eric Pop *(i)*
Stanford Univ., Stanford, United States of America

2BO.8.1 Pathways for Silicon Solar Cells with Molecular Singlet Fission
Phoebe Pearce[1], Nicholas Ekins-Daukes[1]
[1] UNSW, Sydney, Australia

2BO.8.2 Control of Hot Carrier Thermalization Rates in Nanowires for Advanced-Concept Photovoltaic Solar Cells
Hamidreza Esmaielpour[1], Nabi Isaev[1], Imam Makhfudz[2], Markus Döblinger[3], Jonathan Finley [1], Gregor Koblmüller [1]
[1] TUM, Munich, Germany; [2] Aix-Marseille University, Marseille, France; [3] LMU, Munich, Germany

2BO.8.3 Enhancing Triplet Transfer in Singlet Fission Solar Cells Through Optimising Band Alignment
Shona McNab[1], Alex J. Baldacchino[1], Alfie Jones[1], Alvin Mo[1], Alison Ciesla[1], Bram Hoex[1], Murad J. Y. Tayebjee[1], Michael P. Nielsen[1]
[1] UNSW, Sydney, Australia

2BO.8.4 Harvesting the Sun 24 Hours a Day: A Hybrid Photovoltaic-Thermoradiative System
Iñigo Ramiro[1], Antonio Martí[1]
[1] IES-UPM, Madrid, Spain

2BO.8.5 Design and Prototyping of Spectrum-Split-Type Concentrating Photovoltaic-Thermoelectric Hybrid Power Generator
Kenji Kamide[1], Ryoji Funahashi[1], Tomoyuki Urata[1], Yoko Matsumura[1], Jun Sakuma[2], Hidefumi Akiyama[2], Katsuto Tanahashi[1]
[1] AIST, Tsukuba, Japan; [2] University of Tokyo, Kashiwa, Japan

2BO.8.6 Hybrid Quantum/Thermionic Solar Converters
Christiana Honsberg[1], Stuart Bowden[2], Ian Sellers[3], Stephen Goodnick[1]
[1] Arizona State University, Tempe, United States of America; [2] Solestial Solar, Tempe, United States of America; [3] University of Buffalo, Buffalo, United States of America

VISUAL PRESENTATIONS 4BV.3

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

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

PANEL DISCUSSION BO.13

13:30 - 15:00 Panel Discussion on: Long term stability of Tandem devices and risks and opportunities of introducing new technologies in the market

ORAL PRESENTATIONS 1BO.4

15:15 - 16:45 New Concepts for the Manufacturing of IBC and HJT Solar Cells

Chairpersons: Adrien Danel *(i)*
CEA, Le Bourget-du-Lac, France
Cosimo Gerardi *(i)*
3Sun, Catania, Italy

1BO.4.1 Project "BUSSARD" – A Holistic Development of High-Efficiency Solar Cells Covering Innovative Front-End, Metallization and Interconnection Approaches
Andreas Lorenz[1], Jörg Schube[1], Veronika Nikitina[1], Markus Klawitter[1], Mike Jahn[1], Michael Linse[1], Sebastian Schweigert[1], Sebastian Mack[1], Jürg Schleuniger[2], Isabell Kegel[2], Stephane Toguem Fokoua[2], Oliver Mürdter-Feger[3], Michael Mäser[3], Lutz Engisch[3], Ayala Kabla[4], Doron Gurevich[4], Fernando De La Vega[4], Jonas Buddgard[5], Maximilian Pospischil[6], Markus Rinio[7], Achim Kraft[1], Andreas Wolf[1], Martin Hermle[1], Florian Clement[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Continental, Freiburg, Germany; [3] SWG, Frankenberg, Germany; [4] PV NanoCell, Migdal Ha'Emek, Israel; [5] Sticky Solar Power, Lidingö, Sweden; [6] Highline Technology, Freiburg, Germany; [7] Karlstad University, Karlstad, Sweden

1BO.4.2 Absent of Humidity: How Soldering Flux Caused Severe Corrosion-Induced Failure in Silicon HJT Compared to TOPCon Solar Cells
Haoran Wang[1], Chandany Sen[1], Xinyuan Wu[1], Jiexi Fu[1], Xutao Wang[1], Muhammad Umair Khan[1], Yutong Wu[2], Hao Song[2], Ruirui Lv[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] CSI Solar, Jiangsu, China

1BO.4.3 IBC4EU: First Results of Industrialization of Low Cost, High Efficiency IBC Technology
Florian Buchholz[1], Daniel Tune[1], Tobias Messmer[1], Jonathan Linke[1], Manjunath Prasad[1], Juras Ulbikas[2], Arne Dahle[3], Martijn Meereboer[4], Francesca Fabris[5], Erik Eikelboom[5], Tom Borgers[6], Rik Van Dyk[6], Hariharsudan Sivaramakrishnan[6], Samuel Harrison[7], Josco Kester[8], Jan Kroon[8], Verena Mertens[9], Thorsten Dullweber[9], Ofer Shochet[10], Isaac Rosen[10], Ingo Röver[11], Wolfram Palitzsch[11], Yasmin Zaror[12], Johnnes Stierstorfer[12], Aurimas Radzevicius[13], Povilas Lukinskas[13], Julius Denafas[13], Tuomas Vanhanen[14], Tuukka Savisalo[14], Maximilian Pospischil[15], Marian Breitenbücher[15], Özlem Coşkun[16], Melodie de l'Epine[17], Philippe Macé[17]
[1] ISC Konstanz, Konstanz, Germany; [2] ProTechnologies, Vilnius, Lithuania; [3] Norsun, Årdalstangen, Norway; [4] Energyra, Westknollendam, The Netherlands; [5] Futurasun, Citadella, Italy; [6] imec, Genk, Belgium; [7] CEA INES, Le Bourget-du-Lac, France; [8] TNO, Amsterdam, The Netherlands; [9] ISFH, Hamelin, Germany; [10] Copprint, Jerusalem, Israel; [11] LuxChemTech, Freiberg, Germany; [12] WIP Renewable Energies, Munich, Germany; [13] Valoe Cells, Vilnius, Lithuania; [14] Valoe, Mikkeli, Finland; [15] Highline, Freiburg, Germany; [16] Kalyon PV, Ankara, Turkey; [17] Becquerel Institute, Brussels, Belgium

1BO.4.4 Self-Aligned Phase Separation for IBC Cells Using PVD Polysilicon
Erik Hoffmann[1], Geoffrey Gregory[1], Massimo Centazzo[1], Muhammad Khan[1], Nabeel Khan[1], Verena Mertens[2], Sarah Spätlich[2], Ulrike Baumann[2], Thorsten Dullweber[2]
[1] EnPV, Karlsruhe, Germany; [2] ISFH, Hamelin, Germany

1BO.4.5 Gas Phase, Selective Etching of Poly-Silicon for Layer Patterning
Laurent Clochard[1]
[1] Nines Photovoltaics, Dublin, Ireland

1BO.4.6 Investigation of Ag-Reduction on Silicon Heterojunction Solar Cells (HJT) with Different Approaches
Yu Wu[1], Eric Kossen[1], Astrid Gutjahr[1], L.J.(Bart) Geerligs[1]
[1] TNO, Petten, The Netherlands

ORAL PRESENTATIONS 2BO.9

15:15 - 16:45 **Advanced Materials for PV Devices**

Chairpersons: Phoebe Pearce *(i)*, UNSW Sidney, Kensington, Australia; Iñigo Ramiro, UPM, Spain

2BO.9.1 Sequential Growth of Wafer-Scale WSe2 for Photovoltaic Applications
Katie M. Neilson[1], Sarallah Hamtaei[2], Koosha Nassiri Nazif[1], Joshua M. Carr[3], Sepideh Rahimisheikh[4], Frederick U. Nitta[1], Guy Brammertz[2], Jeffrey L. Blackburn[5], Joke Hadermann[4], Krishna C. Saraswat[1], Obadiah G. Reid[5], Bart Vermang[2], Alwin Daus[1], Eric Pop[1]
[1] Stanford University, Stanford, United States of America; [2] Hasselt University/Imo-Imomec, Genk, Belgium; [3] Colorado University, Boulder, United States of America; [4] Antwerp University, Antwerp, Belgium; [5] NREL, Golden, United States of America

2BO.9.2 Single-Layer Carbon Nitride as an Efficient Metal-Free Organic Electron- Transport Material with a Tunable Work Function
Abdus Saboor[1], Oleksandr Stroyuk[2], Oleksandra Raievska[2], Chao Liu[3], Jens Hauch[2], Christoph J. Brabec[1]
[1] University of Erlangen–Nuremberg / HI-ERN, Erlangen, Germany; [2] HI-ERN, Erlangen, Germany; [3] University of Erlangen–Nuremberg, Erlangen, Germany

2BO.9.3 Polymer-Based Electron Selective Contact for Crystalline Silicon Solar Cells
Thomas Tom[1], Eloi Ros[2], David Rovira[2], José Miguel Asensi[1], Regina Galceran[1], Pablo Ortega[2], Joaquim Puigdollers[2], Cristóbal Voz[2], Joan Bertomeu[1], Julian López-Vidrier[1]
[1] University of Barcelona, Barcelona, Spain; [2] UPC, Barcelona, Spain

2BO.9.4 Bandgap Engineering for High Efficiency Kesterite Thin Film Solar Cells
Jacob Andrade-Arvizu[1], Pedro Vidal-Fuentes[1], Robert Fonoll[1], Maxim Guc[1], Claudia Malerba[2], Maykel Courel[3], Alejandro Pérez-Rodríguez[1], Victor Izquierdo-Roca[1]
[1] IREC, Barcelona, Spain; [2] ENEA, Rome, Italy; [3] CUValles, Jalisco, Mexico

2BO.9.5 Phosphorus-Doped Nanocrystalline Silicon as Electron Selective Contact for Germanium Thermophotovoltaic Cell
Mansur Gamel[1], Gema Lopez[1], Moisés Garín [2], Isidro Martín [1]
[1] Technical University of Catalonia, Barcelona, Spain; [2] UVIC-UCC, Barcelona, Spain

2BO.9.6 Atomic Layer Deposition of ZnO_(1-x)S_(x) Absorbers for Wide Bandgap UV-Selective Transparent PV Devices for BIPV Applications
Gustavo Álvarez[1], Victoria Rotaru[1], Jose Miguel Asensi[2], Pedro Vidal-Fuentes[1], Lorenzo Calvo-Barrio[3], Maxim Guc[1], Cristobal Voz[4], Alex J. Lopez-Garcia[1], Joaquim Puigdollers[4], Victor Izquierdo-Roca[1], Alejandro Pérez-Rodríguez[1]
[1] IREC, Barcelona, Spain; [2] University of Barcelona, Barcelona, Spain; [3] CCiTUB, Barcelona, Spain; [4] UPC, Barcelona, Spain

ORAL PRESENTATIONS 3BO.14

15:15 - 16:45 Failure Modes and Degradation Mechanisms in PV Modules

Chairpersons: Ralph Gottschalg
Fraunhofer CSP, Halle (Saale), Germany
Chiara Barretta
PCCL, Leoben, Austria

3BO.14.1 Damp-Heat Module Reliability: Three New Failure Modes in TOPCon That Are Absent in PERC
Chandany Sen[1], Haoran Wang[1], Muhammad Umair Khan[1], Jiexi Fu[1], Xinyuan Wu[1], Xutao Wang[1], Bram Hoex[1]
[1] UNSW, Sydney, Australia

3BO.14.2 Analyses of Glass Quality and Its Influence on Mechanical Stability of Large Area PV Modules
Jochen Markert[1], Pascal Romer[1], Frank Ensslen[1], Enzo Job[1], Tobias Rist[2], Ingrid Hädrich[1], Daniel Philipp[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Fraunhofer IWM, Freiburg, Germany

3BO.14.3 Polarization-Type Potential-Induced Degradation in Bifacial PERC Modules in the Field
Peter Hacke[1], Cecile Molto[2], Dylan J.Colvin[2], Ryan Smith[3], Christopher DiRubio[4], Matthew Gardeski[4], Farrukh Ibne Mahmood[5], Fang Li[5], Jaewon Oh[6], Govindasamy Tamizhmani[5], Hubert Seigneur[2]
[1] NREL, Golden, United States of America; [2] FSEC Energy Research Center University of Central Florida, Cocoa, United States of America; [3] Pordis, Austin, United States of America; [4] First Solar, Tempe, United States of America; [5] ASU, Mesa, United States of America; [6] University of North Carolina, Charlotte, United States of America

3BO.14.4 Shedding Light on PID and Recovery in High-Efficiency Crystalline-Silicon Technologies
Olatz Arriaga Arruti[1], Alessandro Virtuani[1], Bénédicte Bonnet-Eymard[2], Matthieu Despeisse[2], Christophe Ballif[1]
[1] EPFL, Neuchâtel, Switzerland; [2] CSEM, Neuchâtel, Switzerland

3BO.14.5 LeTID in Real Life: The Relevance and Importance of Accelerated Tests and Treatments
Arastoo Teymouri[1], Moonyong Kim[1], Li Wang[1], Catherine Chan[1], Ran Chen[1], Petra Manshanden[2], Astrid Gutjahr[2], Bas Van Aken[2], Jakob Jan Dijksterhuis[3], Alison Ciesla[1]
[1] UNSW, Sydney, Australia; [2] TNO, Petten, The Netherlands; [3] Elsun, Roden, The Netherlands

3BO.14.6 Towards Establishing Criteria for Electrical Safety in Second-Use Photovoltaic (PV) Modules
Tadanori Tanahashi[1], Takashi Oozeki[1]
[1] AIST, Koriyama, Japan

VISUAL PRESENTATIONS 4BV.4

15:15 - 16:45 Photovoltaic in/on Buildings

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 4BO.5

17:00 - 18:30 Design and Coloring Techniques of PV for Buildings

Chairpersons: Delia D'Agostino *(i)*
European Commission JRC, Ispra, Italy
Thomas Friesen *(i)*
Kromatix, Romont, Switzerland

4BO.5.1 MorphoFlex: Integrating MorphoColor on Polymeric Films in Photovoltaic Modules
Benedikt Bläsi[1], Martin Mattenheimer[1], Christine Wellens[1], Jochen Markert[1], Andreas Wessels[1], Hubert Hauser[2], Jörg Mick[2], Leon Fels[3], Brunhilde Kindle-Hasse[3], Thomas Kroyer[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] temicon, Dortmund, Germany; [3] ROWO Coating, Herbolzheim, Germany

4BO.5.2 Developing Colored Solar Panels for BIPV Applications: A Photonic Glass Approach with Metal Oxide Nanospheres
Parisa Sharif[1], Eda Cevik[2], Sahin Coskun[3], Husnu Emrah Unalan[2], Alpan Bek[2], Talat Ozden[1]
[1] ODTÜ-GÜNAM, Ankara, Turkey; [2] METU, Ankara, Turkey; [3] ESOGU, Eskisehir, Turkey

4BO.5.3 Decorative Technique for Building-Integrated Photovoltaics by Using Cellulose Materials
Leo Adachi[1], Takaaki Kasuga[2], Manami Suzuki[1], Kota Goto[1], Masaya Nogi[2], Michio Kondo[3], Hiroyuki Wada[1]
[1] Tokyo Institute of Technology, Yokohama City, Japan; [2] Osaka University, Ibaraki City, Japan; [3] Waseda University, Shinjuku City, Japan

4BO.5.4 Understanding the Outdoor Performance of Colored BIPV-Modules with Interference Coating
David Out[1], Roland Valckenborg[1], Petra Manshanden[1], Lourens van Dijk[2], Paul de Jong[3]
[1] TNO, Eindhoven, The Netherlands; [2] Soluxa, Nijmegen, The Netherlands; [3] Solinso, Kessel, The Netherlands

4BO.5.5 Mitigating Angular Dependence of Structural-Colored PV Module by Introducing Texture Glass for Building-Integrated Photovoltaics Applications
Zhihao Xu[1], Takuya Matsui[1], Hitoshi Sai[1]
[1] AIST, Tsukuba, Japan

4BO.5.6 Novel Colorimetry Approach for Building-Integrated Photovoltaic Applications
Marie Courtant[1], Janne Halme[2], Alejandro Borja Block[1], Antonin Faes[1], Aïcha Hessler-Wyser[1], Christophe Ballif[1]
[1] EPFL, Neuchâtel, Switzerland; [2] Aalto University, Espoo, Finland

ORAL PRESENTATIONS 2BO.10

17:00 - 18:30 New Modelling and Characterisation - Material Properties

Chairpersons: Oliver Fischer
Fraunhofer ISE, Freiburg im Breisgau, Germany
Ana Kanevce
ZSW, Stuttgart, Germany

2BO.10.1 Special Introductory Presentation: In-depth Characterization Methodology for the Assessment of Passivation Impact in Halide Perovskite Solar Cells
Jonathan Parion[1], Santhosh Ramesh[1], Sownder Subramaniam[1], Henk Vrielinck[2], Filip Duerinckx[1], Hariharsudan Sivaramakrishnan Radhakrisnan[1], Jef Poortmans[1], Johan Lauwaert[3], Bart Vermang[1]
[1] imec, Genk, Belgium; [2] Ghent University, Ghent, Belgium; [3] Ghent University, Zwijnaarde, Belgium

2BO.10.2 Implied Voltage of Sub-cells in Tandem Devices from Luminescence Images – The Beauty of Using a Narrow Bandpass Filter
Soma Zandi[1], Shuai Nie[1], Yan Zhu[1], Thomas Allen[2], Erkan Aydin[2], Esma Ugur[2], Jianghui Zheng[3], Guoliang Wang[3], Xu Liu[1], Anita Ho-Baillie[3], Xiaojing Hao[1], Stefaan De Wolf[2], Thorsten Trupke[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia; [2] KAUST, Thuwal, Saudi Arabia; [3] University of Sydney, Sydney, Australia

2BO.10.3 Thickness Variation Determination of Perovskite Solar Cells through Hyperspectral Reflectance Imaging
Ivar Loland Råheim[1], Robert Lee Chin[2], Ziv Hameiri[2], Ingunn Burud[1], Espen Olsen[1]
[1] Norwegian University of Life Sciences, Ås, Norway; [2] UNSW, Sydney, Australia

2BO.10.4 Improving the Investigation of Defect Propreties through Temperature Dependent Modulated Photoluminescence
Hiba Haddara[1], Baptiste Berenguir[2], Sylvain Le Gall[1], Jean-François Guillemoles[2], Jean-Paul Kleider[1]
[1] GeePs, Gif-sur-Yvette, France; [2] IPVF, Palaiseau, France

2BO.10.5 Advanced Outdoor Degradation Analysis of Perovskite Solar Cells Using Bayesian Optimization
Joseph Chakar[1], Karim Medjoubi[2], Jorge Posada[2], Jean-Baptiste Puel[2], Yvan Bonnassieux[1]
[1] LPICM, Palaiseau, France; [2] IPVF, Palaiseau, France

ORAL PRESENTATIONS 3BO.15

17:00 - 18:30 Reliability of PV Modules: Testing and Modelling Approaches

Chairpersons: Ioannis (John) Tsanakas
CEA, Le Bourget-du-Lac, France
Ulrike Jahn
Fraunhofer CSP, Halle (Saale), Germany

3BO.15.1 Worldwide Moisture Ingress Modelling and Its Impact on Photovoltaic Module Degradation Predictions
Stefan Mitterhofer[1], Julian Ascencio-Vasquez[2], Ismail Kaaya[3], Xiaohong Gu[1]
[1] NIST, Gaithersburg, United States of America; [2] UNIVERS, Redwood, United States of America; [3] imo-imomec, Genk, Belgium

3BO.15.2 Material Selection and Novel Reliability Testing for Floating Photovoltaic Modules
Nikoleta Kyranaki[1], Arvid van der Heide[1], Hamed Javanbakht Lomeri[1], Ismail Kaaya[1], Sara Bouguerra[1], Jens Moschner[2], Arnaud Morlier[1], Michaël Daenen[1]
[1] Hasselt University, Genk, Belgium; [2] KU Leuven, Leuven, Belgium

3BO.15.3 Outdoor Accelerated Ageing Tests Using Additional Thermal and Thermomechanical Stresses
Ebrar Ozkalay[1], Gabi Friesen[1], Alessandro Virtuani[2], Mauro Caccivio[1], Christophe Ballif[3]
[1] SUPSI, Mendrisio, Switzerland; [2] CSEM, Neuchâtel, Switzerland; [3] EPFL, Neuchâtel, Switzerland

3BO.15.4 Development of PV Module Hot Desert Test Cycle Protocol Extended Failure Modes and Effective Analysis
Baloji Adothu[1], Jim Joseph John[1], Gerhard Mathiak[1], Vivian Alberts[1], Bengt Jäckel[2], Ralph Gottschalg[2], Narendra S Shiradkar[3], Amir A. Abdallah[4], Juan Lopez Garcia[4], Michael Salvador[5], Bram Hoex[6], Hussein A Kazem[7], Muhammad Ashraful Alam[8]
[1] DEWA, Dubai, United Arab Emirates; [2] Fraunhofer CSP, Halle, Germany; [3] IIT Bombay, Mumbai, India; [4] QEERI, Doha, Qatar; [5] KAUST, Thuwal, Saudi Arabia; [6] UNSW, Sydney, Australia; [7] Sohar University, Sohar, Oman; [8] Purdue University, West Lafayette, United States of America

3BO.15.5 Long-Term Degradation Rate of Photovoltaic Modules: A Meta-Analysis
Michael Straub-Mück[1], Jerome Geyer-Klingeberg[1], Andreas Rathgeber[1]
[1] University of Augsburg, Augsburg, Germany

3BO.15.6 Solar Cell Crack Image Generation for Power Loss Prediction
Norman Jost[1], Emma Cooper[1], Benjamin Pierce[1], Brandon Byford[1], Jennifer Braid[1]
[1] Sandia National Laboratories, Albuquerque, United States of America

VISUAL PRESENTATIONS 1BV.5

17:00 - 18:30 Silicon Material: Growth, Defects and Recycling | Manufacturing of Solar Cells and Related Tools & Processes

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

Wednesday, 25. September 2024

PLENARY PRESENTATIONS CP.1

08:30 - 10:00 PV Everywhere

Chairpersons: Alessandra Scognamiglio
ENEA, Portici, Italy
Roland M. E. Valckenborg
TNO, Eindhoven, The Netherlands

4CP.1.1 Invited Presentation

5CP.1.2 The Potential of Agrivoltaics in the EU's Green Deal
Anatoli Chatzipanagi[1], Georgia Kakoulaki[1], Nigel Taylor[1], Robert Kenny[1], Sandor Szabo[1]
[1] European Commission JRC, Ispra, Italy

4CP.1.3 Coloring Solutions for Building Integrated Photovoltaic Modules: A Review
Alejandro Borja Block[1], Jordi Escarre Palou[2], Marie Courtant[1], Alessandro Virtuani[2], Gianluca Cattaneo[2], Maxime Roten[2], Hengyu Li[2], Matthieu Despeisse[2], Aicha Hessler-Wyser[1], Umang Desai[1], Antonin Faes[1], Christophe Ballif[1]
[1] EPFL, Neuchatel, Switzerland; [2] CSEM, Neuchatel, Switzerland

4CP.1.4 Five Years of Trouble: Learnings from Floating Solar Field Testing in Challenging Conditions
Minne M. de Jong[1], Maarten Dörenkämper[1], Jan Kroon[1]
[1] TNO, Eindhoven, The Netherlands

PLENARY PRESENTATIONS CP.2 | CP.3

10:30 - 12:30 Performance and Reliability | Thin Films and Tandems

Chairpersons: Marika Edoff *(i)*
Uppsala University, Uppsala, Sweden
Gernot Oreski
PCCL, Leoben, Austria

3CP.2.1 Invited Presentation

4CP.2.2 Invited Presentation

4CP.2.3 Performance of Partial Shaded PV Generators Operated by Optimized Power Electronics Review an IEA PVPS T13 Activity
Franz P. Baumgartner[1], Sara Mirbagheri Golroodbari[2], Christof Bucher[3], Matthew Berwind[4], Felipe Valencia[5], Ulrike Jahn[6]
[1] ZHAW, Winterthur, Switzerland; [2] University Utrecht, Utrecht, The Netherlands; [3] Bern University, Bern, Switzerland; [4] Fraunhofer ISE, Freiburg, Germany; [5] ATAMOSTEC, Atacama, Chile; [6] Fraunhofer CSP, Halle (Saale), Germany

2CP.3.4 Perovskite PV Outdoors: From Single-Junction Single Cells to Mini-Modules and Tandems
Mark Khenkin[1], Marko Remec[2], Ulas Erdil[3], Florian Scheler[1], Quiterie Emery[1], Marko Jankovec[4], Cordula Wessendorf[5], Erik Ahlswede[5], Janardan Dagar[1], Steve Albrecht[1], Eva Unger[1], Bernd Stannowski[1], Rutger Schlatmann[1], Marko Topic[4], Carolin Ulbrich[1]
[1] HZB, Berlin, Germany; [2] HZB & University of Ljubljana, Berlin, Germany; [3] HZB & Bielefeld University, Berlin, Germany; [4] University of Ljubljana, Ljubljana, Slovenia; [5] ZSW, Stuttgart, Germany

2CP.3.5 Perovskite/Silicon Triple Junction Devices: An Overview of the Progress and Results From the Triumph Project Funded Under Horizon Europe
Hariharsudan Sivaramakrishnan Radhakrisnan[1], Minasadat Heydarian[2], Maryam Heydarian[2], Kerem Artuk[3], Christian Wolff[3], Luis Restat[4], Jonas Schön[4], Devika Rajagopal[1], Ahmed Eljaouhari[5], Kasimir Reichmuth[2], Jochen Hohl-Ebinger[2], Martin C. Schubert[2], René Köhler[6], Martin Dimer[6], Jons Bolding[7], Floor Souren[7], Martin Späth[8], Petra Manshanden[8], Cristian Villalobos [1], Jonathan Parion[1], Yinghuan Kuang[1], Selin Seyrek[1], Juliane Borchert[2], Florian Hilt[9], Pilar Lopez-Varo[9], Santhosh Ramesh[1], Henrik Pettersson[10], José Alvarez[11], Henry Weber[12], Ralf G. Niemann[12], Lukas Kegelmann[12], Fabian Fertig[12], Felipe Saenz[13], Valérie Depauw[1], Veronika Nikitina[2], Sebastian Nold[2], Mustafa Yaşa[14], Görkem Günbaş[14], Selçuk Yerci[14]
[1] imec/imomec, Genk, Belgium; [2] Fraunhofer ISE, Freiburg, Germany; [3] EPFL, Neuchâtel, Switzerland; [4] University of Freiburg, Freiburg, Germany; [5] RENA, Berg, Germany; [6] Von Ardenne, Dresden, Germany; [7] SALD, Eindhoven, The Netherlands; [8] TNO, Petten, The Netherlands; [9] IPVF, Palaiseau, France; [10] Dyenamo, Stockholm, Sweden; [11] CNRS, Palaiseau, France; [12] Qcells, Bitterfeld-Wolfen, Germany; [13] CSEM, Neuchâtel, Switzerland; [14] METU, Ankara, Turkey

2CP.3.6 Invited Presentation

ORAL PRESENTATIONS 2CO.1

13:30 - 15:00 Processing, Characterisation, and Modelling of Perovskite/ Silicon Tandems

Chairpersons: Ivan Gordon
imec, Genk, Belgium

Anna Robinson
Oxford PV, Oxford, United Kingdom

2CO.1.1 Tailoring Perovskite Crystallization and Interfacial Passivation in Efficient Fully-Textured Perovskite Silicon Tandem Solar Cells
Oussama Er-raji[1], Mohamed Mahmoud[1], Christoph Messmer[1], Oliver Fischer[1], Alexander Bett[1], Alexandra Ramadan[2], Alexander Reinholdt[3], Angelika Schmitt[3], Bhushan Kore[1], Martin Bivour[1], Florian Schindler[1], Jonas Schön[1], Martin Hermle[1], Martin C. Schubert[1], Juliane Borchert[1], Stefan Glunz[1], Patricia Schulze[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] University of Sheffield, Sheffield, United Kingdom; [3] Fraunhofer ISC, Würzburg, Germany

2CO.1.2 Diffusible Capping Layer Enabled Homogeneous Crystallization and Component Distribution of Hybrid Sequential Deposited Perovskite
Qiaojing Xu[1], Biao Shi[1], Yuncheng Li[1], Jingjing Liu[1], Yuxiang Li[1], Zetong SunLi[1], Pengfei Liu[1], Yubo Zhang[1], Cong Sun[1], Wei Han[1], Qian Huang[1], Dekun Zhang[1], Huizhi Ren[1], Xiaona Du[1], Ying Zhao[1], Xiaodan Zhang[1]
[1] Nankai University, Tianjin, China

2CO.1.3 Surface and Interface Passivation for Perovskite Solar Cells and Perovskite/c-Si Tandems
Kerem Artuk[1], Felipe Saenz[2], Deniz Turkay[1], Mostafa Othman[1], Mounir D. Mensi[3], Quentin Jeangros[2], Aïcha Hessler-Wyser[1], Christophe Ballif[1], Christian M. Wolff[1]
[1] EPFL, Neuchâtel, Switzerland; [2] CSEM, Neuchâtel, Switzerland; [3] EPFL, Sion, Switzerland

2CO.1.4 Ultrathin Atomic Layer Deposited Metal Oxides as Robust Passivating Interlayers at the Perovskite C60 Interface
Patricia Schulze[1], Johanna Modes[1], Armin Richter[1], Carl Hartwig[2], Stefan Lange[2], Oliver Fischer[1], Raphael Efinger[1], Martin Hermle[1], Andreas Bett[1], Juliane Borchert[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Fraunhofer CSP, Halle, Germany

2CO.1.5 Visualizing Losses in Highly Efficient and Stable Perovskite-Based Tandem Solar Cells
Esma Ugur[1], Erkan Aydin[1], Thomas G. Allen[1], Hao Chen[1], Edward H. Sargent[1], Stefaan De Wolf[1]
[1] KAUST, Thuwal, Saudi Arabia

2CO.1.6 Ohmic Silicon Substrates Allow Disentangling Perovskite Top Cell Performance from Its Silicon Bottom Cell in Tandems
Eike Köhnen[1], Philipp Wagner[1], Florian Scheler[1], Stefanie Severin[1], Angelika Harter[1], Lea Zimmermann[1], Lars Korte[1], Bernd Stannowski[1], Steve Albrecht[1]
[1] HZB, Berlin, Germany

ORAL PRESENTATIONS 5CO.4

13:30 - 15:00 PV Module Recycling

Chairpersons: Karsten Wambach
Wambach-Consulting, Petersdorf, Germany

Carmen Alonso-García
CIEMAT, Madrid, Spain

5CO.4.1 A Novel and Universal Use of Silicon Kerf Loss and Other Silicon-Based Waste with Amazing Side Effects
Wolfram Palitzsch[1], Arvid Killenberg[1], Ingo Röver[1]
[1] LuxChemtech, Freiberg, Germany

5CO.4.2 Comparative Analysis of Layer Thickness Measurement Methods for Photovoltaic Modules: A Comprehensive Study
Lukas Neumaier[1], Martin De Biasio[1], Gabriele Eder[2], Anika Gassner[2]
[1] Silicon Austria Labs, Villach, Austria; [2] OFI, Vienna, Austria

5CO.4.3 Diamond Wire Process for Glass-Glass PV Modules Opening Prior to Materials Recycling
Fabrice Coustier[1], Roland Riva[1], Margot Pliquet[1], Claire Agraffeil[1], Olivier Caulle[2], Thomas Peccavet[2], Rui DeAlmeida[2], Wolfram Palitzsch[3]
[1] CEA/INES, Le Bourget-du-Lac, France; [2] Mondragon Assembly, Orange, France; [3] LuxChemtech, Freiberg, Germany

5CO.4.4 Characterization of the Output-Fractions from Different Mechanical PV-Recycling Approaches
Anika Gassner[1], Gabriele Eder[1], Ferozan Azizi[2], Sonja Feldbacher[3], Friedrich Bleicher[4]
[1] OFI, Vienna, Austria; [2] MUL, Leoben, Austria; [3] PCCL, Leoben, Austria; [4] TU Vienna, Vienna, Austria

5CO.4.5 Recycling of MAPbI3 Perovskite Solar Cells
Zhenni Wu[1], Mykhailo Sytnyk[1], Jiyun Zhang[1], Gülüsüm Babayeva[1], Jens Hauch[1], Christoph J. Brabec[1], Ian Marius Peters[1]
[1] HI ERN, Erlangen, Germany

5CO.4.6 PV Waste Management in Australia: Strategic Site Selection Integrating Postcode-level Waste Projection and Logistic Optimisation
Rong Deng[1], Chence Niu[1], Verity Tan[1], Renate Egan[1], Vinayak Dixit[1]
[1] UNSW, Sydney, Australia

VISUAL PRESENTATIONS 4CV.1
13:30 - 15:00 Solar Resource and Forecasting

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

PANEL DISCUSSION CO.7
13:30 - 15:00 Panel discussion on: Social Acceptance of Ubiquitous-PV: the era of Integrated Photovoltaics

ORAL PRESENTATIONS 2CO.2
15:15 - 16:45 Triple Junctions and Advanced Concepts in Perovskite-based Tandems
Chairpersons: Jan Christoph Goldschmidt
Philipps University of Marburg, Marburg, Germany
Patricia Schulze
Fraunhofer ISE, Freiburg, Germany

2CO.2.1 High-Efficiency Dual and Triple Junction Perovskite-Silicon Tandem Solar Cells
Erkan Aydin[1], Esma Ugur[1], Fuzong Xu[1], Jiang Liu[1], Thomas Allen[1], Stefaan De Wolf[1]
[1] KAUST, Thuwal, Saudi Arabia

2CO.2.2 Triple-Junction Perovskite–Perovskite–Silicon Photovoltaics
Hang Hu[1], Sophie X. An[1], Yang Li[1], Seyedamir Orooji[1], Roja Singh[1], Fabian Schackmar[1], Felix Laufer[1], Qihao Jin[1], Thomas Feeney[1], Alexander Diercks[1], Fabrizio Gota[1], Somayeh Moghadamzadeh[1], Ting Pan[1], Michael Rienäcker[2], Robby Peibst[2], Paul Fassl[1], Bahram Abdollahi Nejand[1], Ulrich W. Paetzold[1]
[1] KIT, Karlsruhe, Germany; [2] ISFH, Emmertal, Germany

2CO.2.3 Development of Monolithic Perovskite/Perovskite/Silicon Triple-Junction Solar Cells
Minasadat Heydarian[1], Luis Restat[1], Maryamsadat Heydarian[1], Yashika Gupta[1], Christoph Messmer[1], Alexander J. Bett[1], Martin Bivour[1], Florian Schindler[1], Martin Hermle[1], Martin C. Schubert[1], Patricia S. C. Schulze[1], Juliane Borchert[1], Stefan Glunz[1]
[1] Fraunhofer ISE, Freiburg, Germany

2CO.2.4 High-Performance Flexible All-Perovskite Tandem Solar Cells and Mini-Modules
Huagui Lai[1], Jingwei Zhu[2], Radha Kothandaraman[3], Severin Siegrist[1], Philipp Wechsler[1], Cong Chen[2], Ayodhya Tiwari[1], Dewei Zhao[2], Fan Fu[1]
[1] EMPA, Duebendorf, Switzerland; [2] Sichuan University, Chengdu, China; [3] EMPA, Duebendorf, Switzerland

2CO.2.5 Characterisation of Degradation Pathways of 3-Terminal Perovskite-Silicon Tandems After Outdoor Monitoring
Miha Kikelj[1], Laurie-Lou Senaud[2], Florent Sahli[2], Benjamin Lipovšek[1], Marko Topič[1], Christophe Ballif[2], Quentin Jeangros[2], Bertrand Paviet-Salomon[2]
[1] University of Ljubljana, Ljubljana, Slovenia; [2] CSEM, Neuchâtel, Switzerland

2CO.2.6 Scalable Two-Terminal Perovskite-Cigs Tandem Solar Cells and Modules With Record Efficiencies
Radha Krishnan Kothandaraman[1], Shiro Nishiwaki[1], Huagui Lai[1], Romain Carron[1], Ayodhya Nath Tiwari[1], Fan Fu[1]
[1] EMPA, Duebendorf, Switzerland

ORAL PRESENTATIONS 5CO.5
15:15 - 16:45 End-of-Life PV Modules & Ecology
Chairpersons: Garvin Heath
NREL, Golden, United States of America
Nieves Espinosa *(i)*
Universidad de Murcia, Spain

5CO.5.2 Defining Circularity via a Product-Level Circularity Metric
Mirjam Theelen[1], Marylou Kapinski[1], Niels van Loon[1], Simona Villa[1]
[1] TNO partner in Solliance, Eindhoven, The Netherlands

5CO.5.3 PV Module ID: Data Driven Results to Enable PV Circularity and Address Toxicity Concerns Impacting Global Decarbonization
Taylor Curtis[1], Ashley Gaulding[1], Ligia Smith[1]
[1] NREL, Golden, United States of America

5CO.5.4 Standardisation Activities on the Reuse of PV Modules in IEC TC82
Arvid van der Heide[1], Serge Noels[2], Jan Clyncke[2]
[1] imec/imo-imomec, Genk, Belgium; [2] PV CYCLE, Brussels, Belgium

5CO.5.5 Bifacial Module Design to Ensure Critical Vegetation Growth and Soil Quality in Solar Parks
Kay Cesar[1], Bas Van Aken[1]
[1] TNO, Petten, The Netherlands

5CO.5.6 Envisol – Presenting a Cross-Disciplinary Project on How PV Power Plants Influence Nature
Heine Nygard Riise[1], Erlend Hustad Honningdalsnes[1], Dagmar Hagen[2], Markus Sydenham[2], Anne Mehlhoop[2], Trond Simensen[2], Jonathan Rizzi[3], Torunn Kjeldstad[1]
[1] IFE, Kjeller, Norway; [2] NINA, Trondheim, Norway; [3] NIBIO, Ås, Norway

ORAL PRESENTATIONS 4CO.8

15:15 - 16:45	**Solar Resource Assesment**
Chairpersons:	Philippe Blanc *(i)* MINES ParisTech, Paris, France
	Ana Martinez Fernandez *(i)* European Commission JRC, Ispra, Italy

4CO.8.1 The Fourth Edition of the Best Practices Handbook for Solar Resource Data: An Introduction
Manajit Sengupta[1], Aron Habte[1], Elke Lorenz[2], Christian Gueymard[3], Adam Jensen[4], Jan Remund[5], Wilifried Van Sark[6], Stefan Wilbert[7]
[1] NREL, Golden, United States of America; [2] Fraunhofer ISE, Freiburg, Germany; [3] Solar Consulting Services, Colebrook, United States of America; [4] DTU, Copenhagen, Denmark; [5] Meteotest, Berne, Switzerland; [6] Utrecht University, Utrecht, The Netherlands; [7] DLR, Almeria, Spain

4CO.8.2 The New CAMS Radiation Service v4.6 – Method Improvements and Service Evolution with a Special Focus on Solar Energy
Jorge Lezaca[1], Marion Schroedter-Homscheidt[1], Faiza Azam[1], Gilles Fischer[2], Mireille Lefevre[3], Laurent Saboret[2], Yves-Marie Saint-Drenan[3]
[1] DLR, Oldenburg, Germany; [2] Vaisala, Sophia-Antipolis, France; [3] MINES Paris, Sophia-Antipolis, France

4CO.8.3 Statistical Downscaling of Solar Projections from Climate Models
Manajit Sengupta[1], Jaemo Yang[1], Aron Habte[1], Yu Xie[1], Douglas Nychka[2], Maggie Bailey[2], Soutir Bandyopadhyay[2]
[1] NREL, Golden, United States of America; [2] Colorado School of Mines, Golden, United States of America

4CO.8.4 Towards the Optimal Horizon Computation Algorithm for High-Resolution Topography Data
Evgenii Sovetkin[1], Andreas Gerber[1], Bart E. Pieters[1]
[1] Forschungszentrum Jülich, Jülich, Germany

4CO.8.5 Global Patterns of Solar Resource Short-Term Variability Based on Solargis Time Series Data
Juraj Betak[1], Martin Opatovsky[1], Konstantin Rosina[1], Marcel Suri[1]
[1] Solargis, Bratislava, Slovakia

4CO.8.6 Impact of "Black Summer" Bushfire on Solar Power Generation across Australia
Shukla Poddar[1], Merlinde Kay[1], Bram Hoex[1]
[1] UNSW, Sydney, Australia

ORAL PRESENTATIONS 3CO.10

15:15 - 16:45 **Materials and Processes for PV Modules**

Chairpersons: Tudor Timofte
ISC Konstanz, Konstanz, Germany

Invited

3CO.10.1 Benchmarking of Encapsulant Materials for c-Si/Perovskite Tandem Modules
Petra Christöfl[1], Chiara Barretta[1], Marcel Kühne[2], Frans Opden Buijsch[3], Sem Sals[3], Quentin Jeangos[4], Bernd Stannowski[5], Gernot Oreski[1]
[1] PCCL, Leoben, Austria; [2] Hanwha Q CELLS, Thalheim, Germany; [3] The compound company, Geleen, The Netherlands; [4] CSEM, Neuchatel, Switzerland; [5] HZB, Berlin, Germany

3CO.10.2 Reliability Studies of PV Minimodules Using an Ethylene – Butyl Acrylate (EBA) Based Encapsulant and High Efficiency n-Type PV Cells
Ignacio Fidalgo[1], Inmaculada Campoy Felipe[2], Andreas Halm[3]
[1] Polaris Open Innovation, Oviedo, Spain; [2] Repsol Química, Madrid, Spain; [3] ISC Konstanz, Konstanz, Germany

3CO.10.3 Development of PV Module Manufacturing Processes with an Autoclave for Crosslinking and Non-Crosslinking Encapsulants for VIPV Applications
Sebastian Neven-du Mont[1], Christine Wellens[1], Holger Neuhaus[1], Martin Heinrich[1]
[1] Fraunhofer ISE, Freiburg, Germany

3CO.10.4 Reducing Process Time of PV Module Lamination by Using Double-Side Heating System
Sraisth Sraisth[1], Aksel Kaan Oez[2], Djamel Eddine Mansour[1], Paul Gebhardt[2], Daniel Klaus[3], Christine Wellens[2]
[1] RCT Solutions, Konstanz, Germany; [2] Fraunhofer ISE, Freiburg, Germany; [3] Robert Buerkle, Freudenstadt, Germany

3CO.10.5 Development of Multi-Function 5-Layer Anti-Reflection Coating for Cover Glass of PV Module
Yiyu Zeng[1], Yajie Jiang[1]
[1] UNSW, Sydney, Australia

3CO.10.6 Multilayer Antireflection Coating on Solar Module Glass by Magnetron Sputtering
Ning Song[1], Shuo Deng[1], Angus Gentle[1], Nathan Chang[1], Yuhao Cheng[1], Jialiang Huang[1], Martin A. Green[1]
[1] UNSW, Sydney, Australia

VISUAL PRESENTATIONS 1CV.2

15:15 - 16:45 **Processing & Characterisation of Crystalline Si based Solar Cells | Silicon Bottom Cells for Tandem Photovoltaics | Advances in Silicon Solar Cells Characterisation and Simulation**

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 2CO.3

17:00 - 18:30 **New Modelling and Characterisation - Device Performance**

Chairpersons: Theresa Magorian Friedlmeier
ZSW, Stuttgart, Germany

Invited

2CO.3.1 Special Introductory Presentation: Revealing Electric Losses in Perovskite Silicon Tandem Solar Cells – An Overview
Oliver Fischer[1], Anh Dinh Bui[2], Florian Schindler[1], Daniel Macdonald[2], Stefan W. Glunz[1], Martin C. Schubert[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] ANU, Canberra, Australia

2CO.3.2 Understanding Ion-Related Performance Losses in Perovskite-Based Solar Cells by Capacitance-Voltage Measurements and Simulation
Christoph Messmer[1], Jonathan Parion[2], Cristian V. Meza[2], Santhosh Ramesh[2], Martin Bivour[3], Jonas Schön[1], Hariharsudan S. Radhakrishnan[2], Martin Schubert[3], Stefan W. Glunz[1]
[1] University of Freiburg, Freiburg, Germany; [2] imec division IMOMEC and EnergyVille, Genk, Belgium; [3] Fraunhofer ISE, Freiburg, Germany

2CO.3.3 Understanding Outdoor-Characteristics and Bifaciality Effects of Full-Size Perovskite on Silicon Tandem Modules
David Chojniak[1], Marc Steiner[1], Kasimir Reichmuth[1], Alexandra Schmid[1], Gerald Siefer[1], Stefan W. Glunz[1]
[1] Fraunhofer ISE, Freiburg, Germany

2CO.3.4 Analysis and Modelling of Recovery Mechanisms in Perovskite Solar Cells
Guillem Álvarez-Pérez[1], Arthur Julien[1], Karim Medjoubi[1], Jean Baptiste Puel[1], Jean Francois Guillemoles[1]
[1] IPVF, Paris, France

2CO.3.5 Invited Presentation

ORAL PRESENTATIONS 5CO.6

17:00 - 18:30 **Life Cycle Assessment of PV**

Chairpersons: Monica Aleman *(i)*
CINEA, Forest, Belgium

Invited

5CO.6.1 Sustainability Improvement of c-Si PV Manufacturing Through Increased Capacity, Integrated Factories and Technology Choice
Moritz Fath[1], Mehul Reval[1], Wolfgang Jooss[1], Peter Fath[1]
[1] RCT Solutions, Konstanz, Germany

5CO.6.2 Maximizing Solar Sustainability: Analysis of the Leverages for Low-carbon Impact PV Manufacturing and Electricity Generation
Alexis Barrou[1], Alessandro Virtuani[1], Christophe Ballif[1], Bertrand Paviet-Salomon[1]
[1] CSEM, Neuchâtel, Switzerland

5CO.6.3 Generating Simplified and Accurate Models to Assess the Environmental Impact of Perovskite/Silicon Tandem Modules by Parametric Approach
Lu Wang[1], Lars Oberbeck[2], Raphaël Jolivet[1], Mathilde Marchand Lassere[1], Paula Perez-Lopez[1]
[1] PSL University, Sophia Antipolis, France; [2] TotalEnergies, Paris Saclay, Norway

5CO.6.4 Carbon Footprint vs Reliability of Solar Photovoltaic Modules: A New Dilemma?
Alessandro Virtuani[1], Alexis Barrou[1], Bertrand Paviet-Salomon[1], Gianluca Cattaneo[1], Matthieu Despeisse[1], Christophe Ballif[1]
[1] CSEM, Neuchâtel, Switzerland

5CO.6.5 Are BIPV Contributing to Environmental Sustainability? An Environmental LCA Analysis of Innovative BIPV Solutions
Cristina Polacchi[1], Atse Louwen[1], Mirjam Theelen[2], David Moser[1]
[1] Eurac Research, Bolzano, Italy; [2] TNO partner in Solliance, Eindhoven, The Netherlands

5CO.6.6 The Influence of Climate Specific Degradation on the Greenhouse Gas Emissions of PV Electricity
Sina Herceg[1], Ismail Kaaya[2], Julian Ascencio-Vásquez [3], Marie Fischer[1], Karl-Anders Weiß[1], Liselotte Schebek[4]
[1] Fraunhofer ISE, Freiburg, Germany; [2] EnergyVille, Genk, Belgium; [3] Envision Digital, Redwood, United States of America; [4] Technical University of Darmstadt, Darmstadt, Germany

ORAL PRESENTATIONS 4CO.9

17:00 - 18:30 Solar Forecasting

Chairpersons: Manajit Sengupta
NREL, Golden, United States of America

Invited

4CO.9.1 Satellite-based Forecasting: Can Deep Learning Replace CMV?
Nils Straub[1], Steffen Karalus[1], Elke Lorenz[1]
[1] Fraunhofer ISE, Freiburg, Germany

4CO.9.2 Skill-driven Model Training for Solar Forecasting with Sky Images
Amar Meddahi[1], Arttu Tuomiranta[1], Sebastien Guillon[1]
[1] TotalEnergies, Paris, France

4CO.9.3 Ramp Rate Metric Suitable for Solar Forecasting and Nowcasting
Bijan Nouri[1], Yann Fabel[1], Niklas Blum[1], Luis F. Zarzalejo[2], Andreas Kazantzidis[3], Stefan Wilbert[1]
[1] DLR, Almería, Spain; [2] CIEMAT Energy Department, Madrid, Spain; [3] University of Patras, Patras, Greece

4CO.9.4 Fog and Snow Detection to Improve Regional Photovoltaic Power Prediction
Steffen Karalus[1], Wiebke Herzberg[1], Tobias Zech[1], Babak Jahani[2], Elke Lorenz[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] SRON, Leiden, The Netherlands

4CO.9.5 Photovoltaic Power Plants as Efficient Cloud Motion Detectors
Magnus Moe Nygård[1], Erling Ween Eriksen[1], Heine Nygard Riise[1]
[1] IFE, Kjeller, Norway

4CO.9.6 How Connected Cars Can Improve Solar Forecasting - Expanding the Scale of Local Sensor Networks
Tobias Veihelmann[1], Maximilian Lübke[1], Norman Franchi[1]
[1] Friedrich-Alexander-University, Erlangen, Germany

ORAL PRESENTATIONS 3CO.11

17:00 - 18:30 Emerging Interconnection Technologies

Chairpersons: Andreas Halm
ISC Konstanz, Konstanz, Germany

Laurie Burnham *(i)*
Sandia National Laboratories, Albuquerque, United States of America

3CO.11.1 Special Introductory Presentation: IBC Heterojunction: The End of the Tunnel?
Jonathan Champliaud[1], Lison Marthey[1], Alessandro Virtuani[1], Loann Baume[1], Matthieu Despeisse[1], Jun Zaho[1], Damien Lachenal[2], Pierre Papet[2], Till Koessler[2], Ludovic Vuithier[2], Gizem Nogay[3], Rainer Grischke[3], Christophe Ballif[1]
[1] CSEM, Neuchâtel, Switzerland; [2] Meyer Burger Research, Hauterive, Switzerland; [3] Meyer Burger, Gwatt, Switzerland

3CO.11.2 Design Roadmap to Modules with 24% Efficiency
Max Mittag[1], Christian Reichel[1], Alexander Protti[1], Holger Neuhaus[1]
[1] Fraunhofer ISE, Freiburg, Germany

3CO.11.3 Effect of Lowering Curing Temperature of Electrically Conductive Adhesives on Ribbon Connected Solar Cells
Veronika Nikitina[1], Tim Riehle[1], Leonhard Böck[1], Torsten Rößler[1]
[1] Fraunhofer ISE, Freiburg, Germany

3CO.11.4 Towards Low Silver Electrical Conductive Adhesive for HJT Interconnection
Vincent Barth[1], Rémi Monna[1], Bertrand Hladys[1], Eszter Voroshazi[1], Gabriele Bianca[2], Sebastiano Caccamo[2], Alessandro Fucile[2], Antonino Ragonesi[2], Cosimo Gerardi[2]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] 3SUN, Catania, Italy

3CO.11.5 To Bypass or Not to Bypass: Integrating and Evaluating Parallel Connections and Bypasses in c-Si PV Laminates
Tom Borgers[1], Jonathan Govaerts[1], Hamed Javanbakht Lomeri[1], Apostolos Bakovasilis[1], Rik Van Dyck[1], Bart Reekmans[1], Hariharsudan Sivaramkrishnan Radhkrishnan[1], Jef Poortmans[1], Manuel Van den Storme[2], Guy Van den Storme[2]
[1] imec, Genk, Belgium; [2] VdSWeaving, Oudenaarde, Belgium

VISUAL PRESENTATIONS 2CV.3

17:00 - 18:30 Perovskite-based Multijunctions | Perovskite Photovoltaics

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

Thursday, 26. September 2024

ORAL PRESENTATIONS 4DO.1

08:30 - 10:00 PV System Design and Optimisation

Chairpersons: Invited

Invited

4DO.1.1 Enhancing Bifacial Gain: Addressing Tracker Installation Challenges for Optimized Performance
Ismail Kaaya[1], David Moser[2], Richard de Jong[1], Olivier Dupon[1], Arnaud Morlier[1]
[1] Hasselt University/Imo-Imomec, Genk, Belgium; [2] Eurac Research, Bolzano, Italy

4DO.1.2 Assessing the Performance, Reliability, and Economic Impact of PV Systems Installation Parameters in Harsh Climates: Case Study Iraq
Mohammed Hameed[1], Ismail Kaaya[2], Richard de Jong[2], Roland Scheer[3], Ralph Gottschalg[1]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] Imec/imo-imomec, Genk, Belgium; [3] MLU, Halle (Saale), Germany

4DO.1.3 A Techno-Economic Comparison Analysis for Optimal PV Revamping Strategies
Elina Bosch[1], André Penas[1], Philippe Macé[1], Gaëtan Masson[1], Fabrizio Bizzarri[2]
[1] Becquerel Institute, Brussels, Belgium; [2] Enel Green Power, Rome, Italy

4DO.1.4 Increasing the Self-Sufficiency of the Terre Sainte Campus Microgrid by Expanding the PV Capacity While Minimizing the Cost
Tina Arizo Randrianantenaina[1], Josselin Le Gal La Salle[1], Sergiu Viorel Spataru[2], Mathieu David[1]
[1] PIMENT, Saint-Pierre, Réunion; [2] DTU, Roskilde, Denmark

4DO.1.5 A Matlab-Based Software Solution for Irradiance Sensor Allocation in European Solar PV Farms
Alba Alcañiz[1], Mathijs I. van Kouwen[1], Olindo Isabella[1], Hesan Ziar[1]
[1] TU Delft, Delft, The Netherlands

4DO.1.6 Innovative Setups for Photovoltaic Solar Trackers to Really Boost the Electricity Generation per Square Meter of Occupied Surfaces
Rosario Carbone[1], Cosimo Borrello[1], Ferdinando Gioia[1]
[1] University "Mediterranea" of Reggio Calabria, Reggio Calabria, Italy

ORAL PRESENTATIONS 2DO.6

08:30 - 10:00 Towards Improved Understanding of Perovskite Solar Cell Device Physics

Chairpersons: Maria João Brites *(i)*
LNEG, Lisbon, Portugal
Wolfgang Tress *(i)*
ZHAW, Winterthur, Switzerland

2DO.6.1 Bright Insights: Exploring Perovskite Formation Mechanisms with Combined Spectral Reflectance and Photoluminescence In-Situ Data
Nasim Rezaei-Hartmann[1], Thorsten Brand[1], Claudine Groß[1], Enno Malguth[1], Aleksandra Miaskiewicz[2], Marcel Roß[2], Viktor Škorjanc[2], Lars Korte[2], Steve Albrecht[2], Christian Camus[1]
[1] LayTec, Berlin, Germany; [2] HZB, Berlin, Germany

2DO.6.2 Study of the Degradation Kinetics and Lattice Reorganization of Triple Cation Perovskites Under X-Ray Radiation During XPS and XRD Characterization
Mirella Al Katrib[1], Pia Dally[1], Guillaume Vidon[1], Stefania Cacovich[1], Muriel Bouttemy[2], Arnaud Etcheberry[2]
[1] IPVF, Palaiseau, France; [2] ILV, Versailles, France

2DO.6.3 Efficient Charge Separation at 2D Ferroelectric Domains in Halide Perovskite Solar Cells
Jihoo Lim[1], Seungmin Lee[2], Hongjae Shim[1], Hyeonah Cho[2], Lei Wang[1], Jincheol Kim[3], Claudio Cazorla[4], Yong-Jin Kim[5], Hanul Min[2], Minwoo Lee[1], S. Ravi P. Silva[6], Xiaojing Hao[1], Jan Seidel[1], Dohyung Kim[5], Jun Hong Noh[2], Jae Sung Yun[6]
[1] UNSW, Sydney, Australia; [2] Korea University, Seoul, South Korea; [3] Macquarie University, Sydney, Australia; [4] UPC, Barcelona, Spain; [5] KIER, Daejeon, South Korea; [6] University of Surrey, Guildford, United Kingdom

2DO.6.4 Transient Currents Produced by Mobile Ions in Thick Metal-Semiconductor-Metal Devices
Leonardo Koprio[1], Sylvain Le Gall[1], Aurore Brézard-Oudot[1], Koffi Ahanogbe[1], Pilar López-Varo[2], Nitin Mallik[2], Davide Ceratti[2], Jose Alvarez[1], Christophe Longeaud[1], Jean-Paul Kleider[1], Osbel Almora[3]
[1] GeePs, Gif-sur-Yvette, France; [2] IPVF, Palaiseau, France; [3] University of Rovira i Virgili, Tarragona, Spain

2DO.6.5 Enhancing Crystallinity of Perovskite Materials through Rapid Microwave Annealing
Syed Nazmus Sakib[1], David N R Payne[1], Shujuan Huang[1], Binesh P Veettil[1]
[1] Macquarie University, Sydney, Australia

2DO.6.6 Innovative Enhancement of Efficiency in Indoor Perovskite Solar Cells with a Wide Bandgap Through the Incorporation of Tunneling Junctions via a Self-Assembled 2D Dielectric Layer

Minwoo Lee[1], Jihoo Lim[1], Eunyoung Choi[1], Arman Mahboubi Soufiani[2], Seungmin Lee[3], Fa-Jun Ma[1], Sean Lim[1], Jan Seidel[1], Dong Han Seo[4], Ji-Sang Park[5], Wonjong Lee[6], Jongchul Lim[6], Richard Francis Webster[1], Jincheol Kim[7], Danyang Wang[1], Martin A. Green[1], Jung Hong Noh[3], Xiaojing Hao[1], Jae Sung Yun[1]

[1] UNSW, Sydney, Australia; [2] HZB, Berlin, Germany; [3] Korea University, Seoul, South Korea; [4] KENTECH, Naju, South Korea; [5] Sungkyunkwan University, Suwon, South Korea; [6] Chungnam National University, Daejeon, South Korea; [7] Electronics Technology Institute, Seong-Nam, South Korea

ORAL PRESENTATIONS 5DO.11

08:30 - 10:00 Value and Competitiveness of PV in the Growing Market

Chairpersons: Izumi Kaizuka
RTS Corporation, Chuo-ku, Japan
Hubert Fechner
Austrian PV Technology Platform, Breitenfurt, Austria

5DO.11.1 A Snapshot of Global PV Market - 2023

Gaëtan Masson[1], Melodie de l'Epine[2], Arnulf Jäger Waldau[3], Izumi Kaizuka[4], Amelia Oller Westerberg[5], Jose Donoso[6]

[1] IEA PVPS Task 1, Brussels, Belgium; [2] IEA PVPS Task 1, Lyon, France; [3] European Commission JRC, Ispra, Italy; [4] RTS Corporation, Tokyo, Japan; [5] Becquerel Sweden, Knivsta, Sweden; [6] UNEF, Madrid, Spain

5DO.11.2 Driving the Quest for Reliable and Bankable PV in Europe - Status and Targets in 2030

Ulrike Jahn[1], David Moser[2], Delfina Muñoz[3], Paula Sánchez-Friera[4]

[1] Fraunhofer CSP, Munich, Germany; [2] EURAC, Bolzano, Italy; [3] CEA, Le Bourget du Lac, France; [4] Solkeys, Gijón, Spain

5DO.11.3 Is The Value of (BI)PV Increasing or Decreasing Over Time?

Wouter Schram[1]

[1] University of Twente, Enschede, The Netherlands

5DO.11.4 The Role of Flexible Demand in Reducing the Utility-Scale PV Integration Costs: An Italian Case-Study

Elisa Veronese[1], David Moser[1]

[1] EURAC Research, Bolzano, Italy

5DO.11.5 Wholesale Electricity Market Prices Forecast Considering Bidding Conditions Using Price Sensitivity

Shinji Hirota[1], Jindan Cui[1], Takashi Oozeki[2], Yuzuru Ueda[1]

[1] Tokyo University of Science, Tokyo, Japan; [2] National Institute of Advanced Industrial Science and Technology, Fukushima, Japan

5DO.11.6 Cost Analysis for a Small-Scale Hybrid, Hydrogen-Based PV Energy System

Marius C. Möller[1], Stefan Krauter[1]

[1] University of Paderborn, Paderborn, Germany

ORAL PRESENTATIONS 3DO.16

08:30 - 10:00 PV Module Assessment and Classification

Chairpersons: Mauro Pravettoni
Technology Innovation Institute, Abu Dhabi, United Arab Emirates
Esther Fokuhl *(i)*
Fraunhofer ISE, Freiburg, Germany

3DO.16.1 Holistic Analysis for Mismatch Losses in Photovoltaic Modules: Assessing the Impact of Inhomogeneity from Operational Conditions and Degradation Mechanisms on Power and Yield

Ammar Tummalieh[1], Max Mittag[1], Alexander Protti[1], Christian Reichel[1], Johannes Erb[1], Guido Willers[2], Holger Neuhaus[1]

[1] Fraunhofer ISE, Freiburg, Germany; [2] Fraunhofer CSP, Halle (Saale), Germany

3DO.16.2 Outdoor Performance and Reliability of Perovskite-Silicon Tandems: First Results of the NEXUS Project

Atse Louwen[1], Alexander Astigarraga[1], Juan Josè Stivanello[1], David Moser[1], Delfina Muñoz[2], Perrine Carroy[2], Markus Lenz[3], Anika Sidler[3], Jorge Ferrando[4], Henk Bolink[4], Seyedamir Orooji[5], Ulrich W. Paetzold[5], Hisham Nasser[6], Talat Ozden[6], Henry Snaith[7]

[1] Eurac Research, Bolzano, Italy; [2] CEA-INES, Le Bourget du Lac, France; [3] School of Life Sciences FHNW, Muttenz, Switzerland; [4] University of Valencia, Paterna, Spain; [5] KIT, Karlsruhe, Germany; [6] METU, Ankara, Turkey; [7] University of Oxford, Oxford, United Kingdom

3DO.16.3 Quantitative Description of the Quality of Daylight Electroluminescense (dEL) Images Against Dark Room EL Images

Kabir Paul Sulca[1], Carmelo de Castro[1], Diego González-Francés[1], Cristian Terrados[1], Julián Anaya[1], Victor Alonso[1], Miguel Angel González[1], Oscar Mártinez[1]

[1] University of Valladolid, Valladolid, Spain

3DO.16.4 Photovoltaic Cell Defect Classification from Luminescence Images: Embedding and Clustering with Unsupervised Machine Learning

Brendan Wright[1], Rama Sharma[1], Ziv Hameiri[1]

[1] UNSW, Sydney, Australia

3DO.16.5 Daylight Photoluminescence of Silicon Solar Panels in Operation by Electrical Modulation

Cristian Terrados[1], Diego Gonzalez-Frances[2], Kabir Paul Sulca[2], Miguel Ángel González[2], Oscar Martínez[2]

[1] University of Burgos, Burgos, Spain; [2] University of Valladolid, Valladolid, Spain

3DO.16.6 Series Resistance Power Loss Analysis from Daylight Photoluminescence Imaging

Hugh Gottlieb[1], Oliver Kunz[1], Juergen Weber[1], Thorsten Trupke[1]

[1] UNSW, Kensington, Australia

VISUAL PRESENTATIONS 4DV.1

08:30 - 10:00 Dual Use (Floating PV, Agrivoltaics, VIPV) and other Innovative PV Applications

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 4DO.2

10:30 - 12:00 **The Integrated Agrivoltaic Performance: Approaches, Modelling, Experiences**

Chairpersons: Kay Cesar
TNO, Petten, The Netherlands

Thomas Reindl
SERIS, Singapore, Singapore

4DO.2.1 Shaping Europe's Agrivoltaic Future: Design of Four Innovative Demonstrators through Advanced Modeling in the SYMBIOSYST Project
S Prithivi Rajan[1], Jesus Robledo[1], Jonathan Leloux[1], Christian A. Gueymard[1], Angelo Pignatelli[2], Giovanni Borz[3], David Moser[3], Ismail Kaaya[4], Shu-Ngwa Asaa[4], Alexandros Katsikogiannis[5], Martin Thalheimer[6], Walter Guerra[6], Marcel Macarulla[7], Irma Roig[7], Gil Gorchs[7], Niels Groen[8], James MacDonald[9], Giuseppe Demofonti[10], Cinja Seick[11], Giacomo Bosco[12]
[1] LuciSun, Brussels, Belgium; [2] EF Solare, Milano, Italy; [3] EURAC, Bolzano, Italy; [4] Imec, Leuven, Belgium; [5] TU Delft, Delft, The Netherlands; [6] Laimburg, Laimburg, Italy; [7] UPC, Barcelona, Spain; [8] KUBO, South Holland, The Netherlands; [9] Engie-Lab, Barcelona, Spain; [10] Convert, Roma, Italy; [11] Aleo, Prenzlau, Germany; [12] Physee, Delft, The Netherlands

4DO.2.2 Agrivoltaic Impact on Photosynthesis Rates and Crops in Arid Climate
Christiana Honsberg[1], Greg Barron-Gafford[2], Robert Sampson[3], Stuart Bowden[4]
[1] Arizona State University, Tempe, United States of America; [2] University of Arizona, Tucson, United States of America; [3] Pegasus Solar, Phoenix, United States of America; [4] Solestial, Tempe, United States of America

4DO.2.3 Improving the Development of Hyperaccumulating Plants under Photovoltaic Systems as Part of a Brownfield Remediation Strategy
Julien Ancousture[1], Pierre Leglize[2], Emile Benizri[2], Ya Brigitte Assoa[3]
[1] University of Lorraine - CEA, Vandoeuvre-lès-Nancy, France; [2] University of Lorraine - INRAE, Vandoeuvre-lès-Nancy, France; [3] Grenoble Alpes University - CEA, Le Bourget-du-Lac, France

4DO.2.4 Enhancing Agrivoltaics Synergies Through Tracking Optimization
Maddalena Bruno[1], Leonhard Gfüllner [1], Matthew Berwind[1]
[1] Fraunhofer ISE, Freiburg, Germany

4DO.2.5 Monitoring Sytem in an Agrivoltaic Greenhouse in Southern Spain
Natalie Hanrieder[1], Anna Kujawa[1], Sergio Gonzalez Rodriguez[1], Julian Kornas[1], Álvaro Fernandez Solas[1], Stefan Wilbert[1], Manuel Blanco[1], Ana Martínez Gallardo[2], Leontina Berzosa Álvarez[2], Adoración Amate González[2], Marina Casas Fernandez[2], Francisco Javier Palmero Luque[3], Manuel López Godoy[3], M. del Carmen Alonso Garcia[4], José Carballo[5], Robert Pitz-Paal[6]
[1] DLR, Almeria, Spain; [2] ANECOOP, Valencia, Spain; [3] UAL-Anecoop, Almeria, Spain; [4] CIEMAT, Madrid, Spain; [5] CIEMAT, Almeria, Spain; [6] DLR, Cologne, Germany

4DO.2.6 Future-Proofing India's Energy: A Comprehensive Review and Strategy Optimisation for Agrovoltaic Systems
Abubakar Suleiman[1], Chan Hwang See[1], Firdaus Muhammad-Sukki[1], Sundaram Senthilarasu[2]
[1] Edinburgh Napier University, Edinburgh, United Kingdom; [2] Teesside University, Middlesbrough, United Kingdom

ORAL PRESENTATIONS 2DO.7

10:30 - 12:00 **Process Innovations for Perovskite Devices**

Chairpersons: Aranzazu Aguirre
imec, Genk, Belgium

Sjoerd Veenstra *(i)*
TNO Energy Transition, Eindhoven, The Netherlands

2DO.7.1 Special Introductory Presentation: Optimization of Hybrid Two-Step Inkjet Printed Perovskite Solar Cells
Raphael Pesch[1], Alexander Diercks[1], Julian Petry[1], Alexander Welle[2], Ronja Pappenberger[1], Fabian Schackmar[1], Helge Eggers[1], Johannes Sutter[1], Ulrich Lemmer[1], Ulrich W. Paetzold[1]
[1] KIT, Karlsruhe, Germany; [2] KIT, Eggenstein-Leopoldshafen, Germany

2DO.7.2 Progresses on Plasma Processing of Halide Perovskite Materials for Photovoltaic Applications
Sara Covella[1], Alberto Perrotta[2], Francesca Russo[1], Fabio Palumbo[2], Antonella Milella[1], Vincenza Armenise[1], Francesco Fracassi [1], Silvia Colella[2], Andrea Listorti[1]
[1] University of Bari, Bari, Italy; [2] CNR NANOTEC, Bari, Italy

2DO.7.3 DMF-Free Perovskite Cells: Vacuum Quenching and Performance Analysis
Toshimitsu Mochizuki[1], Shota Araki[1], Hidetaka Takato[1], Katsuto Tanahashi[1]
[1] AIST, Koriyama, Japan

2DO.7.4 Large Scale Deposition of Perovskite Solar Cells and Modules by a Combined Evaporation and Slot-die Coating Approach
Adriana Paracchino[1], Ricardo Augusto Zanotto Razera[1], Michele De Bastiani[1], Florent Sahli[1], Daniel Jacobs[1], Lisa Champault[1], Christophe Ballif[1], Quentin Jeangros[1]
[1] CSEM, Neuchâtel, Switzerland

2DO.7.5 Encapsulation of Perovskite Solar Cells by Vacuum Lamination
Robert Witteck[1], Duong Nguyen-Minh[1], Goutam Paul[1], Steven P. Harvey[1], Xiaopeng Zheng[1], Qi Jiang[1], Min Chen[1], Brian Habersberger[2], Ashley Gaulding[1], Emily Warren[1], Joseph M. Luther[1], Lance M. Wheeler[1]
[1] NREL, Golden, United States of America; [2] Dow Chemical, Houston, United States of America

ORAL PRESENTATIONS 3DO.12

10:30 - 12:00 Low Environmental Impact Module Design and Technologies

Chairpersons: Hamed Hanifi
AESOLAR, Königsbrunn, Germany
Sonja Feldbacher
PCCL, Leoben, Austria

3DO.12.1 Steps Towards a 100% Renewable Material Solar Module: Evaluating Material Substitutions for Encapsulation and Interconnection
Ringo Koepge[1], Matthias Pander[1], Anton Mordvinkin[1], Stephan Großer[1]
[1] Fraunhofer CSP, Halle (Saale), Germany

3DO.12.2 New Encapsulant for PV Modules Designed for Recycle: A Lab Scale Prototype
Margot Pliquet[1], Alexis Brastel[2], Eeva Mofakhami[1], Timea Bejat[1], Pierre Piluso[2]
[1] CEA-INES, Le Bourget du Lac, France; [2] CEA Liten, Grenoble, France

3DO.12.3 Laser-Assisted Ablation for Silicon Solar Panels Recycling
Remi Aninat[1], Maarten van der Vleuten[1], Kailan Kats[1], Julien Kolbecher[1], Anne Biezemans[1], Johan Bosman[1], Ando Kuypers[1], Mirjam Theelen[1]
[1] TNO, Eindhoven, The Netherlands

3DO.12.4 Innovative Design-for-Recycle for Critical Material-Free Interconnection
Antoine Perelman[1], Vincent Barth[1], Fabien Mandorlo[2], Eszter Voroshazi[1]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] INSA, Lyon, France

3DO.12.5 Bifacial Lightweight Solution without Glass
Alicia Buceta[1], Ana Belén Cuelli[1], Miguel Aguirre[2], Ana Linares[3], Elena Llarena[3], Silvia Cal[3], Jaione Bengoechea[1]
[1] CENER, Sarriguren, Spain; [2] CENER, Madrid, Spain; [3] ITER, Santa Cruz Tenerife, Spain

3DO.12.6 Development of Novel Protective Coatings to Increase the Durability and Reliability of Glass-Free Lightweight PV Modules
Yuliya Voronko[1], Gabriele Eder[1], Elisabeth Reiser[2], Markus Babin[3], Gernot Oreski[4]
[1] OFI, Vienna, Austria; [2] KANSAI HELIOS AUSTRIA, Vienna, Austria; [3] DTU Electro, Roskilde, Denmark; [4] PCCL, Leoben, Austria

ORAL PRESENTATIONS 3DO.17

10:30 - 12:00 Outdoor Performance and Energy Yield Estimation

Chairpersons: Mauro Caccivio
SUPSI, Canobbio, Switzerland
Ana Maria Gracia Amillo
CENER, Sarriguren, Spain

3DO.17.1 Special Introductory Presentation: PV Module Degradation in Hot Deserts: Laboratory and Outdoor Data Analysis
Gerhard Mathiak[1], Shahzada Pamir Aly[1], Kaushal Chapaneri[1], Baloji Adothu[1], Jim Joseph John[1]
[1] DEWA R&D Center, Dubai, United Arab Emirates

3DO.17.2 Incidence Angle Effect: Results of an Interlaboratory Comparison of Measurements on Commercial-Size Modules
Mauro Pravettoni[1], Min Hsian Saw[2], Giorgio Bardizza[3], Giovanni Bellenda[4], Romain Couderc[5], Gabi Friesen[4], Werner Herrmann[3], Shin Woei Leow[2], Stefan Riechelmann[6], Arvid van der Heide[7], Frank Weinrich[6], Stefan Winter[6]
[1] TII, Abu Dhabi, United Arab Emirates; [2] SERIS, Singapore, Singapore; [3] TUV-Rheinland, Cologne, Germany; [4] SUPSI, Mendrisio, Switzerland; [5] CEA-INES, Le Bourget-du-lac, France; [6] PTB, Braunschweig, Germany; [7] Imec/Imo-imomec, Genk, Belgium

3DO.17.3 Climate Specific Energy Rating (CSER) Analysis of Outdoor PV Field Data
Ismael Medina[1], Teodora S. Lyubenova[1], Ewan Dunlop[1]
[1] European Commission JRC, Ispra, Italy

3DO.17.4 Module Parameters Extraction for Assessing Photovoltaic Energy Yield: A Comparative Approach
Ahmad Hashem[1], Frank Xu[2], Carlos Meza[1], Christos Monokroussos[2], Ralph Gottschalg[3]
[1] Hochschule Anhalt, Köthen, Germany; [2] TÜV Rheinland (Shanghai), Shanghai, China; [3] Fraunhofer CSP, Halle (Saale), Germany

3DO.17.5 Performance and Degradation Evaluation of Crystalline Silicon Modules Under Different Open-Rack and Residential Mounting Configurations
Gabi Friesen[1], Ebrar Özkalay[1], Flavio Valoti[1], Mauro Caccivio[1]
[1] SUPSI ISAAC, Mendrisio, Switzerland

VISUAL PRESENTATIONS 5DV.2

10:30 - 12:00 Energy System Integration; Resilience and Security of Supply; Solar Fuels, Storage | PV Sustainability

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 4DO.3

13:30 - 15:00 The Integrated Agrivoltaic Performance: Different Climatic Conditions, Crops and Technologies

Chairpersons: Anatoli Chatzipanagi
European Commission JRC, Ispra, Italy
Bas Van Aken
TNO Energy Transition, Petten, The Netherlands

4DO.3.1 Comprehensive Methodology Applied to Solar Radiation Prediction for Dual Use for Vertical Agrivoltaics System
Arthur Poquet[1], Etienne Drahi[1], Jordi Badosa[2], Philippe Blanc[3]
[1] TotalEnergies Onetech, Palaiseau Cedex, France; [2] LMD, Palaiseau, France; [3] Mines Paris, Sophia Antipolis Cedex, France

4DO.3.2 Reducing Wind Speeds and Boosting Agricultural Productivity with Vertical Bifacial Solar Panels
Erlend Hustad Honningdalsnes[1], Erik Stensrud Marstein[1], Dag Lindholm[1], Helge Bonesmo[2], Heine Nygard Riise[1]
[1] IFE, Kjeller, Norway; [2] Norwegian Institute of Bioeconomy Research, Trondheim, Norway

4DO.3.3 A Computational Comparison and Validation Between Ray Tracing Techniques Under Special Light-Sharing Trade off Scenarios in Photovoltaics
Hugo Sánchez Ortiz[1], Roxane Bruhwyler[2], Sebastian Dittmann[1], Nicolas De Cook[2], Carlos Meza[1], Frederic Lebeau[2], Ralph Gottschalg[1]
[1] Hochschule Anhalt, Koethen, Germany; [2] Liege University, Gembloux, Belgium

4DO.3.4 Automatic Agrivoltaic Site Selection: A User-Friendly Interface Powered by AHP Multicriteria Decision-Making
Andressa de Sousa Cardoso[1], Alfonso López Ruiz[1], María Isabel Ramos Galán[1], Juan Manuel Jurado Rodríguez[1], Francisco Ramón Feito Higueruela [1]
[1] University of Jaén, Jaén, Spain

4DO.3.6 Optimizing Light Transmission for Crop Growth: The Innovative Voltiris Agrivoltaic System
Jacques Levrat[1], Delphine Petri[1], Matthieu Despeisse[1], Christophe Ballif[1], Jonas Roch[2], Dominik Blaser[2], Max Bernheim[2]
[1] CSEM, Neuchâtel, Switzerland; [2] Voltiris, Lausanne, Switzerland

ORAL PRESENTATIONS 2DO.8

13:30 - 15:00 **Scalability of Perovskite Solar Modules**

Chairpersons: Christian Camus, LayTec, Berlin, Germany; Nikoleta Kyranaki, Hasselt University, Genk, Belgium

2DO.8.1 Special Introductory Presentation: Line-Scan Luminescence Imaging of Large-Area Perovskite Modules - First Demonstration
Shuai Nie[1], Yan Zhu[1], Juergen W. Weber[1], Thorsten Trupke[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia

2DO.8.2 R2R Large Area Processing of Flexible Perovskite Solar Cells on In-Free Transparent Conductive Oxides
Ilker Dogan[1], Anuja Vijayan[1], Harrie Gorter[1], Hero 't Mannetje[1], Marcel Simor[1], Wiljan Verhees[1], Dorrit Roosen-Melsen[1], Herbert Lifka[2], Gayathri Mathiazhagan[2], Sjoerd Veenstra[1]
[1] Solliance, Eindhoven, The Netherlands; [2] HyET Solar, Arnhem, The Netherlands

2DO.8.3 Strategies to Improve Photovoltaic Performance and Stability of ~800 cm2 Perovskite Solar Modules
Yinghuan Kuang[1], Tamara Merckx[1], Aranzazu Aguirre[1], Merve Tutundzic[1], Anurag Krishna[1], Jef Poortmans[1], Bart Vermang[1], Tom Aernouts[1]
[1] imec, Genk, Belgium

2DO.8.4 Fully Printed Low-Temperature Perovskite Solar Cells and Modules
Luigi Vesce[1], Elena Iannibelli[1], Karthikeyan Pandurangan[2], Maurizio Stefanelli[1], Hafez Nikbakht[1], Maria Laura Parisi[2], Adalgisa Sinicropi[2], Aldo Di Carlo[1]
[1] University of Rome Tor Vergata, Rome, Italy; [2] University of Siena, Siena, Italy

2DO.8.5 Key Developments for the Industrialization of Perovskite Photovoltaics
Erik Ahlswede[1], Jonas Hanisch[1], Tina Wahl[1], Oliver Salomon[1], Cordula Wessendorf[1], Stefan Paetel[1], Michael Powalla[1]
[1] ZSW, Stuttgart, Germany

VISUAL PRESENTATIONS 5DV.3

13:30 - 15:00 **PV Diversification Upstream and Downstream - from Industry to Applications | Costs, Economics, Finance and Markets | The Revolution of PV**

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

PANEL DISCUSSION PRESENTATION DO.13

13:30 - 15:00 **Panel discussion on: Integration of PV into the Grid**

LATE NEWS ORAL SESSION DO.18

13:30 - 15:00

ORAL PRESENTATIONS 4DO.4

15:15 - 16:45 **Vehicle Integrated PV**

Chairpersons: Bonna Newman *(i)*
LightYear, Helmond, The Netherlands
Ignacio Antón Hernández
UPM, Madrid, Spain

4DO.4.1 Solar Moves: The impact on Grid Electricity Demand of VIPV
Anna J. Carr[1], Ashish Binani[1], Akshay Bhoraskar[2], Oscar van de Water[2], Michiel Zult[2], René van Gijlswijk[2], Lenneke Slooff-Hoek[1]
[1] TNO, Petten, The Netherlands; [2] TNO, Den Haag, The Netherlands

4DO.4.2 Topical Review for Vehicle Integrated Photovoltaics
Masafumi Yamaguchi[1], Taizo Masuda[2], Yasuyuki Ota[3], Kenji Araki[3], Kensuke Nishioka[3]
[1] Toyota, Nagoya, Japan; [2] Toyota, Susono, Japan; [3] University of Miyazaki, Miyazaki, Japan

4DO.4.3 Simulation and Concept Evaluation of Extendable Lightweight Photovoltaic Modules for Vehicle Integration under Wind Loads
Cornelius Herr[1], Marc Andre Schüler[1], Felix Basler[1], Daniel Christopher Joseph[1], Andreas Beinert[1], Pascal Romer[1], Martin Heinrich[1]
[1] Fraunhofer ISE, Freiburg, Germany

4DO.4.4 Public Road Driving Tests of Toyota Prius Equipped with High-Efficiency Photovoltaic Modules Consist of III-V-Based Triple-Junction Solar Cells
Taizo Masuda[1], Masafumi Yamaguchi[2], Tatsuya Takamoto[3], Kensuke Nishioka[4]
[1] Toyota Motor Corporation, Shizuoka, Japan; [2] Toyota Technological Institute, Nagoya, Japan; [3] Sharp Corporation, Nara, Japan; [4] University of Miyazaki, Miyazaki, Japan

4DO.4.5 Industrialization of Curved Glass-Free PV Module for VIPV Applications
Antonin Faes[1], Gianluca Cattaneo[1], Fahradin Mujovi[1], Nelson Koch[1], Julien Robin[2], Hugo Martins[3], Kléber Nicolet[4], Umang Desai[4], Matthieu Despeisse[1], Bénédicte Bonnet-Eymard[1], Christophe Ballif[1]
[1] CSEM, Neuchâtel, Switzerland; [2] Simoldes, Oliveira, Portugal; [3] Ceiia, Matosinhos, Portugal; [4] EPFL, Neuchâtel, Switzerland

4DO.4.6 VIPV: Urban Shading Effect to Solar Radiation Estimation Method Using GIS: Case Study in Fukushima, Japan
Pawita Bunme[1], Hidenori Mizuno[1], Takumi Takashima[1], Takashi Oozeki[1]
[1] AIST, Fukushima, Japan

ORAL PRESENTATIONS 2DO.9

15:15 - 16:45 **Lifetime and Reliability of Perovskite Devices**

Chairpersons: Mark Khenkin
HZB, Berlin, Germany
Adriana Paracchino *(i)*
CSEM, Switzerland

2DO.9.1 Long-Term Perovskite Module Outdoor Performance in Different Outdoor Regions
Aranzazu Aguirre[1], Tamara Merckx[1], Santhosh Ramesh[1], Yinghuan Kuang[1], Anurag Krishna[1], Vasiliki Paraskeva[2], Maria N Hadjipanayi[2], Matthew Norton[2], Elias Peraticos[2], Tom Aernouts[1], Jef Poortmans[1]
[1] imec, Genk, Belgium; [2] University of Cyprus, Nicosia, Cyprus

2DO.9.2 TÜV Rheinland Specification on the I-V Characterization of Perovskite-Based PV Modules
Giorgio Bardizza[1], Qi Gao[2], Wenhao Xu[2], Yating Zhang[2], Christos Monokroussos[2]
[1] TUV Rheinland, Milan, Italy; [2] TUV Rheinland, Shanghai, China

2DO.9.3 Comparative Study of Reverse Bias Degradation in Perovskite Solar Cells and Modules
Sujith Vishwanathreddy[1], Aranzazu Aguirre[2], Michael Daenen[1], Tom Aernouts[3], Jef Poortmans[4]
[1] Hasselt University, Hasselt, Belgium; [2] Imec, Hasselt, Belgium; [3] Imec, Genk, Belgium; [4] KU Leuven, Leuven, Belgium

2DO.9.4 Analyzing Ion Migration and Degradation in Perovskite Solar Cells: Insight from Outdoor Exposure and Accelerated Stress Testing
Takeshi Tayagaki[1], Sayaka Hirooka[1], Haruka Kobayashi[1], Kohei Yamamoto[1], Takurou N. Murakami[1], Masahiro Yoshita[1]
[1] AIST, Tsukuba, Japan

2DO.9.5 One-Year Outdoor Testing of 4T Perovskite/Si PV Modules
Vasiliki Paraskeva[1], Maria Hadjipanayi[1], Matthew Norton[1], Elias Peratikos[1], Aranzazu Aguirre[2], Anurag Krishna[2], Santhosh Ramesh[2], Tom Aernouts[2], George E. Georghiou[1]
[1] University of Cyprus, Nicosia, Cyprus; [2] Hasselt University/Imo-Imomec, Genk, Belgium

2DO.9.6 Degradation Mechanisms in Interface-Engineered Perovskite Solar Cells with 2D Passivation Layer
Anyssa Derj[1], Karim Medjoubi[1], Anna Capitaine[1], Dounya Barrit[2], Marion Provost[1], Jean Rousset[1], Jorge Posada[3]
[1] IPVF, Palaiseau, France; [2] Total Energies, Palaiseau, France; [3] EDF, Palaiseau, France

ORAL PRESENTATIONS 5DO.14

15:15 - 16:45 **Energy System Integration with Storage**

Chairpersons: Marta Victoria
Aarhus University, Aarhus, Denmark
Rui Pestana *(i)*
R&D NESTER, Sacavém, Portugal

5DO.14.1 Solar-Driven CO2 Electroreduction under Realistic Irradiance, Temperatuer and Diurnal Cycles
Thérèse Cibaka[1], Tsvetelina Merdzhanova[1], Guangxin Liu[2], Florian Seidler[1], Sergey Shcherbachenko[1], Chuyen Pham[2], Oleksandr Astakhov[1], Uwe Rau[1]
[1] Forschungszentrum Jülich, Jülich, Germany; [2] Forschungszentrum Jülich, Erlangen, Germany

5DO.14.2 Effects of the Operation Point on PV Systems Equipped with Energy Storage
Kari Lappalainen[1]
[1] Tampere University, Tampere, Finland

5DO.14.3 Elevating Green Hydrogen Yields: A Comparative Study of Photovoltaic-Electrolyzer Coupling Strategies
Pablo Garcia-Linares[1], Alfonso González del Valle[1], Antonio Martí Vega[1]
[1] UPM, Madrid, Spain

5DO.14.4 An Assessment of The Impact of Firm Power Contracts on Battery Degradation in Hybridised Solar PV - Battery Energy Storage Systems
Alexandra Sheppard[1], Øyvind Sommer Klyve[2], Magnus Moe Nygård[2], Jonathan Fagerström[2], Soumya Das[2]
[1] NTNU, Trondheim, Norway; [2] IFE, Oslo, Norway

5DO.14.5 Power-to-Heat-to-Power Storage for Enhancing Photovoltaic Self-Consumption in Heat Electrification
Alicia López-Ceballos[1], Ignacio Antón[1], Carlos Cañizo[1], Alejandro Datas[1]
[1] UPM, Madrid, Spain

5DO.14.6 Hybrid Photovoltaics, Batteries, Concentrating Solar Power and Thermal Energy Storage: An Economic Pathway to 100% Renewables?
Joshua S. Stein[1], Jennifer L. Braid[1], Luke McLaughlin[1], Nathan Schroeder[1], Jeremy Sment[1], Henk Laubscher[1]
[1] Sandia National Laboratories, Albuquerque, United States of America

ORAL PRESENTATIONS 3DO.19

15:15 - 16:45 **Modelling Techniques for PV Modules**

Chairpersons: Theodoros Makris
RWE, Germany
Eszter (Esther) Voroshazi *(i)*
CEA, Le Bourget-du-Lac, France

3DO.19.1 An Accurate Data-Driven Physical Model for Bifacial PV Power Estimation
Ali Sohani[1], Marco Pierro[2], David Moser[2], Cristina Cornaro[1]
[1] University of Rome Tor Vergata, Rome, Italy; [2] Eurac Research, Bolzano, Italy

3DO.19.2 Comparative Analysis of Temperature Estimation Models in Bifacial Photovoltaic Modules
Aline Kirsten Vidal de Oliveira[1], Isadora Maciel Queiroz[1], Marília Braga[1], Ricardo Rüther[1]
[1] Federal University of Santa Catarina (UFSC), Florianópolis, Brazil

3DO.19.3 Benchmarking Models for IV Curves of Bifacial PV Modules
Martin Bartholomäus[1], Luca Morino[1], Peter Behrensdorff Poulsen[1], Sergiu Viorel Spataru[1]
[1] Technical University of Denmark, Roskilde, Denmark

3DO.19.4 A Calibratable PV Temperature Model that Integrates Wind Direction in a Realistic Way: Insights from Long-Term Outdoor Measurements
Gofran Chowdhury[1], Anastasios Kladas [2], Bert Herteleer[2], Jan Cappelle[2], Francky Catthoor[3]
[1] KU Leuven, Leuven, Belgium; [2] KU Leuven, Ghent, Belgium; [3] imec, Leuven, Belgium

3DO.19.5 Apparent Intensity Dependence of Shunts in PV Module and Tandem Cells: Revision of the Shunt Parameterization in De Soto Model and PVsyst
Nils-Peter Harder[1], José Cano Garcia[1]
[1] TotalEnergies, Palaiseau, France

3DO.19.6 Blind Photovoltaic Performance Modeling Comparison of Commercial Software
Lelia Deville[1], Marios Theristis[1], Kevin Anderson[1], Juergen Sutterlueti[2], Javier Lopez Lorente[3], Kurt Rhee[4], Matthew Prilliman[5], Bruno Wittmer[6], Michele Oliosi[6], Felix Perez[7], Maitheli Nikam[8], Branislav Shnierer[9], Joshua Stein[1]
[1] Sandia National Laboratories, Albuquerque, United States of America; [2] Gantner Instruments, Schruns, Austria; [3] DNV, Arnhem, The Netherlands; [4] Terabase Energy, San Diego, United States of America; [5] NREL, Golden, United States of America; [6] PVSyst, Satigny, Switzerland; [7] Rated Power, Madrid, Spain; [8] 3E, Brussels, Belgium; [9] Solargis, Bratislava, Slovakia

VISUAL PRESENTATIONS 4DV.4

15:15 - 16:45 **PV System Engineering | Control and Systems for Power Systems with Renewables Integration**

Detailed information on this session is presented in the section entitled 'EU PVSEC 2024 Visual Presentations'.

ORAL PRESENTATIONS 4DO.5

17:00 - 18:30 Floating, Integrated and Hybrid PV

Chairpersons: Jonathan Leloux
LuciSun, Sart-Dames-Avelines, Belgium

Angele Reinders *(i)*
Eindhoven University of Technology, Eindhoven, The Netherlands

4DO.5.1 Implementing Offshore Monitored Data for the Offshore FPV System Model Validation
Sara Mirbagheri Golroodbari[1], Gijsbert Houtman[2], Dora de Jong[2], Wilfried van Sark [1]
[1] Utrecht University, Utrecht, The Netherlands; [2] Oceans of Energy, Leiden, The Netherlands

4DO.5.2 Exploiting the Full Performance Potential of (Offshore) Floating Photovoltaics Through Thermal Approaches: An Overview of Options
Oscar Delbeke[1], Jens D. Moschner[1], Johan Driesen[1]
[1] KU Leuven/EnergyVille, Leuven, Belgium

4DO.5.3 Quantification of Differences in Humidity Stress Profiles Between Floating Photovoltaics and Ground Mounted Photovoltaics
Nathan Roosloot[1], François Clayer[2], Dag Lindholm[1], Curtis DeGasperi[3], Ankur R. Desai[4], Daniel Hornbach[5], Katy Nugent[6], Ulrike Obertegger[7], Blaize Denfeld[8], Piet Verburg[9], Huaxia Yao[10], James Rusak[10], Kiyoko Yokota[11], Junhong Wang[12], Ian D. Jones[13], Torunn Kjeldstad[1], Josefine H. Selj[1], Gaute Otnes[1]
[1] IFE , Kjeller, Norway; [2] Norwegian Institute for Water Research, Oslo, Norway; [3] King County, Seattle, United States of America; [4] University of Wisconsin-Madison, Madison, United States of America; [5] Macalester College, Saint Paul, United States of America; [6] University of Saskatchewan, Saskatoon, Canada; [7] Fondazione Edmund Mach, S. Michele all'Adige, Italy; [8] Swedish University of Agricultural Sciences, Uppsala, Sweden; [9] National Institute of Water & Atmospheric Research, Wellington, New Zealand; [10] Ministry of the Environment, Conservation and Parks, Ontario, Canada; [11] State University of New York, Oneonta, United States of America; [12] University at Albany, Albany, United States of America; [13] University of Stirling, Stirling, United Kingdom

4DO.5.4 Evaporation of Reservoir for Different Floating Photovoltaic Layouts
Baptiste Berlioux[1], Baptiste Amiot[2], Martin Ferrand[2], Rémi Le Berre[3], Hervé Pabiou[1], Ronnie Knikker[1]
[1] Univ Lyon INSA, Villeurbanne, France; [2] CEREA, Marne la Vallée, France; [3] EDF R&D, Écuelle, France

4DO.5.5 Performance Analysis of a Zigzag Noise Barrier in a Belgian Highway
Sara Bouguerra[1], Richard de Jong[1], Fallon Colberts[2], Marta Casasola Paesa[1], Ismail Kaaya[1], Nikoleta Kyranaki[1], Arnaud Morlier[1], Michaël Daenen[1]
[1] IMO-IMOMEC, Diepenbeek, Belgium; [2] Zuyd University, Heerlen, The Netherlands

4DO.5.6 Hybrid (Tandem?) Implementation: Solar Spectrum Splitting PV/CSP for Thermal and Electrical Energy Harvesting
Jonathan Govaerts[1], Bart Reekmans[1], Patrick Choulat[1], Filip Duerinckx[1], Loic Tous[1], Bin Luo[1], Tom Borgers[1], Hariharsudan Sivaramakrishnan Radhakrishnan[1], Jef Poortmans[1], Hannes Laget[2], Qizheng Dou[3], Francis Costa[3], Lieven Stalmans[3], Ravi Kishore[4], Youri Meuret[4], Georgi H. Yordanov[4], Jens Moschner[4], Tatjana Vavilkin[5], Stefan Dewallef[5]
[1] imec, Genk, Belgium; [2] Azteq, Genk, Belgium; [3] Borealis, Beringen, Belgium; [4] KULeuven, Leuven, Belgium; [5] Soltech, Genk, Belgium

ORAL PRESENTATIONS 5DO.10

17:00 - 17:30 Manufacturing PV in Europe | Social Aspects of PV

Chairpersons: Michael Woodhouse
NREL, Golden, United States of America

Chiara Candelise *(i)*
Imperial College London, United Kingdom

5DO.10.1 Would an Increase in PV Modules Prices Impact the European PV Market?
Johan Lindahl[1], Gaëtan Masson[2], Elina Bosch[2], Amelia Oller Westerberg[1]
[1] Becquerel Sweden, Stockholm, Sweden; [2] Becquerel Institute, Brussels, Belgium

5DO.10.2 Reshoring PV Manufacturing to Europe: Can EU-made PV Compete in a Global Market?
Atse Louwen[1], Mohammad Dehghanimadvar[2], Nathan Chang[2], Julian Reichle[3], Wolfgang Jooß[3], Peter Fath[3], Elisa Veronese[1], Cristina Polacchi[1], Jordi Veirman[1], David Moser[1]
[1] Eurac Research, Bolzano, Italy; [2] UNSW, Sydney, Australia; [3] RCT Solutions, Konstanz, Germany

5DO.10.3 Cost Driven Planning for New PV Production Facilities: Case Study for Setting-up a TOPCon Cell Factory in Europe
Baljeet Singh Goraya[1], Dilara Maria Subasi[1], Peter Henri Brailovsky Signoret[1], Vasileios Georgiou-Sarlikiotis[1], Sukesh Mysore Swamy[1], Estelle Gervais[1], Oscar Rodolfo Ortega Alvarado[1], Nico Wöhrle[1], Jochen Rentsch[1], Sebastian Nold[1]
[1] Fraunhofer ISE, Freiburg, Germany

5DO.10.4 Challenges and Strategies for Establishing a Rooftop Photovoltaic System Crowdsourced by Students and Employees at a University
Marta Victoria[1], Zhe Zhang[1], Gorm B. Andresen[1], Parisa Rahdan[1], Ebbe K. Gøtske[1]
[1] Aarhus University, Aarhus, Denmark

5DO.10.5 Adoption of Solar Green Electricity by Small and Medium-Sized Enterprises: A Case Study in Singapore on Motivations and Deterrents
Mavian Tay[1], Grace Wong[1], Siu-Kit Lau[1], Stephen Tay[1]
[1] National University of Singapore, Singapore, Singapore

5DO.10.6 Social Acceptance of Floating Photovoltaics: from the General to the Local Perspective
Leonardo Micheli[1], Alice Zaghini[1], Fabio Bisegna[1]
[1] Sapienza University of Rome, Rome, Italy

ORAL PRESENTATIONS 5DO.15

17:00 - 18:30 **Resilience and Security of Supply**

Chairpersons: Johannes Stierstorfer
WIP Renewable Energies, Munich, Germany

Ana Catarina Neves Foles *(i)*
University of Évora, Portugal

5DO.15.1 Extraction of PV Yield Data from Smart Meter Data Disaggregation
Bas van der Ploeg[1], Wilfried van Sark[1]
[1] Utrecht University, Utrecht, The Netherlands

5DO.15.2 Development of an Architecture for Power Interchange by Linking Photovoltaic and Electrification Vehicles
Jun Tsunoda[1], Tohru Kohno[1], Issei Suemitsu[1], Kengo Kumano[1]
[1] Hitachi, Tokyo, Japan

5DO.15.3 Managing Minute-Scale Variability in Gigawatt-Scale PV Systems: A Techno-Economic Perspective
Harry Apostoleris[1], Ansari Aadil Shahzad[1], Juan David Barbosa Ramirez[1], Sgouris Sgouridis[1]
[1] DEWA, Dubai, United Arab Emirates

5DO.15.4 Local Energy Hub for Urban Environment: Role of Energy Management System
Aihui Fu[1], Joel Bosrup[2], Simona Renzaglia[1], Milos Cvetkovic[1], Marjan Kreijns[1], Miro Zeman[1]
[1] TU Delft, Delft, The Netherlands; [2] Wintersol Energy, Utrecht, The Netherlands

5DO.15.5 Reliability Analysis of Coupled PV-Electrolyser Systems – Evaluation of OnSite Factors
Stefan Niederhofer[1], Marcus Rennhofer[2], Rene Hofmann[3]
[1] Austrian Institute of Technology, Obernberg am Inn, Austria; [2] Austrian Institute of Technology, Vienna, Austria; [3] Vienna University of Technology, Vienna, Austria

5DO.15.6 Grid Supporting Powerplants on 100% Energy from PV and Wind
Gerhard Mütter[1], Andreas Hensel[2], Jan Winkelmann[3]
[1] Gerhard Mutter, Waldneukirchen, Austria; [2] Fraunhofer ISE, Freiburg, Germany; [3] VENSYS Electrical Engineering, Diepholz, Germany

ORAL PRESENTATIONS 3DO.20

17:00 - 18:30 **Shading and Soiling on PV Modules**

Chairpersons: Juan Lopez-Garcia
QEERI, Doha, Qatar

Anna J. Carr
TNO, Petten, The Netherlands

3DO.20.1 Simplified Simulation and Experiments for Hot-Spot Evaluation of Novel PV Module with Partial Shading
Jay Lin[1], Shiny Chen[1], Min-An Tsai[2], Yean-San Long[2], Wei Lun Yang[2]
[1] PV Guider, Taipei, Taiwan; [2] ITRI, Hsinchu, Taiwan

3DO.20.2 Correlating Field Experimentation and Image Processing for the Assessment of Induced Losses from Thin Object Shading
Matthew Axisa[1], Marija Demicoli[1], Luciano Mule'Stagno[1]
[1] University of Malta, Marsaxlokk, Malta

3DO.20.3 Laboratory Intercomparison on a Shading Resistance Classification of PV Modules
Stefan Riechelmann[1], Hendrik Sträter[1], Giorgio Bardizza[2], Werner Herrmann[2], Ebrar Özkalay[3], Gabi Friesen[3], Özcan Bazkir[4], Alexandra Schmid[5], Stefan Winter[1]
[1] PTB, Braunschweig, Germany; [2] TÜV Rheinland, Cologne, Germany; [3] SUPSI, Manno, Switzerland; [4] TÜBITAK, Ankara, Turkey; [5] Fraunhofer ISE, Freiburg, Germany

3DO.20.4 Exploring Dust Particle Properties and PV Soiling Mapping: A Case Study in the Arid Landscape of a Desert Environment
Brahim Aissa[1], Atef Zekri[2], Mosab Kareem Subeh[1]
[1] QEERI, Doha, Qatar; [2] HBKU Core Labs, Doha, Qatar

3DO.20.5 Correlation Analysis Between Soiling Coverage, Light Transmittance, Short-circuit Current Losses and Characteristics of Deposited Dusts
Guido Willers[1], Nattakarn Sakarapunthip [2], Ralph Gottschalg[1], Klemens Ilse[1]
[1] Fraunhofer CSP, Halle, Germany; [2] KMUTT, Bangkok, Thailand

3DO.20.6 PV Module Cleaning under Hot Desert Conditions
Gerhard Mathiak[1], Afra Seentakath[1], Nithin Sha[1], Prashanth Gabbadi[1], Arumugham Muthusamy[1], Kaushal Chapaneri[1]
[1] DEWA R&D Center, Dubai, United Arab Emirates

POSTER AWARDS WINNERS SESSION

17:00 - 18:30

Friday, 27. September 2024

ORAL PRESENTATIONS 3EO.1

08:30 - 09:15 In Field Characterisation of PV Modules | BoS Components in Operation

Chairpersons: Teodora Stoyanova Lyubenova
European Commission JRC, Ispra, Italy

Nikos Kopidakis
NREL, Golden, United States of America

3EO.1.1 Verification of In-Field Visual Inspection for Application on Utility-Scale PV Power Plants
Monphias Vumbugwa[1], Jacqueline Crozier McCleland[1], Ernest van Dyk[1], Frederik Vorster[1], Oleksandr Stroyuk, [2], Poland Michael[1], Roelof Roodt[1], Ian Marius Peters[2], Claudia Buerhop-Lutz[2]
[1] Nelson Mandela University, Port Elizabeth, South Africa; [2] FZJ -HI ERN, Erlangen, Germany

3EO.1.2 From Fab to Field - Quality Control with a Mobile PV Laboratory
Magnus Herz[1], Hamza Maaroufi[1], Giorgio Bardizza[2]
[1] TÜV Rheinland, Cologne, Germany; [2] TÜV Rheinland, Milan, Italy

3EO.1.3 Reduction of Uncertainty of Outdoor PV Module Characterization: Test Field Experiences
Mariella Rivera[1], Christian Reise[1]
[1] Fraunhofer ISE, Freiburg, Germany

3EO.1.4 Fully Integrated and System-Optimized Electronic Solutions on Solar Modules
Henning Schulte-Huxel[1], Tobias Manthey[2], Tobias Brinker[2], Paul Ranft[3], Henning Woock[4], Tim Hahn[2], Leonardo Moerlein [2], Susanne Blankemeyer[1], Adrian Skorcz[3], Marc Köntges[1], Dirk Manteuffel[2], Jens Friebe[2]
[1] ISFH, Emmerthal, Germany; [2] Leibniz University Hannover, Hannover, Germany; [3] Optimel Schmelzgusstechnik, Iserlohn, Germany; [4] who Ingenieurgesellschaft, Lubeck, Germany

3EO.1.5 MPP Tracking Losses of Module Level Power Electronics at Partial Module Shading
Franz P. Baumgartner[1], Adrian Widler[1], Linus Baumann[1]
[1] ZHAW, Winterthur, Switzerland

3EO.1.6 Improvement of Tracking Algorithms using Machine Learning
Sarra Ben Brahim[1], Kai Saegebarth[1], Martin Dennenmoser[2], Alsayed Algergawy[3]
[1] Baywa, Munich, Germany; [2] Baywa, Freiburg, Germany; [3] University of Passau, Passau, Germany

ORAL PRESENTATIONS 4EO.2

08:30 - 09:15 Planning of PV Systems | Digital PV

Chairpersons: Roland Bründlinger *(i)*
AIT, Vienna, Austria

Michele Oliosi
PVsyst, Satigny, Switzerland

4EO.2.1 BIPV and PV in a Multidisciplinary Building Information Modelling (BIM) Planning and Asset Management System
Astrid Schneider[1], Karin Stieldorf[1], Christian Schranz[1], Harald Urban[1], Alfred Waschl[2], Markus Feichtner[3], Fedele Rende[4], Andreas Aiello[5], Martin Hauer[6], Kurt Battisti[7], Markus Dörn[7], Jaqueline Scherret[7], Christoph Treberspurg[8]
[1] TU Vienna, Vienna, Austria; [2] buildingSMART, Vienna, Austria; [3] Sonnenkraft, Veith, Austria; [4] ACCA Software, Bagnoli, Italy; [5] ACCA Software, Vienna, Austria; [6] Bartenbach, Aldrans, Austria; [7] A-Null Development, Vienna, Austria; [8] Treberspurg and Partner, Vienna, Austria

4EO.2.2 Assessing Yield Disparities: Anticipated Versus Optimal Rooftop Solar Photovoltaic Systems and Implications for Prosumer Viability
Dominik Keiner[1], Dmitrii Bogdanov[1], Stefan Krauter[2], Christian Breyer[1]
[1] LUT University, Lappeenranta, Finland; [2] Paderborn University, Paderborn, Germany

4EO.2.3 Energy Yields and Wind Loads of Alternative PV Designs for Roofs in Snowy Climates
Maria Svedjeholm[1], Josefin Lampa[1], Robin Andersson[1], Ehsan Fooladgar[1], Anna Malou Petersson[1], Pirjo Estola[2], Mattias Lindh[1]
[1] RISE, Umeå, Sweden; [2] Lulea Energi, Lulea, Sweden

4EO.2.4 Digital Twin of Photovoltaic Power Plants Considering Spatio-Temporal Characteristics
Faruk Ugranli[1], Eşref Deniz[2], Engin Karatepe[3]
[1] Izmir Bakircay University, Izmir, Turkey; [2] Entegro Enerji Sistemleri, Izmir, Turkey; [3] Ege University, Izmir, Turkey

4EO.2.5 Federated Learning and Homomorphic Encryption for Privacy-Preserving Load and PV Generation Prediction
Mousa Sondoqah[1], Atse Louwen[1], David Moser[1], Grazia Barchi[1]
[1] EURAC, Bolzano, Italy

4EO.2.6 Impact and Frequency of Extreme Weather Events on the National Photovoltaic Power Supply
Leonardo Micheli[1]
[1] Sapienza University of Rome, Rome, Italy

ORAL PRESENTATIONS 5EO.3

08:30 - 10:00 **Challenges and Opportunities along the PV Value Chain**

Chairpersons: Maria Getsiou *(i)*
European Commission DG RTD, Brussels, Belgium

Stefan Nowak *(i)*
NET Nowak Energy & Technology, St. Ursen, Switzerland

5EO.3.1 European PV Manufacturing and LCOE: Ensuring Resilience and Competitiveness Through R&I and Industrial Policies
Ivona Kafedjiska[1], Christian Breyer [2], Chiara Busto[3], Nabih Cherradi[4], Peter Fath[5], Bianca Lim[6], David Moser[7], Ralf Preu[8], Eduardo Roman [9], Rutger Schlatmann[1], Marko Topič[10], Jutta Trube[11], Eero Vartiainen[12]
[1] HZB, Berlin, Germany; [2] LUT University, Lappeenranta, Finland; [3] Eni, Novara, Italy; [4] Desert Technologies, Jeddah, Saudi Arabia; [5] RCT Solutions, Konstanz, Germany; [6] ISFH, Emmerthal, Germany; [7] Eurac Research, Bolzano, Italy; [8] Fraunhofer ISE, Freiburg, Germany; [9] TECNALIA, Bilbao, Spain; [10] University of Ljubljana, Ljubljana, Slovenia; [11] VDMA, Frankfurt, Germany; [12] Fortum Renewables, Espoo, Finland

5EO.3.2 Comparative Global PV Manufacturing Cost and Sustainable Pricing Assessment: China, Southeast Asia, India, USA, and Europe
Sebastian Nold[1], Baljeet Singh Goraya[1], Ralf Preu[1], Jochen Rentsch[1], Julian Reichle[2], Wolfgang Jooß[2], Peter Fath[2], Michael Woodhouse[3]
[1] Fraunhofer ISE, Freiburg, Germany; [2] RCT Solutions, Konstanz, Germany; [3] NREL, Golden, United States of America

5EO.3.3 Assessing the Potential of Agrivoltaic Systems in Korea through Geospatial Analysis and Multi-Criteria Scenarios
Chang Yeol Yun[1], Changki Kim[1], Jinyoung Kim[1], Sangmin Jo[2], Yongil Kim[3]
[1] Korea Institute of Energy Research, Daejeon, South Korea; [2] Korea Energy Economics Institute, Ulsan, South Korea; [3] Seoul National University, Seoul, South Korea

5EO.3.4 Invited Presentation

5EO.3.5 Distributed Photovoltaics Provides Key Benefits for a Highly Renewable European Energy System
Parisa Rahdan[1], Elisabeth Zeyen[2], Cristobal Gallego-Castillo[3], Marta Victoria[1]
[1] Aarhus University, Aarhus, Denmark; [2] TU Berlin, Berlin, Germany; [3] Technical University of Madrid, Madrid, Spain

5EO.3.6 Identifying the Ecological Implications of the Repowering of PV Systems
Marie Fischer[1], Sina Herceg[1], Karl-Anders Weiß[1], Liselotte Schebek[2]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Technical University of Darmstadt, Darmstadt, Germany

PLENARY PRESENTATIONS EP.1

10:30 - 12:00 **Sustainability**

Chairpersons: David Moser
Eurac Research, Bolzano, Italy

Delfina Muñoz
CEA, Le Bourget-du-Lac, France

5EP.1.1 Invited Presentation

1EP.1.2 Copper as Cost-Effective Alternative to Silver for Si Solar Cell Metallization – Status and Outlook
Florian Clement[1], Andreas Lorenz[1], Jonas Huyeng[1], Roman Keding[1], Jonas Bartsch[1], Sven Kluska[1], Andreas Brand[1], Jan Nekarda[1], Sebastian Pingel[1], Daniel Ourinson[1], Ralf Preu[1]
[1] Fraunhofer ISE, Freiburg, Germany

5EP.1.3 Towards Reuse-ready PV: A Perspective on Recent Advances, Practices and Future Challenges
Ioannis (John) Tsanakas[1], Gernot Oreski[2], Gabriele Eder[3], Anika Gassner[3], Arvid van der Heide[4], Daniela Ariolli[5], Guillermo Oviedo Hernandez[5], David Moser[6], Karsten Wambach[7]
[1] CEA, Le Bourget-du-Lac, France; [2] PCCL, Leoben, Austria; [3] OFI, Vienna, Austria; [4] imo-imomec, Genk, Belgium; [5] BayWa r.e., Milan, Italy; [6] Eurac Research, Bolzano, Italy; [7] Wambach-Consulting, Petersdorf, Germany

5EP.1.4 Enhancing Citizens' Participation in PV Deployment
Silvia Caneva[1], Duygu Celik[1], Chiara Busto[2], Chiara Candelise[3], Alessia Cornella[4], Letizia Bua[5], Edouard Breniaux[6], Nouha Gazbour[7], Ivan Gordon[8], Wander Jager[9], Rudolf Kapeller[10], Gökhan Kirkil[11], Paola Mazzucchelli[12], Osbel Almora Rodríguez[13], Marcello Passaro[14], Alessandro Sciullo[15], Sebastien Lizin[16], Alessandro Martulli[16], Atse Louwen[4], Hanna Dittmar[17], Thomas Garabetian[17], Rania Fki[1], Johannes Stierstorfer[1], Melanie Kern[1]
[1] WIP Renewable Energies, Munich, Germany; [2] Eni, Novara, Italy; [3] Bocconi University, Milan, Italy; [4] Eurac Research, Bolzano, Italy; [5] Eni, Milan, Italy; [6] Carnot Institute Chimie Balard Cirimat, Toulouse, France; [7] CEA, Le Bourget-du-Lac, France; [8] imec, Genk, Belgium; [9] University College Groningen, Groningen, The Netherlands; [10] Johannes Kepler University Linz, Linz, Austria; [11] Kadir Has University, Istanbul, Turkey; [12] CIRCE, Zaragoza, Spain; [13] URV, Tarragona, Spain; [14] Sunzest Solar, Rotterdam, The Netherlands; [15] University of Turin, Turin, Italy; [16] Hasselt University, Hasselt, Belgium; [17] SolarPower Europe, Brussels, Belgium

CLOSING SESSION

12:00 - 13:00

EU PVSEC 2024 VISUAL PRESENTATIONS

Monday, 23. September 2024

VISUAL PRESENTATIONS 3AV.1

13:30 - 15:00 PV Module Design and Manufacturing | BoS Components, Operation and Aging

3AV.1.1 Using DoE Mathematical Models for the Optimization of EVA and POE Encapsulant Additives
Fabio Silva[1], Kristof Proost[1]
[1] IP FAB, Mechelen, Belgium

3AV.1.2 Mitigation of Edge Compression in Glass-Glass Modules by Local Pre-Crosslinking of the Encapsulant
Gernot M. Wallner[1], Gabriel Riedl[1], Robert Pugstaller[1]
[1] University of Linz, Linz, Austria

3AV.1.3 New Encapsulant Materials for Eco-Design PV: Thermochemical Characterization
Valeria Fiandra[1], Lucio Sannino[1], Concetta Andreozzi[1], Mario Tucci[2], Massimo Izzi[2]
[1] ENEA Portici, Naples, Italy; [2] ENEA Casaccia, Rome, Italy

3AV.1.4 Challenges for Solder Interconnection Pushed by High-Efficiency Solar Cell Developments
Benjamin Grübel[1], Angela De Rose[1], Achim Kraft[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.1.5 Optimizing Sustainability: Balancing Antimony Content for Enhanced Optical Properties and Environmental Impact in Solar Glass
Anika Glaubitz[1], Sven Grüttner[1], Selim Yagci[1], Oliver Pfeiffer[1], Ulf Blieske[1]
[1] University of applied Sciences Cologne, Cologne, Germany

3AV.1.6 Photovoltaic Modules Comprising III-V Cells Encapsulated in Composite Material
Oihana Zubillaga[1], Werther Cambarau[1], Naiara Yurrita[1], Jon Aizpurua[1], Juan M. Hernández[1], Gorka Imbuluzqueta[1], Francisco J. Cano[1], Eduardo Román Medina[2]
[1] TECNALIA, Donostia - San Sebastián, Spain; [2] TECNALIA, Derio, Spain

3AV.1.7 Formulation and UV Ageing Behavior of Colored, Thermoplastic Encapsulants for Double Glass Photovoltaic Modules
Martin Huemer[1], Gernot M. Wallner[1], Andreas Brandstätter[2]
[1] University of Linz, Linz, Austria; [2] Lenzing Plastics, Lenzing, Austria

3AV.1.8 Approach to Light-Weight of Bi-Facial Photovoltaic Module Structural Design
Yohan Noh[1], Jaehyeong Lee[1]
[1] Sungkyunkwan University, Suwon-si, South Korea

3AV.1.9 Impact of Backsheet Orientation on Peel Force of Photovoltaic Modules
Aksel Kaan Öz[1], Reinhard Helfmeyer[1], Angelika Beinert[1], Christine Wellens[1], Martin Heinrich[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.1.10 Techno-Economic Analysis of Rectangular Solar Cells in PV Modules
Max Mittag[1], Hannah Hoffman[1], Nico Wöhrle[1], Alexander Protti[1], Sebastian Nold[1], Christian Reichel[1], Holger Neuhaus[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.1.11 Reliability of Aluminum-Copper Contact in PV Modules
Tobias Messmer[1], Andreas Halm[1]
[1] ISC Konstanz, Konstanz, Germany

3AV.1.12 Lightweight Photovoltaic Modules Technologies: Reliability Evaluation and Market Opportunity
Julien Dupuis[1], Christine Abdel Nour[1], Paul Lefillastre[1]
[1] EDF R&D, Palaiseau, France

3AV.1.13 Design and Investigation of Anti-Soiling Coatings for Mitigating Dust Accumulation on Photovoltaic Panels
Redouane Miloua[1], Attouya Bouzidi[1], Abdelkader Nakrela[1]
[1] Djillali Liabès University, Sidi Bel-Abbes, Algeria

3AV.1.14 Analysis of Characteristics of Environmentally Friendly Bio-Epoxy Composite Applied BIPV Modules for Carbon Reduction
Chanyong Lee[1], Yohan Noh[1], Hangoo Cho[1], Jaehyeong Lee[1]
[1] Sungkyunkwan University, Suwon, South Korea

3AV.1.15 MgO/SiOX Adds Heat Dissipation Function to Crystalline Silicon Solar Cell Modules
Eiko Shimokata[1], Yasushi Sobajima[1], Keisuke Ohdaira[2], Atsushi Masuda[3]
[1] Gifu University, Gifu, Japan; [2] JAIST, Nomi, Japan; [3] Niigata University, Niigata, Japan

3AV.1.16 Investigation of Temperature Homogeneity during Infrared Soldering of Silicon Solar Cells Using the Finite Element Method
Daniel Christopher Joseph[1], Angela De Rose[1], Andreas J. Beinert[1], Holger Neuhaus[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.1.17 Impact of Textured Surfaces and Cleaning on Solar Panel Glass Transmittance
Aapo Poskela[1], Julianna Virjonen[1], Tommi Jokikyyny[1], Aleksi Kamppinen[1], Heikki Palonen[1], Kati Miettunen[1]
[1] University of Turku, Turku, Finland

3AV.1.18 Analyzing the Changes in Electrically Conductive Adhesives During the Curing Process for Shingled Solar Cells
Meryem Ezgi Karahalli[1], Parisa Sharif[1], Cem Maden[1], Talat Ozden[1]
[1] ODTU-GUNAM, Ankara, Turkey

3AV.1.19 Ultra-thin Flexible Glass as Environmental Shield for CIGS Photovoltaic Modules
Nikolina Pervan[1], Sonja Feldbacher[1], Martina Harnisch[2], Tuuli Tettenborn[2], Andreas Zimmermann[2], Gernot Oreski[1]
[1] PCCL, Leoben, Austria; [2] Sunplugged, Wildermieming, Austria

3AV.1.20 Process Development and Material Evaluation of Photovoltaic Aluminum Facade Element for BIPV Applications
Ringo Koepge[1], Matthias Pander[1], Stephan Großer[1], Bengt Jaeckel[1]
[1] Fraunhofer CSP, Halle (Saale), Germany

3AV.1.21 Low Temperature Encapsulation for Sensitive Solar Cell Technologies
Maria Van Eijndhoven[1], Jeroen Oderkerk[2], Geir Kristian Johnsen[1]
[1] Borealis Polymers, Beringen, Belgium; [2] Borealis, Stenungsund, Sweden

3AV.1.22 Material Properties Requirements for Frame Sealant and Junction Box Adhesives
Guy Beaucarne[1], Emmanuel Jadot[1], Dominique Culot[1], Rono Cao[2], Kayla Kenney[3], Suraj Ahuja[4]
[1] Dow Silicones Belgium, Seneffe, Belgium; [2] Dow, Shanghai, China; [3] Dow Silicones Corporation, Midland, United States of America; [4] Dow Chemical International, Mumbai, India

3AV.1.23 Solder Pastes in Shingled Modules
Karl Wienands[1], Ignacia Devoto[1], Nils Kopp[2], Carina Hallensleben[2], Rihoko Kizukuri[2], Matthias Helbig[1], Enita Kurtovic[1], Andreas Halm[1], Daniel Tune[1]
[1] ISC Konstanz, Konstanz, Germany; [2] TAMURA-ELSOLD, Ilsenburg, Germany

3AV.1.24 Polyethylene Glycol Enhances the Electrical Conductivity of Epoxy-based Adhesives with Low Silver Content for Application in Photovoltaics
Marianne Kronsbein[1], Norbert Willenbacher[1]
[1] KIT, Karlsruhe, Germany

3AV.1.25 TiO2/SiOX Surface Coating on Crystalline Silicon-Based-Solar Cell Module to Provide Anti-Soiling Functionality
Koshiro Iwaki[1], Yasushi Sobajima[1], Keisuke Ohdaira[2], Atsushi Masuda[3]
[1] Gifu University, Gifu, Japan; [2] JAIST, Nomi, Japan; [3] Niigata University, Niigata, Japan

3AV.1.26 Performance Analysis of Different Shading-Resistant PV Module Designs under Different Partial Shading Scenarios
Andreas Maixner[1], Tales Siquera[1], Matthias Pander[2], Jens Froebel[2], Bengt Jaeckel[2], Hamed Hanifi[1]
[1] AESOLAR, Koenigsbrunn, Germany; [2] Fraunhofer CSP, Halle, Germany

3AV.1.27 FoilMet®-Interconnect-Shingling: Latest Results of our Silver-, Copper-, Lead-, Solder- and Adhesive-free Cell & String Interconnection Technology for Crystalline Silicon PV Based on Laser Joined Pure Aluminum Foil
Jan Nekarda[1], Julian Weber[1], Max Mittag[1], Gernot Emanuel[1], Andreas Nägele[1], Ralf Preu[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.1.28 Analysis of Electrical Characteristics and Power Degradation of Split Heterojunction Solar Cells with Non-Destructive Cutting Laser Scriving
Guemhee Ham[1], Jae Hyeong Lee[1]
[1] Sungkyunkwan University, Suwon-si, South Korea

3AV.1.35 Design and Implementation of a CSI Photovoltaic Microinverter Prototype with High Frequency Switching
Francisco Guzman[1], Patricio Valdivia-Lefort[1], Antonio Sanchez[1], Rodrigo Barraza[1]
[1] Federico Santa Maria Technical University, Santiago, Chile

3AV.1.36 Analysis of the Impact of Shading on PV Systems Located in Germany and Australia
Marija Milosavljeva[1]
[1] Fronius International, Wels, Austria

3AV.1.37 PV Microinverters: Balcony Power Plants, Latest Efficiency Rankings, Yield Calculation for Overpowered Mini PV Systems
Stefan Krauter[1], Jörg Bendfeld[1]
[1] Paderborn University, Paderborn, Germany

3AV.1.38 Aging Behavior of Polymeric Materials Used in Inverter Casings
Eric Helfer[1], Petra Christöfl[1], Julia Petro[1], Margit Lang[1], Gernot Oreski[1]
[1] PCCL, Leoben, Austria

3AV.1.39 Performance of Arc Fault Circuit Interrupters in Photovoltaic Inverters Connected to Long DC Cables
Christof Bucher[1], Donat Hess[1], David Joss[1]
[1] BUAS, Burgdorf, Switzerland

3AV.1.40 Design of the Substring MPP Tracker
Patrick Mader[1], Sascha Eckerter[1], Rainer Merz[1]
[1] Karlsruhe University of Applied Sciences, Karlsruhe, Germany

VISUAL PRESENTATIONS 3AV.2

15:15 - 16:45 PV Modules Reliability: Components, Failure Mechanisms, Testing & Modelling

3AV.2.1 Impact of Climatic Conditions in Degradation Assessment of PV Modules Exposed to Extreme High UV Solar Radiation
Valentina Navarro[1], Patricio Valdivia-Lefort[1], Rodrigo Barraza[1]
[1] Federico Santa Maria Technical University, Santiago, Chile

3AV.2.2 PV Module Brush Abrasion Testing
Gerhard Mathiak[1], Nithin Sha[1], Prashanth Gabbadi[1], Yogesh Kumar[1], Afra Seentakath[1], Mark Mirza[2]
[1] DEWA R&D Center, Dubai, United Arab Emirates; [2] Fraunhofer ISC, Würzburg, Germany

3AV.2.3 Numerical Simulation for Comparison of PV Module Designs Based on Outdoor Data in Desert Climates
Matthias Pander[1], Bengt Jaeckel[1], Klemens Ilse[1], Amir A. Abdallah[2]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] QEERI HBKU, Doha, Qatar

3AV.2.4 Accelerated Degradation Test Using Damp-Heat of n-Type Crystalline Silicon Photovoltaic Modules
Tomihisa Tachibana[1], Katsuhiko Shirasawa[1], Katsuto Tanahashi[1]
[1] AIST, Koriyama, Japan

3AV.2.5 Impact of Modern Cell Geometries on Power and Energy Loss due to Cell Cracks
Aniket Shirgupe[1], Ahmad Hashem[2], Ralph Gottschalg[3]
[1] Hochschule Anhalt, Halle (Saale), Germany; [2] Hochschule Anhalt, Köthen, Germany; [3] Fraunhofer CSP, Halle (Saale), Germany

3AV.2.6 Approaching the Safety Limits for Powerful Modules
Nico J. Dekker[1], Gertjan J. de Graaf[1], Mark J. Jansen[1], Koen M. de Groot[1], Lenneke H. Slooff[2], Menno N. van den Donker[3], Gerard de Leede[3], Wouter van Strien[1], Tatjana Vavilkin[4], Stefan Dewallef[4], Peter Pasmans[5]
[1] TNO Solar Energy, Petten, The Netherlands; [2] TNO Energy Transition, Petten, The Netherlands; [3] Solarge, Weert, The Netherlands; [4] Soltech, Genk, Belgium; [5] Endurans, Urmond, The Netherlands

3AV.2.7 Performance Evaluation of the Custom-Made Small PV Modules After Exposure to Saudi Arabia's Climatic Conditions Over 10 Long Years
Amir Al-Ahmed[1], Amjad Ali[1], Mohammed A. Alghamdi[2], Osama Asker[2], Ridha Ben Mansour[1], Firoz Khan[1], Atif S. Alzahrani[1]
[1] KFUPM, Dhahran, Saudi Arabia; [2] Gulf Renewable Lab, Dammam, Saudi Arabia

3AV.2.8 Analyzing the Effect of Damp Heat Test on Various PV Module Technologies, A Comparative Study
Ahmad Alheloo[1], Ali Almheiri[1], Baloji Adothu[1], Gerhard Mathiak[1], Vivian Alberts[1]
[1] DEWA, Dubai, United Arab Emirates

3AV.2.9 Comparative Degradation Analysis of Emerging PV Module Technologies Undergoing Thermal Cycling
Ali Almheiri[1], Ahmad Alheloo[1], Baloji Adothu[1], Gerhard Mathiak[1], Vivian Alberts[1]
[1] DEWA, Dubai, United Arab Emirates

3AV.2.10 Assessment of Critical Laminate Temperatures Increase by Fast IR-based Analysis of Hot Spots on Solar Cells
Stephan Grosser[1], Matthias Schak[1], Stefan Eiternick[1], Bengt Jaeckel[1], Marko Turek[1]
[1] Fraunhofer CSP, Halle (Saale), Germany

3AV.2.11 Correlational Study on the Impact of Harsh Environment Stress Factors on the Ageing Effects of Several Encapsulation Materials for PV Modules
Tudor Timofte[1], Valentina Arias Reyes[2], Ignacia Maria Acevedo Devoto[1], Joachim Glatz-Reichenbach[1], Andreas Halm[1]
[1] ISC Konstanz, Konstanz, Germany; [2] Technical University Federico Santa Maria, Valparaiso, Chile

3AV.2.12 Determination of Environmental Factors Accelerating Degradation in Bifacial Modules Located in Santiago Including UVA, Uvb, Incident Radiation and Day-Night Temperature Variations.
Valentina Arias Reyes[1], Patricio Valdivia-Lefort[1], Iván González Echeverria[1], Rodrigo Barraza Vicencio[1]
[1] Federico Santa Maria Technical University, Santiago, Chile

3AV.2.13 Electrical Characterization of Fresh and Degraded Photovoltaic Backsheets Based on Temperature and Humidity-Dependent DC Conductivity
Anagha E R[1], Shrikrishna V Kulkarni[1], Narendra Shiradkar[1]
[1] IIT Bombay, Mumbai, India

3AV.2.14 Investigation of PV Module Degradation in Fixed and Single-axis Tracker in Hot Desert Climate
Baloji Adothu[1], Shahzada Pamir Aly[1], Afra Seentakath Puthiyapurayil[1], Kaushal Chapaneri[1], Gerhard Mathiak[1], Vivian Alberts[1]
[1] DEWA R&D Center, Dubai, United Arab Emirates

3AV.2.15 Experimental and Numerical Study of Glass Failure in a PV Module due to External Stresses
Kamal Harb[1], Zeina Hamam[2], Olivier Doucet[2], Jérémie Aime[2]
[1] ENS Paris Saclay, Gif-sur-Yvette, France; [2] INES, Le Bourget-du-Lac, France

3AV.2.16 Performance Degradation Analysis of Glass/Glass Poly C-Si Photovoltaic Modules in a Mediterranean Climate: Experimental Insights
Amina Chahtou[1], El Amin Kouadri Boudjelthia[1], Nasreddine Belhaouas[1]
[1] CDER, Algies, Algeria

3AV.2.17 Tackling The Fire Safety in Glass Free PV Modules
Nikolina Pervan[1], Sonja Feldbacher[1], Umang Desai[2], Antonin Faes[2], Christophe Ballif[2], Gernot Oreski[1]
[1] PCCL, Leoben, Austria; [2] EPFL, Neuchâtel, Switzerland

3AV.2.18 Investigating PV Module Packaging Mechanical Properties with Cross-sectional Nano-indentation
Stefan Mitterhofer[1], Soshana Smith[1], Stephanie L. Moffitt[1], Xiaohong Gu[1]
[1] NIST, Gaithersburg, United States of America

3AV.2.19 The Influence of the Configuration of TOPCon Technology Photovoltaic Modules on Resistance to Degradation in Damp Heat and Potential-Induced
Harison Santos[1], Hugo Alvarez[1], Eduardo Mendes[1], Rodrigo Garcia[1]
[1] BYD Energy do Brasil, Campinas, Brazil

3AV.2.20 Analysis and Material Modeling of Mechanical Property Degradation for Simulation of Weather Exposed Polymers
Julia Petro[1], Volker Reisecker[2], Eric Helfer[1], Gernot Oreski[1], Thomas Antretter[3], Margit Lang[1]
[1] Polymer Competence Center Leoben, Leoben, Austria; [2] TCKT, Wels, Austria; [3] Mining University Leoben, Leoben, Austria

3AV.2.21 Reliability Investigation of Structural Colour Interlayers for Coloured PV Modules
Markus Babin[1], Roberto Boccardi[1], Aliihsan Bagci[1], Nanna Lysgaard Andersen[1], Peter Behrensdorff Poulsen[1], Sune Thorsteinsson[1], Karlis Petersons[2], Leif Yde[2], Jan Stensborg[2], Catarina Ferreira[3], Joel Cox[3], Irina Vyalih[4], Morten Madsen[4]
[1] Technical University of Denmark, Roskilde, Denmark; [2] Stensborg, Roskilde, Denmark; [3] University of Southern Denmark, Odense, Denmark; [4] University of Southern Denmark, Sønderborg, Denmark

3AV.2.22 Diagnosing Potential Induced Degradation in Crystalline Silicon Photovoltaic Modules
Aysha Mahmood[1], Rodrigo del Prado Santamaria[1], Peter B. Poulsen[1], Sergiu V. Spataru[1]
[1] Technical University of Denmark, Roskilde, Denmark

3AV.2.23 Temperature and Humidity Environment Reliability Testing of Large Size PV Modules and Supporting Devices
San-Yu Ting[1], Huan-Wu Lu[1], Wei-Lun Yang[1], Min-An Tsai[1], Cho-Fan Hsieh[1]
[1] ITRI, Hsinchu, Taiwan

3AV.2.24 Measurements and Modelling of Mechanical Stress in PV Modules
Christoph Seiffert[1], Hallvard Fjær[1], Dag Lindholm[1], Sigurd Brattheim[1], Josefine Selj[1], Gaute Otnes[1]
[1] IFE, Kjeller, Norway

3AV.2.25 On-Site Evaluation of Oxygen-Plasma Treated Glass Surfaces for Anti-Soiling Properties
Brahim Aissa[1], Ayman Samara[2]
[1] QEERI, Doha, Qatar; [2] HBKU Core Laboratories, Doha, Qatar

3AV.2.26 On the Study of Degradation in Heterojunction Technology Solar Modules
Sung Hyun Kim[1], Hyunsoo Lim[1], Godeong Park[1]
[1] KETI, SeongNam-Si, South Korea

3AV.2.27 Performance, Abrasion Resistivity and Anti-soiling Testing of Innovative, Nanostructured Antireflection Coatings Under Controlled and Standardized Conditions
Charlotte Pfau[1], Guido Willers[1], Christos Allagiannis[2], Ioannis Arabatzis[2], Marko Turek[1]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] Nanophos, Lavrio, Greece

3AV.2.28 Study of Degradation at the Au/Perovskite Interface for Light Stability Analysis in Large-Area Perovskite Modules
Jiyeon Nam[1], Won-Kyu Lee[1], Da Seul Lee[2], Youngho Choe[1], Donghwan Kim[1], Hae-Seok Lee[1], Yoonmook Kang[1]
[1] Korea University, Seoul, South Korea; [2] Sungkyunkwan University, Suwon, South Korea

3AV.2.30 Development of Encapsulant-Less Crystalline Silicon Photovoltaic Modules and Their Durability Against Potential-Induced Degradation
Keisuke Ohdaira[1], Shuntaro Shimpo[1], Huynh Thi Cam Tu[1]
[1] JAIST, Ishikawa, Japan

3AV.2.31 Exploring Sodium-Related Salts for Insight into TOPCon Solar Cell Damp-heat Degradation
Xinyuan Wu[1], Xutao Wang[1], Yutong Wu[2], Hao Song[2], Ruirui Lv[2], Yuanjie Yu[2], Tao Xu[2], Muhammad Umair Khan[1], Alison Ciesla[1], Chandany Sen[1], Guangchun Zhang[2], Bram Hoex[1]
[1] UNSW, Sydney, Australia; [2] Canadian Solar, Suzhou, China

3AV.2.32 Potential-Induced Degradation in Perovskite Devices: A Comparison Between Cells and Modules in an Inert Environment
Robbe Breugelmans[1], Stijn Lammar[2], Aranzazu Aguirre[3], Tom Aernouts[3], Bart Vermang[1], Michaël Daenen[1]
[1] Hasselt University, Hasselt, Belgium; [2] KU Leuven, Leuven, Belgium; [3] Imec/imo-imomec, Genk, Belgium

3AV.2.33 Modelling the Moisture Ingress and Its Impact in PV Modules
Youri Blom[1], Daniel Jimenez Pelarda[1], Ismail Kaaya[2], Nikoleta Kyranaki[3], Olindo Isabella[1], Rudi Santbergen[1], Malte Ruben Vogt[1]
[1] TU Delft, Delft, The Netherlands; [2] imec, Genk, Belgium; [3] Hasselt University, Hasselt, Belgium

3AV.2.34 Identification of a Free Vibration and Natural Resonance of Solar Cells inside the Photovoltaic Module under the Laminated Glass/EVA Structure using a Laser Doppler Technique
Shota Matsushita[1], Kenji Araki[1], Yasuyuki Ota[1], Kensuke Nishioka[1]
[1] University of Miyazaki, Miyazaki, Japan

3AV.2.35 Evaluation of the Impact of the UV Excitation Intensity on the Ultraviolet Fluorescence Measurement System for Photovoltaics
Zonghan Jiang[1], Carlos Meza[1], Ralph Gottschalg[2]
[1] Hochschule Anhalt, Koethen, Germany; [2] Fraunhofer CSP, Halle (Saale), Germany

3AV.2.36 How to Mount your PV Modules: a Parametric Study of the Effect of Different Clamping Configuration on Mechanical Stresses in Framed PV Modules
Pascal Romer[1], Andreas J. Beinert[1], Charlotte Hasselblatt[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.2.37 Developing Highly Accelerated Stress Tests for PV Modules: A Detailed Comparison of the Pressure Cooker Test and the Damp Heat Test
Angelika Beinert[1], Johannes Erb[1], Paul Gebhardt[1], Daniel Philipp[1], Ingrid Haedrich[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.2.38 Developing Highly Accelerated Stress Test Sequences: UV + Damp Heat Test Compared to UV + Pressure Cooker Test
Angelika Beinert[1], Sumeet Mujumdar[1], Aksel Oez[1], Christine Wellens[1], Daniel Philipp[1], Ingrid Haedrich[1]
[1] Fraunhofer ISE, Freiburg, Germany

3AV.2.39 DIC as a Thermo-Mechanical Characterisation Method for the Inner Layers in a Multi-Layer PV Module Structure
Marta Casasola Paesa[1], Nikolina Pervan[2], Bin Luo[1], Gernot Oreski[2], Jonathan Govaerts[1], Jef Poortmans[1], Hariharsudan Sivaramakrishnan[1], Michaël Daenen[1]
[1] imec, Leuven, Belgium; [2] PCCL, Leoben, Austria

3AV.2.40 FMEA Based Degradation Rate Evaluation to Study Impact of Different Failure Modes as Function of Mission Profiles
Bengt Jaeckel[1], Baloji Adothu[2], Matthias Pander[1]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] DEWA, Dubai, United Arab Emirates

3AV.2.41 Manufacturing and Extended Damp Heat (DH) Degradation Analysis of Low-power Interconnected Back Contact (IBC) Photovoltaic Modules
Julia Vincent[1], Ali Khouzam[2], Pierre-Olivier Logerais[1], Fabien Delaleux[1], Olivier Riou[1], Mustapha Elyaakoubi[3]
[1] UPEC, Lieusaint, France; [2] ICAM, Lieusaint, France; [3] SOLEMS, Palaiseau, France

3AV.2.42 Numerical Simulation of the Bypass Diode Failure Resistance and Those Power Consumption in a Photovoltaic Solar Module with Failed Bypass Diode
Ibuki Kitamura[1], Toshiyuki Hamada[1], Ikuo Nanno[2], Norio Ishikura[3], Masayuki Fujii[4], Shinichiro Oke[5]
[1] Osaka Electro-Communication University, Osaka, Japan; [2] Ube College, Yamaguchi, Japan; [3] Yonago College, Tottori, Japan; [4] Oshima College, Yamaguchi, Japan; [5] Tsuyama College, Okayama, Japan

3AV.2.43 Polymer Additive Diffusion and the Impact on Encapsulant Reliability
Robert Heidrich[1], Marius Lüdemann[1], Anton Mordvinkin[1], Ralph Gottschalg[1]
[1] Fraunhofer CSP, Halle, Germany

3AV.2.44 Outdoor Performances and Reliability of Perovskite Solar Modules
Karim Medjoubi[1], Anne Migan Dubois[2], Thomas Guillemot[1], Johan Parra[3], Marion Provost[1], Nao Harada[1], Anyssa Derj[1], Armelle Yaiche[1], Dounya Barrit[4], Jean Baptiste Puel[1], Daniel Ory[1], Julie Goffard[1], Jordi Badosa[3], Jean Rousset[1], Jorge Posada[1]
[1] IPVF, Palaiseau, France; [2] Université Paris-Saclay, Gif-sur-Yvette, France; [3] Université Paris-Saclay, Palaiseau, France; [4] TotalEnergies, Paris la Defense, France

3AV.2.45 Impact of the Material Combination on the Barrier Properties and Their Stability in the Course of Accelerated Weathering
Daniel Schüsler[1], Patrick Wessel[1], Anton Mordvinkin[1]
[1] Fraunhofer CSP, Halle, Germany

3AV.2.46 Investigation of Thermo-Mechanical Behavior of Encapsulation Materials Used in Solar Panel Production
Umran Dilmac[1], Meric Caliskan[1], Yildirim Aydogdu[2]
[1] Kalyon PV, Ankara, Turkey; [2] Gazi University, Ankara, Turkey

3AV.2.47 Comparative Analysis of Indoor Simulated and Real Hail-Induced Damage on Photovoltaic Modules: A Study on Impact by Large Diameter Hailstones
Dominika Chudy[1], Mattia Ceretti[1], Ezio Cadoni[1], Daniele Forni[1], Giovanni Bellenda[1], Mauro Caccivio[1]
[1] SUPSI, Mendrisio, Switzerland

3AV.2.48 Naturally Induced Aging of Different c-Si Solar Cell Technologies and Encapsulate Materials by Harsh Environment with High UV Radiation Doses
Valentina Arias[1], Ignacia Devoto[2], Tudor Timofte[2], Valeria Reyes[1], Danilo Estay[1], Patricio Valdivia[1], Andreas Halm[2], Rodrigo Barraza[3]
[1] Federico Santa María Technical University, Santiago, Chile; [2] ISC Konstanz, Konstanz, Germany; [3] Adolfo Ibáñez University, Santiago, Chile

3AV.2.49 UV Exposure of Glass/Glass Coupons With Edge Seal and Different Encapsulants
Chiara Barretta[1], Lisa Meinhart[1], Andreas Brandstaetter[2], Dieter Geier[3], Roland Einhaus[3], Abdulkerim Gok[4], Gernot Oreski[1]
[1] PCCL, Leoben, Austria; [2] Lenzing Plastics, Lenzing, Austria; [3] ZSW, Stuttgart, Germany; [4] Gebze Technical University, Gebze, Turkey

3AV.2.50 Material Screening for the Development of a Photovoltaic Module Using Biodegradable Materials from Renewable Raw Materials
Matthias Pander[1], Ringo Koepge[1], Anton Mordvinkin[1], Bengt Jaeckel[1]
[1] Fraunhofer CSP, Halle (Saale), Germany

3AV.2.51 Analysis of Failures Modes in Road-Integrated Photovoltaic Modules Based on Measurements at Austrias First Road-Integrated PV System
Alexander Erber[1], Bernhard Grasel[1]
[1] University of Applied Sciences Vienna, Vienna, Austria

3AV.2.52 Effects of Encapsulant- Backsheet Combinations on Durability of Optical Properties
Jishnu Ramachandran Nair[1], Daniel Schuesler[1], Michael Wendt[1], Anton Mordvinkin[1]
[1] Fraunhofer CSP, Halle, Germany

3AV.2.53 PID Outdoor Measurements, a New Test Setup
Joerg Kirchhof[1]
[1] Fraunhofer IEE, Kassel, Germany

3AV.2.54 Coatings or tapes? Imaging Methods to Show the Successful Repair of Backsheet Cracks
Raffael Schifferegger[1], Yuliya Voronko[1], Anika Gassner[1], Gabriele C. Eder[1], Eric Tilly[2]
[1] OFI, Vienna, Austria; [2] ENcome Energy Performance, Klagenfurt, Austria

VISUAL PRESENTATIONS 3AV.3

17:00 - 18:30 PV Modules Performance: Testing, Modelling Techniques and Outdoor Performance

3AV.3.1 Enhanced Performance of PV Modules Using Hierarchically Structured Glass in Different Climatic Conditions
Cristina Leyre Pinto[1], Jaione Bengoechea[1]
[1] CENER, Sarriguren-Navarra, Spain

3AV.3.2 Developing a Simplified I-V Translation Methodology in Accordance with IEC 60891:2021 Correction Procedure 2
Wenhao Xu[1], Yating Zhang[1], Qi Gao[1], Christos Monokroussos[1], Harald Müllejans[2], Werner Herrmann[3], Giorgio Bardizza[3]
[1] TUV Rheinland, Shanghai, China; [2] European Commission, Ispra, Italy; [3] TUV Rheinland Solar, Cologne, Germany

3AV.3.3 Multispectral Photovoltaic Module Characterization by Simultaneous Daylight Photoluminescence and Infrared Thermography Inspection
Lukas Koester[1], Atse Louwen[1], David Moser[1]
[1] Eurac Research, Bolzano, Italy

3AV.3.4 Evaluation of the Glare Function of PV-Modules by Measuring Only the Cover Sheet
Wolfgang Nemitz[1], Roman Trattnig[1], Jakob Zehndorfer[2], Lukas Plessing[3]
[1] Joanneum Research, Weiz, Austria; [2] Zehndorfer Engineering, Klagenfurt, Austria; [3] TPPV, Wien, Austria

3AV.3.5 Analysis of Field Performance based on Solar Cell Design
Sung Ho Hwang[1], Yoonmook Kang[1], Dongchul Suh[2]
[1] Korea University, Seoul, South Korea; [2] Hoseo University, Chungnam, South Korea

3AV.3.6 Establishment of the Direct Sunlight Method for the Primary Calibration of Reference Solar Cells at PTB
Marcel Pastuschek[1], Ingo Kröger[1], Dirk Friedrich[1], Fatima Masic[2], Stefan Winter[1]
[1] PTB, Braunschweig, Germany; [2] Institute of Metrology of Bosnia and Herzegovina, Sarajevo, Bosnia

3AV.3.7 An Innovative Electrical-Thermal Model for Bifacial Photovoltaic Modules: Comprehensive Validation in Indoor and Outdoor Environments
Valentina González Becerra[1], Patricio Valdivia-Lefort[1], Rodrigo Barraza Vicencio[1]
[1] Federico Santa Maria Technical University, Santiago, Chile

3AV.3.8 High-Output Bifacial Shingled Solar Module Design: Solar Cell and Shingled Module Modeling Methods
Seung ah Ur[1], Jaehyung Lee[1]
[1] Sungkyunkwan University, Suwon, South Korea

3AV.3.9 A Data-Driven Calibration of the FEM Temperature Model with Wind Direction Input
Anastasios Kladas[1], Bert Herteleer[1], Jan Cappelle[1]
[1] KU Leuven, Leuven, Belgium

3AV.3.10 Using the Equivalent Cell Temperature for Power Matrix Calculations
Hanna Ellis[1], Harald Muellejans[1], Teodora Lybenova[1], Diego Pavanello[1], Ewan D. Dunlop[1]
[1] European Commission JRC, Ispra, Italy

3AV.3.11 A Gaussian Process Regression Model for a Time Series of IV Characteristics Under Varying Temperature and Irradiation Conditions
Timon Sebastian Vaas[1], Bart E. Pieters[1], Andreas Gerber[1], Evgenii Sovetkin[1], Uwe Rau[1]
[1] Forschungszentrum Jülich, Jülich, Germany

3AV.3.12 Performance Measurements of Photovoltaic Devices Under Indoor Standard Testing Conditions
George Koutsourakis[1], Daniel Parsons[1], Gregory Burwell[2], Stefan Zeiske[3], Ardalan Armin[2], Paul Meredith[2], James Blakesley[1]
[1] NPL, Teddington, United Kingdom; [2] Swansea University, Swansea, United Kingdom; [3] Northwestern University, Evanston, United States of America

3AV.3.13 Areal Cell Temperature Monitoring Using Array of In-laminate Integrated Sensors for Partial Shading Detection
Seyed Mojtaba Sadati Faramarzi[1], Georgi H. Yordanov[2], Arvid van der Heide[1], Jan Genoe[1], Jef Poortmans[1]
[1] imec, Leuven, Belgium; [2] KU Leuven, Leuven, Belgium

3AV.3.14 Maximum Power Output Predicting Algorithm of Solar Modules Based on Artificial Intelligence Technology
Ju-Hee Kim[1], Joonyoung Jeon[1], Yong Hyun Kim[1]
[1] KOPTI, Gwangju, South Korea

3AV.3.15 Estimation of the Transmission and Albedo of PV Modules and Their Impact on the Performance of the PV System
Oume Lgheit Rhazi[1], Julien Dupuis[1], Romain Bodeux[2], Geoffrey Rachinel[3]
[1] EDF R&D-TREE, Moret-sur-Loing, France; [2] EDF R&D-IPVF, Palaiseau, France; [3] EDF Renouvelables, Colombiers, France

3AV.3.16 A Parametric Approach for Estimation of PV Short-Circuit Current
Sergiu Mihai Hategan[1], Marius Paulescu[1]
[1] West University of Timisoara, Timisoara, Romania

3AV.3.17 Assessment of the Performance and Degradation of Photovoltaic Panels in a Brazilian Experimental Solar Power Plant
Pedro Antonio Assad Baracat[1], Kamal Abdel Radi Ismail[1], Fatima Aparecida de Morais Lino[1], Jean Marcos Andery Baracat[2], José Eduardo Bertuzzo[2], Wladinei Ricardo Camillo Menegassi[2], José Roberto Martins da Silva[2], Rodrigo Moreno Garcia[3], Harison Franca Santos[3]
[1] State University of Campinas, Campinas, Brazil; [2] Eldorado Research Institute, Campinas, Brazil; [3] BYD Energy Brazil, Campinas, Brazil

3AV.3.18 Power Matrix Validation of Long-Term Outdoor PV Field Data
Ismael Medina[1], Teodora Stoyanova Lyubenova[1], Ewan Dunlop[1]
[1] Joint Research Centre, Ispra, Italy

3AV.3.19 Modeling of Junction Temperature for Crystalline Silicon Photovoltaic Module
Zewen chen[1], Baojie Lv[1], Ling Li[1], Gang Lu[2], Hong Yang[1]
[1] Xi'an Jiaotong University, Xi'an, China; [2] PV Industrial Innovation Center of State Power Investment Corporation, Xi'an, China

3AV.3.20 Analysis of Measurement Reproducibility for Photovoltaic Modules under Outdoor Test Conditions
Gang Lu[1], Qian Yang[2], Xin Huang[3], Hong Yang[3]
[1] PV Industrial Innovation Center of State Power Investment, Xi'an, China; [2] Xi'an University of Technology, Xi'an, China; [3] Xi'an Jiaotong University, Xi'an, China

3AV.3.21 Data Acquisition and Monitoring of Photovoltaic Modules to Quantify the Effect of Radiative Cooling Coating
José Miguel Asensi[1], Joan Bertomeu[1], Regina Galceran[1], Julian López-Vidrier[1], Javier Achiaga[2], Antonio Onteniente[2], Alejandra Jacobo[2], Ares Llados[2], Neffer Gómez[2], Juliana Jaramillo[2]
[1] University of Barcelona, Barcelona, Spain; [2] Cooling Photonics, Barcelona, Spain

3AV.3.22 Comparison of Changes in the Parameters of Five PV Modules Types After One Year in the Swiss Jura Mountains
Christof Bucher[1], Matthias Burri[1], Fabio Panduri[1], Mauro Caccivio[2], Gabi Friesen[2]
[1] BFH, Burgdorf, Switzerland; [2] SUSPI, Mendrisio, Switzerland

3AV.3.23 A Comparative Study of TOPCon and PERC Photovoltaic Modules under Different Light Intensity Conditions
Baojie Lv[1], Zewen Chen[1], Ling Li[1], Gang Lu[2], Hong Yang[3]
[1] Xi'an Jiaotong University, Xi'an, China; [2] PV Industrial Innovation Center of State Power Investment, Xi'an, China; [3] Xi'an Jiaotong University, Xi'an, China

3AV.3.24 Exact IV Curve Extraction of Damaged PV-Strings from Outdoor EL-Images
Pascal Koelblin[1], Liviu Stoicescu[1], Michael Reuter[1]
[1] Solarzentrum Stuttgart, Stuttgart, Germany

3AV.3.25 Accurate Energy Performance Model for Bifacial PV Modules
Kristijan Brecl[1], Matevž Bokalič[1], Antonin Faes[2], Marko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia; [2] CSEM, Neuchâtel, Switzerland

3AV.3.26 Optimal Extraction of Pvsyst Pan File Parameters for Latest PV Cell Technologies Using Laboratory Measurements
Aditya Vichare[1], Gabi Friesen[2]
[1] University of Oldenburg, Oldenburg, Germany; [2] SUPSI, Mendrisio, Switzerland

3AV.3.27 Outdoor Characterization Protocol of Bifacial PV Modules for Agri-PV Application
Federico Andreozzi[1], Gianluigi Bovesecchi[1], Marcello Petitta[1], Cristina Cornaro[1]
[1] University of Rome Tor Vergata, Rome, Italy

3AV.3.28 Uncertainty Assessment in the Measurement of Solar Cells under Standard Test Conditions
Yating Zhang[1], Wenhao Xu[1], Qi Gao[1], Giorgio Bardizza[2], Werner Herrmann[2], Christos Monokroussos[1]
[1] TUV Rheinland, Shanghai, China; [2] TUV Rheinland Energy, Cologne, Germany

3AV.3.29 Stabilization of Field-Aged Crystalline PV Modules Before STC Power Determination
Soha Essbai[1], Marcus Rennhofer[1], Ankit Mittal[1], Gusztav Ujvari[1], Thomas Weber[2], Brian Azzopardi[3]
[1] Austrian Institute of Technology, Vienna, Austria; [2] PI Berlin, Berlin, Germany; [3] FIR Malta, Valetta, Malta

3AV.3.30 AC/DC Electroluminescence. The War of the Currents
Sergio Suarez[1], Jorge Lorenzo[1], Enrique Graña[1], Daniel Villoslada[1], Ignacio Fernandez[1], Sofia Rodriguez[1]
[1] Enertis Applus, Madrid, Spain

3AV.3.31 Evaluation of the Contact Quality in Silicon Solar Cells and Modules Using LBIC Phase Mapping
Majid Salari[1], Jonas Buddgård[2], Markus Rinio[1]
[1] Karlstad University, Karlstad, Sweden; [2] Sticky Solar Power, Stockholm, Sweden

3AV.3.32 Nomenclature and Description of EL Observations: Cell Cracks and Other Findings
Bengt Jaeckel[1], Paul Schenk[1], Matthias Pander[1], Aswin Linsenmeyer[2], Stephan Rupp[3], Jochen Kirch[4]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] SUNSET Solar, Adelsdorf, Germany; [3] Hanwha Q CELLS, Bitterfeld-Wolfen (Thalheim), Germany; [4] Ing.-Büro Jochen Kirch, Leeder, Germany

3AV.3.33 An Investigation on the Uncertainty of Fill Factor
Diego Pavanello[1], Tony Sample[1], Harald Müllejans[1]
[1] European Commission JRC, Ispra, Italy

3AV.3.34 A Verification and Correction Methodology for Spectroradiometers under Natural Sunlight
Diego Pavanello[1], Seonyong Park[2], Antonio Romano[3], Gianni Leanza[3], Edoardo Celi[4], Alessandro Minuto[4], Mauro Pravettoni[5], Shin Woei Leow[6], Flavio Valoti[7], Tobias Weigner[8], Kevin Murray[9]
[1] European Commission JRC, Ispra, Italy; [2] ESA, Nordwijk, The Netherlands; [3] ENEA, Portici, Italy; [4] RSE, Piacenza, Italy; [5] TII, Abu Dhabi, United Arab Emirates; [6] SERIS, Singapore, Singapore; [7] SUPSI, Mendrisio, Switzerland; [8] PVLAB, Potsdam, Germany; [9] Morth West Regional College, Derry, United Kingdom

3AV.3.35 Field Performance of BAPV System in Operation for 30 Years in Sweden
Emmanouil Psimopoulos[1], Frank Fiedler[1], André Augusto[1]
[1] Dalarna University, Falun, Sweden

3AV.3.36 Outdoor Power Characterization of Bifacial Photovoltaic Modules: Method Discussion and Validation
Anelise Medeiros Pires[1], Marília Braga[1], Matheus Hohmann[1], Eduardo Augusto Brunetoo[1], Ricardo Rüther[1]
[1] UFSC, Florianópolis, Brazil

3AV.3.37 Investigation of Two Types of Bifacial Solar Cells for Vertical PV Systems in Various Directions
Ji Woo Sohn[1], Solhee Lee[1], Hongjun Jang[1], SuBeom Hong[1], Mingun Kim[1], Sungho Hwang[1], Youngho Choe[1], Hae Seok Lee[1], Donghwan Kim[1], Yoonmook Kang[1]
[1] Korea University, Seoul, South Korea

3AV.3.38 Daylight Electroluminescence Inspection of PV Panels On-site vs. Traditional EL Inspection with Silicon Cameras
Luis Alberto Carpintero[1], Diego Gónzalez-Francés[2], Kabir Paul Sulca[2], Cristian Terrados[2], Carmelo de Castro[2], Victor Alonso[2], Míguel Ángel Gónzalez Rebollo[2], Oscar Mártinez[2]
[1] Cobra Instalaciones y Servicios, Valladolid, Spain; [2] University of Valladolid, Valladolid, Spain

3AV.3.39 Photovoltaic Module Array Luminescence Image Preprocessing: Heuristic Algorithms for Perspective Correction and Cell Segmentation
Brendan Wright[1], Ali Shakiba[1], Rama Sharma[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia

3AV.3.40 Optical Inspection Approach for In-Line Industrial Monitoring of Nano and Micrometric Layers Quality in Thin Film Photovoltaics Technologies
Robert Fonoll-Rubio[1], Victoria Rotaru[1], Lilley Govinda[2], Ginner Laurin[2], Alice Motschi[2], Pedro Vidal-Fuentes[1], Stefan Paetel[3], Krzysztof Stanik[4], Konrad Wojciechowski[4], Pierpaolo Spinelli[4], Ignacio Becerril-Romero[1], Victor Izquierdo-Roca[1], Maxim Guc[1]
[1] IREC, Sant Adria de Besos, Spain; [2] AIT, Vienna, Austria; [3] ZSW, Stuttgart, Germany; [4] Saule, Wroclaw, Poland

3AV.3.41 How and Why We Determine the Spectral Temperature Coefficient of PV Modules
Hendrik Sträter[1], Konstantin Ladner[1], Stefan Winter[1]
[1] PTB, Brunswick, Germany

3AV.3.42 Comparing Measured PV Module Power to Nameplate Values
Frank Weinrich[1], Stefan Riechelmann[1], Laura Stenzig[1], Stefan Winter[1]
[1] PTB, Braunschweig, Germany

3AV.3.43 Leveraging AI-software to Identify Microcracks in Solar Panels
Arthur Claire[1], Niclas Weimar[2], David Yilong[3]
[1] Sinovoltaics, Lausanne, Switzerland; [2] Sinovoltaics, Hong Kong, Hong Kong; [3] Sinovoltaics, Shanghai, China

3AV.3.44 Finding the Cell to Module Performance Values for Industrial TOPCon and HJT Technologies
Sraisth Sraisth[1], Djamel Eddine Mansour[1], Hardik Gohil[1], Mehul Raval[1], Wolfgang Jooss[1]
[1] RCT Solutions, Konstanz, Germany

3AV.3.45 The Impact of Module Degradation on the Economics of PV Projects
Harry Apostoleris[1], Baloji Adothu[1], Bengt Jaeckel[2], Gerhard Mathiak[1], Sgouris Sgouridis[1]
[1] DEWA, Dubai, United Arab Emirates; [2] Fraunhofer CSP, Halle, Germany

3AV.3.46 A Pilot Measurement and Verification Line for Building Integrated Photovoltaic (BIPV), Solar Thermal (ST) and Hybrid Photovoltaic/Thermal (PV/T) Systems Facing Efficiency and Safety Requirements
Olaia Aurrekoetxea-Arratibel[1], Nerea Otaño Aramendi[1], Susana Santamaria-Fernandez[1], Daniel Valencia-Caballero[2], Izaskun Alvarez-Alava[3], Inigo López-Villamor[3], Xabier Olano-Azkune[1]
[1] TECNALIA, Azpeitia, Spain; [2] Tecnalia, Donostia - San Sebastián, Spain; [3] TECNALIA, Derio, Spain

3AV.3.47 Outdoor Performance Assessment for PV Modules in High Radiation Environments
Robinson Cavieres[1], Felipe Valencia[1]
[1] ATAMOSTEC, Santiago, Chile

3AV.3.48 Analysis of Wire-interconnection Junction Characteristics in MBB Solar Strings
Seo Hee Hwang[1], Jae Hyeong Lee[1]
[1] Sungkyunkwan University, Suwon, South Korea

Tuesday, 24. September 2024

VISUAL PRESENTATIONS 2BV.1

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

2BV.1.1 Development of an Interdigitated Back-Contacted Solar Cell Architecture as a Platform to Assess Emerging Absorbers and New Selective Contacts
Juan de Dios Castillo[1], Gerard Masmitjà[1], Pau Estarlich[1], Pablo Ortega[1], Cristobal Voz[1], Oriol Segura[1], Edgardo Saucedo[1], Massoud Karimipour[2], Sonia Ruiz[2], Mónica Lira[2], Joaquim Puigdollers[1]
[1] UPC, Barcelona, Spain; [2] ICN2, Barcelona, Spain

2BV.1.2 Annealed Phosphorus-doped Amorphous Silicon Layers as Electron Selective Contact for Crystalline Germanium Thermophotovoltaic Cells
Gerard Rivera[1], Mansur Gamel[1], Gema López[1], Moisés Garín[2], Isidro Martín[1]
[1] UPC, Barcelona, Spain; [2] University of Vic, Vic, Spain

2BV.1.3 Two Years under the Weather: Post-Mortem Analysis of Quantum Dot-Based Luminescent Solar Concentrators
Raimon Terricabres-Polo[1], Thomas de Bruin[1], Annanta Kaul[1], Wilfried van Sark[1], Celso de Mello Donega[1]
[1] Utrecht University, Utrecht, The Netherlands

2BV.1.4 Damp Heat Test Characteristics of the Cu2O Top Cell for Highly Efficient Cu2O/Si Tandem Solar Cells
Atsushi Wada[1], Sara Yoshio[1], Soichiro Shibasaki[1], Naoyuki Nakagawa[1], Yuya Honishi[1], Yukitami Mizuno[1], Kodai Wakamatsu[1], Takashi Yamamoto[1], Motohiro Toyota[1], Yasutaka Nishida[1], Kanta Sugimoto[2], Junji Sano[2], Maho Hayase[2], Kazushige Yamamoto[1]
[1] Toshiba, Kawasaki, Japan; [2] Toshiba, Yokohoma, Japan

2BV.1.5 Evidence of Hot Carriers in Perovskite Solar Cells
Shashi Sourabh[1], Hadi Afshari[1], V. R. Whiteside[1], Giles Eperon[2], Madalina Furis[1], Matthew Beard[3], Ian Sellers[4]
[1] University of Oklahoma, Norman, United States of America; [2] Swift Solar, Santa Clara, United States of America; [3] NREL, Golden, United States of America; [4] University at Buffalo, Buffalo, United States of America

2BV.1.6 Hot Carrier Solar Cells: Phonon Management and Valley Photovoltaics
Kyle Dorman[1], Hamidreza Esmaielpour[2], Vincent Whiteside[1], David Ferry[3], Stephen Goodnick[3], Tetsuya Mishima[1], Michael Santos[1], Ian Sellers[4]
[1] University of Oklahoma, Norman, United States of America; [2] TUM, Munich, Germany; [3] Arizona State University, Tempe, United States of America; [4] University at Buffalo, Buffalo, United States of America

2BV.1.7 Harvesting Solar Energy Below Si Bandgap from Hot-Carrier Effect at Metal-Silicon Junction with 6% Efficiency Through Optimizing Inverted Pyramid Structure
Hsin-Ting Lin[1], Yu-Hsiang Hung[1], Ching-Fuh Lin[1]
[1] NTU, Taipei, Taiwan

2BV.1.8 Estimating the Photovoltaic Potential of Iron Disulfide Thin Films
Awais Zaka[1], Saeed Alhassan[1], Ammar Nayfeh[1]
[1] Khalifa University, Abu Dhabi, United Arab Emirates

2BV.1.9 Effect of Heating Spin Coated Graphene for the Application as Transparent Conductive Electrodes in Solar Cells
Wafa Alnaqbi [1], Ayman Rezk[1], Shanavas Shajahan[1], Yarjan Abdul Samad[1], Ammar Nayfeh[1]
[1] Khalifa University, Abu Dhabi, United Arab Emirates

2BV.1.10 Sensitization of Crystalline Silicon with Organic Dye Molecules
Lukáš Gdula[1], Branislav Dzurňák[1], Tom Markvart[2]
[1] Czech Technical University in Prague, Prague, Czech Republic; [2] University of Southampton, Southampton, United Kingdom

2BV.1.11 Self-Organized Films of Carbazole Derivatives on Structured Silicon Substrates for Photovoltaic Application
Sergii Mamykin[1], Daria Kuznetsova[1], Nina Roshchina[1], Petro Smertenko[1], Saulius Grigalevicius[2], Gintare Krucaite[2], Raminta Beresneviciute[2], Simona Sutkuviene[3]
[1] V. Lashkaryov Institute of Semiconductor Physics NAS Ukraine, Kyiv, Ukraine; [2] Kaunas University of Technology, Kaunas, Lithuania; [3] Lithuanian University of Health Sciences, Kaunas, Lithuania

2BV.1.12 Research on Placement Angles for Luminescent Solar Concentrators: Simulating and Experimenting with Bifacial Photovoltaic Mosaic Devices
Xitong Zhu[1], Frits Reijners[1], Michael Debije[1], Angèle H.M.E Reinders[1]
[1] Eindhoven University of Technology, Eindhoven, The Netherlands

2BV.1.13 Effect of Annealing Temperature on Structural and Morphological Properties of AgBiS2
Ana Paula de M. M. Modesto[1], Maria Eduarda Suekuni[1], Victor Henrique Silva[1], Caio César Coelho Tavares[1], Tarcio A. S. Barros[1], Francisco das Chagas Marques[1]
[1] UNICAMP, Campinas, Brazil

2BV.1.14 Deposition of Bi2S3-Sb2S3 Thin Films via Close-Spaced Sublimation
Mykhailo Koltsov[1], Nicolae Spalatu[1], Daria Miliaieva[1], Atanas Katerski[1], Raitis Grzibovskis[2], Aivars Vembris[2], Malle Krunks[1], Ilona Oja Acik[1]
[1] Tallinn University of Technology, Tallinn, Estonia; [2] University of Latvia, Riga, Latvia

2BV.1.15 NiTiO3 Based Highly Stable Heterojunction for Photovoltaic and Hydrogen Generation Applications
Nikita Chaudhary[1], Kaushik Ghosh[1]
[1] Institute of Nanoscience and Technology, Mohali,Punjab, India

2BV.1.17 Low-Emissive ITO for High-Vacuum Photovoltaic-Thermal Application
Daniela De Luca[1], Umar Farooq[2], Paolo Strazzullo[2], Eliana Gaudino[1], Antonio Caldarelli[1], Marilena Musto[2], Roberto Russo[1], Emiliano Di Gennaro[2]
[1] National Research Council of Italy, Naples, Italy; [2] University of Naples Federico II, Naples, Italy

2BV.1.18 Examination and Characterization of Thin Films of Cu2Fe0.5Co0.5SnS4 Produced using the Sol-Gel Technique, Excluding the Sulfurization Process
Safia Drissi[1], Abdelkader El Kissani[1], A. Abali[1], D. Ait Ihaj[1], Said Elmassi[1], Mohammed Bousseta[1], Lahoucine Amiri[1], Lahcen Nkhaili[1], Kassem El Assali[1], Abdelkader Outzourhit[1]
[1] Cadi Ayyad University, Marrakesh, Morocco

2BV.1.19 Structural, Phonon, and Optical Characterizations of Hafnium Oxynitride Thin Films for Hot Carrier Properties
Ayush Pratik[1], Gavin J. Conibeer[1], Santosh Shrestha[1]
[1] UNSW, Sydney, Australia

2BV.1.20 Low-emissive Molybdenum doped ITO for High-Vacuum Photovoltaic-Thermal Application
Umar Farooq[1], Eliana Gaudino[1], Daniela De Luca[1], Antonio Caldarelli[1], Paolo Strazzullo[1], Emiliano Di Gennaro[1], Marilena Musto[1], Roberto Russo[1]
[1] University of Naples Federico II, Naples, Italy

2BV.1.26 Optimizing Solar Simulator Spectrum for Accurate Efficiency Measurements of Perovskite Photovoltaics
Blago Mihaylov[1], Harald Muellejans [1], Tony Sample[1], Ewan Dunlop[1]
[1] European Commission JRC, Ispra, Italy

2BV.1.27 Optimization of a Planar Perovskite Solar Cell Layer Thicknesses: Optical and Electrical Effects
Aleksi Kamppinen[1], Kati Miettunen[1]
[1] University of Turku, Turku, Finland

2BV.1.28 Photoluminescence Imaging of Perovskite Solar Cells in Full Sunlight
Zhiwen Zheng[1], Felix Gayot[1], Juergen Weber[1], Yan Zhu[1], Ziv Hameiri[1]
[1] UNSW, Sydney, Australia

2BV.1.29 Analysis of Color Alteration as a Novel Degradation Assessment Method for Perovskite Solar Cells
Rustem Nizamov[1], Aapo Poskela[1], Mahboubeh Hadadian[1], Maryam Esmaeilzadeh[1], Mikael Nyberg[1], Kati Miettunen[1]
[1] University of Turku, Turku, Finland

2BV.1.30 Statistical Model of Outdoor Perovskite Performance
Petra Manshanden[1], Martin Späth[1], Mark Jansen[1], Valerio Zardetto[2], Arantxa Aguirre[3], Valerie Depauw[3], Mina Heydarian[4], Juliane Borchert[4]
[1] TNO, Petten, The Netherlands; [2] TNO, Eindhoven, The Netherlands; [3] imec, Genk, Belgium; [4] Fraunhofer ISE, Freiburg, Germany

2BV.1.31 TCAD Simulation of Graphene/Silicon Schottky Junction Solar Cells: Effect of Doping and Workfunciton
Syed Usama Bin Afzal [1], Wafa Alnaqbi [1], Ayman Rezk [1], Ammar Nayfeh[1]
[1] Khalifa University, Abu Dhabi, United Arab Emirates

2BV.1.32 Characterization and Degradation of Perovskite Mini-Modules
Rita Ebner[1], Ankit Mittal[1], Gusztav Ujvari[1], Maria Hadjipanayi[2], Vasiliki Paraskeva[2], George E. Georghiou[2], Afshin Hadipour[3], Aranzazu Aguirre[4], Tom Aernouts[4], Thommaso Fontanot[5], Sabrina Pechmann[5], Silke Christiansen[5], Valerio Zardetto[6]
[1] AIT Austrian Institute of Technology, Vienna, Austria; [2] University of Cyprus, Nicosia, Cyprus; [3] Kuwait University, Kuwait, Kuwait; [4] imec, Genk, Belgium; [5] IKTS, Forchheim, Germany; [6] TNO, Eindhoven, The Netherlands

2BV.1.33 Triple-Junction Solar Cells: Sub-Cell IV Curve and Current Matching Point Analysis
Alexander J. Bett[1], Johanna Aulich[1], David Chojniak[1], Maryamsadat Heydarian[1], Oliver Fischer[1], Marc Steiner[1], Florian Schindler[1], Gerald Siefer[1], Jan Christoph Goldschmidt[2], Martin C. Schubert[1], Stefan W. Glunz[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Philipps University of Marburg, Marburg, Germany

2BV.1.34 Subcell Resolved Electroluminescence Imaging of Monolithic Perovskite/Silicon Tandem Solar Cell for High Throughput Characterization
Ivanol Jaurece Djeukeu[1], Klaus Ramspeck[1], Jonas Horn[1], Michael Meixner[1], Enno Wagner[2], Stefan Glunz[3]
[1] halm elektronik, Frankfurt, Germany; [2] Frankfurt University of Applied Sciences, Frankfurt, Germany; [3] Fraunhofer ISE, Freiburg, Germany

2BV.1.35 A Case Study of Certainly I-V Measurement of the Perovskite Solar Cell under Dim Light Intensity for Solar/ Indoor Lighting Application
Yean-San Long[1], Min-An Tsai[1], Hsin-Hsin Hsieh[1], Teng-Chun Wu[1], Fan-Hsuan Yeh[2]
[1] ITRI, Hsinchu, Taiwan; [2] Taipei First Girls High School, Taipei, Taiwan

2BV.1.36 Optical Characterization and Prediction with Neural Network Modeling of Various Stoichiometries of Perovskite Materials Using a Hyperregression Method
Soo Min Kim[1], Syed Dildar Haider Naqvi[2], Min Gu Kang[2], Hee-eun Song[2], SeJin Ahn[2]
[1] GERI, Gumi, South Korea; [2] KIER, Daejeon, South Korea

2BV.1.37 An ANN Model for Predicting the Effect of Solar Spectrum Variation on Tandem Solar Cell Current
Shilpi Shital[1], A. R. Burgers[2], Petra Manshanden[2], L. J. Geerligs[2], V. Zardetto[2], Neeraj Bokde[1], G. Coletti[3]
[1] TII, Abu Dhabi, United Arab Emirates; [2] TNO, Petten, The Netherlands; [3] UNSW, Sydney, Australia

2BV.1.38 Towards Digital Twins by One-Dimensional Simulation of Thin-Film Solar Cells on the Example of Cu(In,Ga)Se2
Matthias Maiberg[1], Chang-Yun Song[1], Marcin Morawski[1], Felix Neduck[1], Joshua Damm[1], Heiko Kempa[1], Dimitrios Hariskos[2], Wolfram Witte[2], Roland Scheer[1]
[1] Martin-Luther-University Halle-Wittenberg, Halle, Germany; [2] ZSW, Stuttgart, Germany

2BV.1.39 Perovskite Solar Cell Light-Soaking and Relaxation Modelling for Improved Energy Yield Predictions in Indoor Environments
Matija Pirc[1], Špela Tomšič[1], Marko Jošt[1], Marko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia

2BV.1.40 Loss Analysis of a Perovskite/Perovskite/Si
Luis Restat[1], Christoph Messmer[1], Maryamsadat Heydarian[2], Minasadat Heydarian[2], Jonas Schoen[1], Martin C. Schubert[2], Stefan W. Glunz[1]
[1] University of Freiburg, Freiburg, Germany; [2] Fraunhofer ISE, Freiburg, Germany

2BV.1.41 Modelling the Effects of Tandem Module Circuit Configurations
Daniel Tune[1], Ignacia Devoto[1], Ahmer A.B. Baloch[2], Bhaskar Parida[2], Vivian Alberts[2], Omar Albadwawi[2], Karl Wienands[1], Andreas Halm[1]
[1] ISC Konstanz, Konstanz, Germany; [2] DEWA Research & Development Center, Dubai, United Arab Emirates

2BV.1.42 Understanding the Fill Factor Losses in Monolithic Perovskite-Si Tandem Solar Cells
Deniz Turkay[1], Daniel A. Jacobs[2], Christophe Ballif[1], Christian M. Wolff[1]
[1] EPFL, Neuchâtel, Switzerland; [2] CSEM, Neuchâtel, Switzerland

VISUAL PRESENTATIONS 2BV.2
10:30 - 12:00 Compound and Organic Semiconductors

2BV.2.1 Strain-Relaxation Analysis during Temperature Drop Process after Growth of GaAs/Si Hetero-Structure
Nobuaki Kojima[1], Yuito Yasukochi[1], Yoshio Ohshita[1]
[1] Toyota Technological Institute, Nagoya, Japan

2BV.2.2 Thermomechanical Stress Concentration in the Vicinity of Wires or Ribbons in Silicon Modules for Space Applications
Louis Perrotin[1], Jean-Baptiste Charpentier[1], Romain Cariou[1], Clément Jamin[1]
[1] Univ. Grenoble Alpes, CEA-INES, Le Bourget du Lac, France

2BV.2.3 Investigation on Radiation Resistance of GaInP/GaInAs/Ge Quantum Well Solar Cells
Wenyi Yang[1], Zimin Chen[1], Xiaobin Zhang[2], Gang Wang[1]
[1] Sun Yat-sen University, Guangzhou, China; [2] Zhongshan Uniwatt Technology, Zhongshan, China

2BV.2.4 Comparison of SnO2 and CdSe Buffer Layers for Sb2Se3 Thin Film Solar Cells
Narges Torabi[1], Mariyam Mukhtar[1], Elisa Artegiani[1], Simya Olavil Karayi[1], Ikram Anefnaf[1], Romain Carron[2], Alessandro Romeo[1]
[1] University of Verona, Verona, Italy; [2] EMPA, Dübendorf, Switzerland

2BV.2.5 Remote-Plasma CVD as a New Process for III-V Thin Films Growth
Lise Watrin[1], François Silva[2], Cyril Jadaud[2], Pavel Bulkin[2], Jean-Charles Vanel[2], Erik V. Johnson[2], Karim Ouaras[2], Pere Roca i Cabarrocas[1]
[1] IPVF, Palaiseau, France; [2] LPICM, Palaiseau, France

2BV.2.6 PECVD Grown Germanium Thin Films for Multijunction Solar Cell Applications
Paula Perez-Rodriguez[1], Devansh Sharma[1], Shubham Litke[1], Arno H. M. Smets[1]
[1] TU Delft, Delft, The Netherlands

2BV.2.7 Post-Growth Annealing Approaches for Antimony Selenide Solar Cells
Daniya Sindi[1], Thomas Shalvey[1], Jonathan Major[1]
[1] University of Liverpool, Liverpool, United Kingdom

2BV.2.8 Improvement of the Efficiency of Ingap/Gaas Double Junction Solar Cell Bonded on Si Substrate by Optimizing Annealing Treatment Process
Hyo Jin Kim[1], Gwang Yeol Park[1], Woo Yong Jeong[1]
[1] Photonics Energy Materials Research Center, Gwangju, South Korea

2BV.2.9 Modeling and Mmeasurement of Lumped Series Resistance with Varying Illumination and Current Condition of Low-Bandgap Solar Cells
Shipei Zhang[1], Xiawa Wang[1]
[1] Duke Kunshan University, Kunshan, China

2BV.2.10 Innovative Rear Interface Designs to Scale Down (A)CIGS Absorber
André F. Violas[1], António J.N. Oliveira[1], Enzo Ribeiro[1], Paulo A. Fernandes[1], Pedro M.P. Salomé[1], Jennifer P. Teixeira[1]
[1] INL, Braga, Portugal

2BV.2.11 Color Implementation of Cu(In,Ga)Se2 Thin-film Solar Cells with Multilayered Conductive Optical Filters
Yong-Duck Chung[1], Dae-Hyung Cho[1], Rina Kim[1], Woo-Jung Lee[1], Tae-Ha Hwang[1], Soyoung Lim[1], Donghyeop Shin[2], Kihwan Kim[2], Mangu Kang[1]
[1] ETRI, Daejeon, South Korea; [2] KIER, Daejeon, South Korea

2BV.2.12 Boosting the CISe Solar Cell Performance through K-Soaking Method: A Novel Post-Deposition Treatment
Temujin Enkhbat[1], Hyun-Beom Shin[2], Ho Kwan Kang[2], Seongju Park[1], Jaehyung Jang[1]
[1] KENTECH, Naju, South Korea; [2] Korea Advanced Nano Fab Center, Suwon, South Korea

2BV.2.13 Effects of NaF Co-Evaporation on the Optoelectronic Properties of Cu(In,Ga)S2 for Wide Bandgap Thin Film Solar Cells
Arivazhagan Valluvar Oli[1], Kulwinder Kaur[1], Michele Melchiorre[1], Susanne Siebentritt[1]
[1] University of Luxembourg, Belvaux, Luxembourg

2BV.2.14 Environmentally Friendly Methods for Silver Particles Recovery from CIGS Solar Cells Using Ultrasounds
Ioanna Teknetzi[1], Burcak Ebin[1]
[1] Chalmers University of Technology, Gothenburg, Sweden

2BV.2.15 Bottom-Up Grown CISe Micro Absorber Arrays: Microstructure Analysis and Solar Cell Integration
Jan Lucassen[1], Setareh Zahedi-Azad[2], Heike Voss[3], Tristan Koehler[1], Ihab Kardosh[1], Owen Ernst[2], Sonja Cinque[3], Jörn Bonse[3], Jörg Krüger[3], Torsten Boeck[2], Jens Martin[2], Martina Schmid[1]
[1] University of Duisburg-Essen, Duisburg, Germany; [2] Leibniz Institute for Crystal Growth, Berlin, Germany; [3] BAM, Berlin, Germany

2BV.2.16 Custom-Art: Kesterite Thin Film Technologies for Next Generation Customized PV Integration
Alejandro Pérez-Rodríguez[1], Pedro Vidal-Fuentes[1], Jacob Andrade-Arvizu[1], Yuancai Gong[2], Alex Jimenez-Arguijo[2], Edgardo Saucedo[2], Maarja Grossberg-Kuusk[3], Romain Scaffidi[4], Guy Brammertz[5], Bart Vermang[5], G. Larramona[6], C. Choné[6], Dieter Meissner[7], Kaia Ernits[8], Martin Vetter[7], C. Spudat[7], Levent Gütay[9], Susan Schorr[10], Jonathan Scragg[11], Alberto Mittiga[12], Romain Carron[13], S. Resalati[14], Lionel Tenchine[15], E. Moscardini[16], Andreas Zimmermann[17], M. Olive[18], P. Schiestl[19], R. Gutierrez[20]
[1] IREC, Sant Adrià de Besòs, Spain; [2] UPC, Barcelona, Spain; [3] Tallinn University of Technology, Tallinn, Estonia; [4] UCLouvain, Louvain-la-Neuve, Belgium; [5] imec, Diepenbeek, Belgium; [6] IMRA Europe, Sophia Antipolis Cedex, France; [7] Crystalsol, Vienna, Austria; [8] Crystalsol, Tallinn, Estonia; [9] Carl von Ossietzky University of Oldenburg, Oldenburg, Germany; [10] HZB, Berlin, Germany; [11] Uppsala University, Uppsala, Sweden; [12] ENEA, Rome, Italy; [13] EMPA , Dübendorf, Switzerland; [14] Brookes University, Oxford, United Kingdom; [15] Industrial Technical Center for Plastics and Composites, Bellignat, France; [16] Ecorecycling, Rome, Italy; [17] Sunplugged, Wildermieming, Austria; [18] RESCOLL, Bordeaux, France; [19] KWS, Linz, Austria; [20] Ayesa, Sevilla, Spain

2BV.2.17 Flexible Thin-Film CZTS Solar Cell based on an Electroplated Metallic Precursor Deposited on a Molybdenum/Glass Coated Stainless Steel Foil
Io Mizushima[1], Peter Torben Tang[1], Christoph Kammerlander[2], Andreas Zimmermann[2]
[1] IPU, Virum, Denmark; [2] Sunplugged, Affenhausen, Austria

2BV.2.18 Cd-free Buffer Layers for Kesterite Solar Cells
Yudania Sánchez[1], Gustavo Álvarez[1], Alex Jimenez-Arguijo[1], Yuancai Gong[1], Edgardo Saucedo[2], Alejandro Pérez Rodríguez[1]
[1] IREC, Barcelona, Spain; [2] UPC, Barcelona, Spain

2BV.2.19 Improvement of Optical Properties of CZTSSe-Based Solar Cells and Photocathode Devices via Cadmium Doping
Suyoung Jang[1], Jin Hyeok Kim[1]
[1] Chonnam National University, Gwangju, South Korea

2BV.2.20 Investigation of Cu2ZnSn(S,Se)4 Solar Cells Fabricated Through Aqueous Non-Vacuum Spray Deposition
Ikram Anefnaf[1], Simya O.K.[1], Elisa Artegiani[1], Narges Torabi[1], Mariyam Mukhtar[1], Alessandro Romeo[1]
[1] University of Verona, Verona, Italy

2BV.2.21 Impact of Lithium as Interfacial Treatment for CZTSSe Solar Cells
Simya O.K.[1], Ikram Anefnaf[1], Elisa Artegiani[1], Narges Torabi[1], Mariyam Mukhtar[1], Alessandro Romeo[1]
[1] University of Verona, Verona, Italy

2BV.2.22 Unveiling Performance Limits in the Scale-Up of CZTSe Solar Cells: A Spectroscopic Big Data Investigation
Pedro Vidal-Fuentes[1], Fabien Atlan[1], Jacob Andrade-Arvizu[1], David Payno[1], Robert Fonoll-Rubio[1], Alejandro Pérez-Rodríguez[2], Ignacio Becerril-Romero[1], Maxim Guc[1], Victor Izquierdo-Roca[1]
[1] IREC, Sant Adria de Besos, Spain; [2] University of Barcelona, Barcelona, Spain

2BV.2.23 Manufacturing, Characterisation and Stability Tests of Printed Organic Photovoltaic Devices for Indoor Applications
Ignacio Ballesteros Garcia[1], Donia Fredj[2], Carmen M Ruiz Herrero[1], Hasan Alkhatib[2], Sadok Ben Dkhil[2], Judikaël Le Rouzo[1], Jörg Ackermann[1]
[1] CNRS, Marseille, France; [2] Dracula Technologies, Valence, France

2BV.2.24 Sustainable Solvent Selection for Greener OPVs: A Reduced Carbon Footprint Approach through Terpenes
Daniel Corzo[1], Derya Baran [2], Jurgen Kosel[1]
[1] SAL, Villach, Austria; [2] KAUST, Thuwal, Saudi Arabia

2BV.2.25 Side Chain Modifications of Non-fullerene Acceptors for Increased Permittivity and Improved Non-halogenated Solvent Processability for Organic Solar Cells
Peter Fürk[1], David Paarhammer[1], Suman Mallick[1], Jana Schaubeder[1], Matiss Reinfleds[1], Thomas Rath[1], Gregor Trimmel[1]
[1] Graz University of Technology, Graz, Austria

2BV.2.26 Selective Area Epitaxy to Improve Performances of Zn3P2/InP Heterojunction Solar Cell
Raphaël Lemerle[1], Melanie Micali[2], Marina Bal López[2], Valerio Piazza[1], Thomas Hagger[1], Didem Dede[1], Esther Alarcón Lladó[2], Anna Fontcuberta i Morral[1]
[1] EPFL, Lausanne, Switzerland; [2] AMOLF, Amsterdam, The Netherlands

2BV.2.27 Crystal Structure and Electronic Properties of Cu2CdxZn1−xSnS4 Thin Films
Marin Rusu[1], Galina Gurieva[1], Sergiu Levcenko[1], Leonid Bruc[2], Nicolai Curmei[2], Lazari Dermenji[2], Thomas Unold[1], Ernest Arushanov[2], Susan Schorr[1]
[1] HZB, Berlin, Germany; [2] Moldova State University, Chisinau, Moldova

2BV.2.28 Analyses of Cd(Te,Se) Thin Film Solar Cells with Different Selenium Gradients
Olaf Zywitzki[1], Thomas Modes[1], Sagar Baitule[2], Bettina Späth[2], Bastian Siepchen[2]
[1] Fraunhofer FEP, Dresden, Germany; [2] CTF Solar, Dresden, Germany

2BV.2.29 Study of Ultra-Thin Cadmium Telluride Solar Cells
Mariyam Mukhtar[1], Elisa Artegiani[1], Narges Torabi[1], Ikram Anefnaf[1], Simya O.K.[1], Jessica Jazmine Nicole Barrantes[1], Matteo Meneghini[1], Alessandro Romeo[1]
[1] University of Verona, Verona, Italy

2BV.2.30 Fabrication of Highly Efficient Cdsete/Cdte Thin Film Solar Cells With Emitter-Less Cell Structure
Yanbo Cai[1], Hongxu Jiang[1], Kai Yi[1], Fei Liu[1], Guangwei Wang[1], Deliang Wang[1]
[1] University of Science and Technology of China, Hefei, China

2BV.2.32 Navigating the Challenges of Establishing a Competitive Organic Photovoltaic Industry in Europe
Thomas Kolbusch[1]
[1] Coatema Coating Machinery, Dormagen, Germany

2BV.2.33 Enhancing Crystal Growth in Low Temperature Process with Ag Doped CuInSe2 Solar Cells for Bi-Facial Structure
Dong-Hwan Jeon[1], Ali Amanat[1], Jae-Baek Lee[1], Shi-Joon Sung[1], Dae-Kue Hwang[1], Dae-Hwan Kim[1]
[1] DGIST, Daegu, South Korea

2BV.2.34 Photovoltaic Performances of Dye-Senitized Solar Cells based on Heavy-Atom-Free Materials
Mi-Ra Kim[1], Sungsoo Park[1], Songyi Lee[2]
[1] Dong-Eui University, Busan, South Korea; [2] Pukyong National University, Busan, South Korea

2BV.2.35 1.87 eV GaInP Photovoltaic Module for Indoor Light Energy Harvesting
Yasushi Shoji[1], Kikuo Makita[2], Takeyoshi Sugaya[2]
[1] National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan; [2] AIST, Tsukuba, Japan

2BV.2.36 Air Processed Asymmetric Squaraine Dyes for Photovoltaic Application
Vilko Mandić[1], Floren Radovanović-Perić[1], Thomas Rath[2], Dragana Vuk[1]
[1] University of Zagreb, Zagreb, Croatia; [2] Graz University of Technology, Graz, Austria

VISUAL PRESENTATIONS 4BV.3
13:30 - 15:00 Operation, Performance and Maintenance of PV Systems

4BV.3.1 In-Situ Maintenance-Free Measurement of Soiling-Induced Power Losses in PV Arrays
Michael Gostein[1], Damien Cosme[2], Quentin Berthet-Rayne[2], Julien Chapon[3], Josh Horst[1], Brahim Aïssa[4], Benjamin Figgis[4], Juan Lopez-Garcia[4], Veronica Bermudez Benito[4]
[1] Atonometrics, Austin, United States of America; [2] TotalEnergies, Doha, Qatar; [3] TotalEnergies, Paris, France; [4] QEERI, Doha, Qatar

4BV.3.3 Improving Performance Ratio Calculations through Optimizing Front POA Irradiance Sensor Positioning
Marc A. N. Korevaar[1], Shuo Wang[2], Damon Nitzel[1]
[1] OTT Hydromet, Delft, The Netherlands; [2] TUAS, Turku, Finland

4BV.3.4 Quantification of Degradation Reduction due to Enhanced PV Module Cooling in Floating PV Systems
Marit S. Ulset[1], Torunn Kjeldstad[1], Josefine Selj[1], Dag Lindholm[1], Gaute Otnes[1]
[1] IFE, Kjeller, Norway

4BV.3.5 A Sudy on the Fault-Type Diagnosis Algorithm for Photovoltaic System using Cross Verification Method
Min-Jae Oh[1], Jung-Min Moon[1], Ju-Hee Kim[1], Young-Ah Park[1], Minkook Kim[1], Joonyoung Jeon[1], Changheon Kim[1], Yong Hyun Kim[1], Myungwoo Son[1]
[1] Korea Photonics Technology Institute, Gwangju, South Korea

4BV.3.6 A Method for Detecting PV Module's Degradation Due to Increased Local Resistance in Power Plant
Tohru Kohno[1], Jun Tsunoda[1]
[1] Hitachi, Tokyo, Japan

4BV.3.7 Comparative Performance Study between Single Axis Tracker and Fixed Tilt Solar PV Systems on a Hot Climate near Coastal Area in Oman
Mazin Al Shidhani[1], Waleed Al Washahi[1], Abbas Al Lawati[1], Hamed Al Hashmi[1], Mohamed Al Busaidi[1], Habib Abdulkhaliq[1]
[1] Petroleum Development Oman, Muscat, Oman

4BV.3.8 Dependence of Series Resistance on Ideality Factor and Shunt Resistance in Online Photovoltaic Module Parametric Identification
Heidi Kalliojärvi[1], Kari Lappalainen[1]
[1] Tampere University, Tampere, Finland

4BV.3.9 Predictive Maintenance and Anomaly Detection Analytics for Utility-Scale Photovoltaic Plants
Jesus Montes-Romero[1], Nino Heinzle[2], Andreas Livera[3], George Makrides[3], Juergen Sutterlueti[2], Steve Ransome[4], George E. Georghiou[3]
[1] University of Jaen, Jaen, Spain; [2] Gantner Instruments, Schruns, Austria; [3] University of Cyprus, Nicosia, Cyprus; [4] Steve Ransome Consulting, Kingston upon Thames, United Kingdom

4BV.3.10 Underwater Structures Inspection and Aquatic Organism Attachment Stability Analysis of Nearshore Floating Photovoltaic
Hyunsik Jo[1], Jieun Lee[1], Jungi Jung[1], Changsub Won[2]
[1] K-water, Daejeon-Si, South Korea; [2] Konkuk University, Seoul-Si, South Korea

4BV.3.11 Analysis of PV Module Failure and Power Degradation in Floating Photovoltaic
Jieun Lee[1], Hyunsik Jo[1], Jungi Jeong[1], Wonwook Oh[2], Chang-sub Won[3], Donghwan Kim[4]
[1] K-water, Daejeon, South Korea; [2] Chungbuk Technopark, Chungcheongbuk-do, South Korea; [3] Konkuk University, Seoul, South Korea; [4] Korea University, Seoul, South Korea

4BV.3.12 Safety Analysis of PV Systems for Soundproof Tunnel Based on Voltage and Current Mismatch
Juhee Jang[1], Chongmin Kim[1], Sujeong Oh[1]
[1] Korea Electrical Safety, Wanju, South Korea

4BV.3.13 Analysis of Underperformance of PV Plants: Deviations From Expectatives and Operational Faults
Carlos Redondo-Obispo[1], Javier Gonzalez[1], Antonio López[1], Jorge Solórzano[1]
[1] QPV, Madrid, Spain

4BV.3.14 Improved Modelling of PV Systems with Snow Soiling for Optimized Local Energy Sharing
Ida Fuchs[1], Ole-Morten Midtgård[1]
[1] NTNU, Trondheim, Norway

4BV.3.15 Ensuring Photovoltaic Module Integrity Through Electroluminescence Imaging and Machine Learning Solutions
Daniel J. Castillo Patton[1], Lucas Viani[1], Fernando García[2], Vicente Parra[1], Sofía Rodríguez-Conde[1], Jesús Cuaresma[1]
[1] Enertis Applus+, Madrid, Spain; [2] UC3M, Madrid, Spain

4BV.3.16 RACONT2050 - Reliability and Comparison of New PV Technologies
Domenico Chianese[1], Mauro Caccivio[1], Gabi Friesen[1]
[1] SUPSI, Mendrisio, Switzerland

4BV.3.17 Monitoring based Automated PV Module Orientation Predictor
Ernst Wittmann[1], Clauida Buerhop-Lutz[1], Vincent Christlein[2], Vincent Le Corre[1], Christoph Brabec[1], Marius Peters[1]
[1] HI ERN, Erlangen, Germany; [2] Friedrich Alexander University, Erlangen, Germany

4BV.3.18 Comparative Analysis of String IV Measurement Methods for Fault Detection in Photovoltaic Systems
Martin Bartholomäus[1], Peter Behrensdorff Poulsen[1], Sergiu Viorel Spataru[1]
[1] Technical University of Denmark, Roskilde, Denmark

4BV.3.19 Installation of Twin 'Solar Labs' to Monitor Performances of Photovoltaic Solar Modules in Harsh Conditions
Giulio Mangherini[1], Valentina Diolaiti[1], Alfredo Andreoli[1], Simone Beneduce[2], Giacomo Gorni[2], Cosimo Mazzella[2], Fabio Melchiorre[2], Donato Vincenzi[1]
[1] University of Ferrara, Ferrara, Italy; [2] ENI, Novara, Italy

4BV.3.20 Revamping Options of a Stand-alone PV Facility
Cristian Terrados[1], David González[1], Salvador Seguí[2], Cristina Alonso[1]
[1] University of Burgos, Burgos, Spain; [2] University of Valencia, Valencia, Spain

4BV.3.21 Anomaly Detection and Visualization for Outdoor Photovoltaic
Goodfriend Whyte[1], Bart Pieters[1], Andreas Gerber[1]
[1] Forschungszentrum Jülich, Jülich, Germany

4BV.3.22 AI-SafePV: An AI-Based Fault Detection Software Package for Enhancing Safety in Photovoltaic Arrays
Aref Eskandari[1], Jafar Milimonfared[2], Amir Nedaei[2], Mohammadreza Aghaei[3]
[1] Iran University of Science and Technology, Tehran, Iran; [2] Amirkabir University of Technology, Tehran, Iran; [3] NTNU, Ålesund, Norway

4BV.3.23 DetectivePV: A Detection Software Package for Electrical Faults in Photovoltaic Arrays Based on Machine Learning Models
Aref Eskandari[1], Jafar Milimonfared[2], Amir Nedaei[2], Mohammadreza Aghaei[3]
[1] Iran University of Science and Technology, Tehran, Iran; [2] Amirkabir University of Technology, Tehran, Iran; [3] NTNU, Ålesund, Norway

4BV.3.24 Wet Leakage and Insulation Test on String Level Through IEC 61215
Sergio Suarez[1], Jose Cantisano[1], Jonathan Vilela[1], Jose Maria Alvarez[1], Ignacio Fernandez[1], Sofia Rodriguez[1]
[1] Enertis Applus, Madrid, Spain

4BV.3.25 TALOS: Autonomous Robotic Solutions for Operation and Maintenance in PV Scenarios
Nicolas Congouleris[1], Athanasios T. Balafoutis[1], Lisandro Puglisi[2], João Formiga[3], Daniel Albuquerque[3], Bruno Barrionuevo[1]
[1] CERTH, Thermi, Greece; [2] EDP Renewables, Madrid, Spain; [3] EDP NEW, Lisbon, Portugal

4BV.3.26 Harmonising Multi-sites Measurement of Photovoltaic Systems: Comprehensive Framework for Real-Life Test Conditions in a Maltese Environment
Brian Bartolo[1], Brian Azzopardi[1], Alexandre Mignonac[2], Marcus Rennhofer[3], Bernhard Kubicek[4], Rita Ebner[4], Carlos Meza[5], Melodie de l'Epine[6], Eugenia Zugasti[7], Steve Zerafa[8]
[1] The Foundation for Innovation and Research, Birkirkara, Malta; [2] CEA, Cadarache, France; [3] AIT, Vienna, Austria; [4] AIT, Vienna, Malta; [5] HSA, Anhalt, Germany; [6] BI, Brussels, Belgium; [7] CENER, Pamplona, Spain; [8] PIXAM, Msida, Malta

4BV.3.27 Mediterranean Climate Impact on Photovoltaic Systems: Insights from Malta and Implications for Future European Integration
Brian Bartolo[1], Brian Azzopardi[1], Alexandre Mignonac[2], Marcus Rennhofer[3], Bernhard Kubicek[3], Rita Ebner[3], Carlos Meza[4], Melodie de l'Epine[5], Eugenia Zugasti[6], Steve Zerafa[7]
[1] The Foundation for Innovation and Research, Birkirkara, Malta; [2] CEA, Cadarache, France; [3] AIT, Vienna, Austria; [4] HSA, Anhalt, Germany; [5] BI, Brussels, Belgium; [6] CENER, Pamplona, Spain; [7] PIXAM, Msida, Malta

4BV.3.28 Comparison of Physical, Machine Learning and Hybrid Models of Monofacial and Bifacial PV Systems
Jonas Petzschmann[1], Dirk Stellbogen[1], Manuel Heim[1]
[1] ZSW, Stuttgart, Germany

4BV.3.29 Quantitative Shade Detection for PV Systems Based on Clearsky Data
Achim Schulze[1], Markus Panhuysen[2], Darwin Daume[3], Maximilian Schönau[2]
[1] Rosenheim Technical University of Applied Sciences, Rosenheim, Germany; [2] Smartblue, Munich, Germany; [3] Coburg University of Applied Sciences, Coburg, Germany

4BV.3.30 Robust Electroluminescence Image Quality Metrics Based on Texture Analysis and Machine Learning
Thøger Kari[1], Gisele A. dos Reis Benatto[1], Rodrigo del Prado Santamaria[1], Sergiu Spataru[1]
[1] DTU, Roskilde, Denmark

4BV.3.31 Forecasting the Lifetime of Photovoltaic Modules through Coupling a Physics-Based Degradation Model with 3D Heat Transfer Simulations
Timofey Golubev[1]
[1] ThermoAnalytics, Calumet, United States of America

4BV.3.32 Development of a Model to Ensure the Safety of PV Systems Using FMEA
Sujeong Oh[1], Chongmin Kim[1], Juhee Jang[1]
[1] Korea Electrical Safety Corporation, Wanju-gun, South Korea

4BV.3.33 Analysis of Output Efficiency Between Reused Solar Modules and New Modules (50kW : ECO, 50kW : New Bifacial PV module)
Jae-hyeok Hur[1], Han-Yeol Kim[1], Jeong-Eon Lee[1], Myoung-Geon Seo[1], Ji-hyan Yoo[1], Goong-hyun Nam[1], Su-Mi Yang[1]
[1] Far East University, Eumseong-gun, CB, South Korea

4BV.3.34 Longtime Economic and Energetic Viability of PV Facilities in Castilla Y Leon, Spain
Eduardo Fernández-Cabal[1], Cristian Terrados-Lopez[1], Ignacio Garcia-Ruiz[1], Cristina Alonso-Tristan[1]
[1] University of Burgos, Burgos, Spain

4BV.3.35 Long-Term Monitoring of Degradation and Defect in High-Voltage Strings Through Dark I-V Measurements
Samuele Chiesa[1], Gian Carlo Dozio[1], Domenico Chianese[2]
[1] SUPSI-ISEA, Lugano, Switzerland; [2] SUPSI-ISAAC, Lugano, Switzerland

4BV.3.36 Machine Learning Techniques for Assesment of Open Circuit Voltage Loss in PV Systems
Sandra Riaño[1], Jose Domingo Santos[1], Miguel Esteras[1], Amaia Abanda[1], Javier del Ser[2]
[1] TECNALIA Research & Innovation, Derio, Spain; [2] UPV / EHU, Bilbao, Spain

4BV.3.37 A Dependent Climatic Zone Dependency on the Impact of HSAT Use to the LCOE of Utility Scale PV Power Plants
Dhanup Pillai[1], Juan Lopez Garcia[1], Sachin Jain[1], Veronica Bermudez Benito[1]
[1] HBKU-QEERI, Doha, Qatar

4BV.3.38 PV Module Cleaning Models Incorporating Weather Data Sets
Fnu Muhfizaturrahmah [1], Christiana Honsberg[1]
[1] Arizona State University, Tempe, United States of America

4BV.3.39 Real-time Monitoring and Diagnostic of Rooftop Monofacial PV System with Thermography Validation
Amr Osama[1], Giuseppe Marco Tina[1], Antonio Gagliano[1], Gabino Jiménez-Castillo[2], Francisco Jose Muñoz-Rodriguez[2]
[1] University of Catania, Catania, Italy; [2] University of Jaén, Jaén, Spain

4BV.3.40 Geospatial Referencing from a Single Image
Evgenii Sovetkin[1], Andreas Gerber[1], Bernhard Kubicek[2], Bart E. Pieters[1]
[1] Forschungszentrum Jülich, Jülich, Germany; [2] AIT, Vienna, Austria

4BV.3.41 Outdoor Exposure Study on the Performance of Nine Different Types of Industrial PV Modules under 35° and under 90°
Luka Wernke[1], Maximilian Riedel[1], Björn Rau[1], Rutger Schlatmann[1], Carolin Ulbrich[1]
[1] HZB, Berlin, Germany

4BV.3.42 Operation and Maintenance of Floating PV Systems – What is Unique About it?
Harsha Lakmal Walpita[1], Erik Stensrud Marstein[1], Bjørn Aarseth[2]
[1] University of Oslo, Oslo, Norway; [2] IFE, Kjeller, Norway

4BV.3.43 Photovoltaic Output Power Modeling: A Hybrid Approach
Leticia de Oliveira Santos[1], Francisco Alexandre Andrade Souza[2], Tarek AlSkaif[3], Paulo C. M. Carvalho[1]
[1] UFC, Fortaleza, Brazil; [2] imec-NL, Wageningen, The Netherlands; [3] Wageningen University, Wageningen, The Netherlands

4BV.3.44 PV Failure Diagnosis using Combined Approaches of Imaging Techniques and Electrical Characterization
Daha Hassan Daher[1], Alexandre Mathieu[2], Dek Mouhomed[1], Léon Gaillard[2], Pierre-Olivier Logerais[3], Christophe Menezo[4]
[1] CERD, Djibouti, Djibouti; [2] Heliocity, Grenoble, France; [3] CERTES, Lieusaint, France; [4] CNRS, Le Bourget-du-Lac, France

4BV.3.45 Estimation of Annual Power Loss of a Solar PV System due to Rise in the Cell Temperature: A Case Study for Indian Climate
Shubham Kumar[1], P. M. V. Subbarao[1]
[1] IIT Delhi, New Delhi, India

4BV.3.46 Snow Losses for Different PV Module Designs: Modelling and Validation in South-West Finland
Shuo Wang[1], Hugo E. Huerta[1], Sami Jouttijärvi[2], Kati Miettunen[2], Aleksi Heinonen[1], Samuli Ranta[1]
[1] Turku University of Applied Sciences, Turku, Finland; [2] University of Turku, Turku, Finland

4BV.3.47 A Case Study of Digital O&M Using the Physics and Machine Learning Estimation Model
Hye-mi Hwang[1], Woo-gyun Shin[1], Young-chul Ju[1], Seok-whan Ko[1]
[1] KIER, Daejeon, South Korea

4BV.3.48 Predictive Analysis of Renewable Energy Generation Infrastructures Based on Big Data Algorithms: The Case of Soiling
Pedro J. Pérez-Higueras[1], João Gabriel Bessa[1], Florencia Almonacid-Cruz[1], Diego Lopez Talavera[1], Pablo Cárdenas[1], Raul Mata[1], Eduardo F. Fernández[1]
[1] University of Jaén, Jaén, Spain

VISUAL PRESENTATIONS 4BV.4

15:15 - 16:45 Photovoltaic in/on Buildings

4BV.4.1 Performance of Vertically Mounted Bifacial Photovoltaics on High-Rise Buildings in the Nordic Conditions
Bergpob Viriyaroj[1], Sami Jouttijärvi[2], Matti Matti Jänkälä[1], Kati Miettunen[2]
[1] Aalto University, Espoo, Finland; [2] University of Turku, Turku, Finland

4BV.4.2 Integrated Design Process Supporting the Customization of BIPV Applications Within Curtain Wall Facades Based on Quantum Dot-Luminescent Solar Concentrator Technology
Martina Pelle[1], Claudio Castellan[2], Marcello La Rosa[2], Alexander Astigarraga[1], Giorgio Belluardo[1], Martino Gubert[1], Laura Maturi[1]
[1] EURAC Research, Bolzano, Italy; [2] Glass to Power, Rovereto, Italy

4BV.4.3 Reducing the Angular Colour Dependence of Building Integrated Photovoltaic Modules Based on Optical Interference Coatings
Chang Chuan You[1], Ørnulf Nordseth[1], Arne Røyset [2], Tore Kolås[2]
[1] Institute for Energy Technology, Kjeller, Norway; [2] SINTEF Industry, Trondheim, Norway

4BV.4.4 Maximizing Solar Electricity and Daylighting from Building Envelopes: A Smart Translucent Window Based on Concentrator Photovoltaics with Integrated Tracking
Almudena Garcia-Sanchez[1], Guido Vallerotto[1], Steve Askins[1], Ignacio Antón [1], César Domínguez[1]
[1] UPM, Madrid, Spain

4BV.4.6 Design and Optimization of Structural Colored Interlayers for Building-Integrated Photovoltaic Applications
Catarina Ferreira[1], Irina Vyalih[2], Markus Babin[3], Roberto Boccardi[3], Aliihsan Bagci[3], Nanna Lysgaard Andersen[3], Peter Behrensdorff Poulsen[3], Sune Thorsteinsson[3], Karlis Petersons[4], Joel Cox[1], Morten Madsen[2]
[1] University of Southern Denmark, Odense, Denmark; [2] University of Southern Denmark, Sonderborg, Denmark; [3] Technical University of Denmark, Roskilde, Denmark; [4] Stensborg, Roskilde, Denmark

4BV.4.7 A Demonstration Study on Colored BIPV System of Construction Material Type in a Library Building
SangMyung Kim[1], Jinhee Kim[1], Juntae Kim[1]
[1] Kongju National University, Cheonan-si, South Korea

4BV.4.8 Comparative Analysis of Individual and Collective PV Integration Strategies for a Residential Neighborhood
Qiuxian Li[1], Natasa Vulic[2], Hanmin Cai[2], Philipp Heer[2]
[1] KU Leuven, Ghent, Belgium; [2] Urban Energy Systems Laboratory, Empa, Duebendorf, Switzerland

4BV.4.9 Shining Lights on Limits: Optimizing Luminescent Solar Concentrators for Solar Windows
Thomas de Bruin[1], Wilfried Van Sark[1]
[1] Utrecht University, Utrecht, The Netherlands

4BV.4.10 Modelling Framework for Optimizing Hybrid Photovoltaic-Thermal Systems in Combination with Seasonal Heat Storage
Aron van Rossum[1], Zain Ul Abdin[1], David Martinez Aguilera[1], Olindo Isabella[1], Rudi Santbergen[1]
[1] Delft University of Technology, Delft, The Netherlands

4BV.4.11 Performance Assessment of Novel Solar Energy Systems for Aged Neighbourhoods and Buildings in Dutch Cities
Edward Otoo[1], Roel C. G. M. Loonen [1], Angèle H.M. E. Reinders [1]
[1] Eindhoven University of Technology, Eindhoven, The Netherlands

4BV.4.12 Steel Framing/Structure as a Solution to Support BIPV Competitiveness
Simon Boddaert[1], Jean-Pierre Reyal[2], Michel Dernis[3], Philippe Alamy[4]
[1] CSTB, Sophia Antipolis, France; [2] Semperstyl, Eragny Sur Oise, France; [3] Atrium Data, Paris, France; [4] EnerBim, Donneville, France

4BV.4.13 Advanced PV and Thermal Modeling for a Feasible and Efficient BAPV-T System Design and Evaluation
Iñaki Cornago[1], Mikel Ezquer[1], Patxi Sorbet[1], Alicia Kalms[1], Gonzalo Diarce[2], Olatz Irulegi[3], Fritz Zaversky[1]
[1] CENER, Sarriguren, Spain; [2] UPV/EHU, Bilbao, Spain; [3] UPV/EHU, San Sebastian, Spain

4BV.4.14 PV on Green Roofs. Over Two Years of Comparative Measurement Data From Various System Concepts, Supplemented by Simulation Results and General Considerations
Markus Klenk[1], Roger Hiltebrand[1], Selina Pfyffer[1], Hartmut Nussbaumer[1]
[1] ZHAW, Winterthur, Switzerland

4BV.4.15 BIPV Design and Performance Evaluation Using 5kW Shingled Solar Module
Minseob Kim[1], Sungmin Yoon[2], Min-Joon Park[2], Eunae Jo[2], Kiseok Jeon[2], Jinho Shin[2], Eunbi Lee[2], Yujin Kim[2], Chaehwan Jeong[2]
[1] Chonnam National University, Gwangju, South Korea; [2] KITECH, Gwangju, South Korea

4BV.4.16 Constructive Glass Protection on PV Facades
Joachim Sting[1], Ralf Haselhuhn[1]
[1] DGS, Berlin, Germany

4BV.4.17 Integration of PCM into PV Windows to Improve the Efficiency of Structures Based on LSC Technologies
Giulio Mangherini[1], Baccega Eleonora[1], Valentina Diolaiti[1], Alfredo Andreoli[1], Donato Vincenzi[1]
[1] University of Ferrara, Ferrara, Italy

4BV.4.18 Analysis of the Photovoltaic Systems Construction Capacities and Conditions on the Residential Rooftops in Serbia
Iva Batic[1]
[1] University of Belgrade, Belgrade, Serbia

4BV.4.19 Optimizing Integrated Renewable Energy Systems for Zero Energy Consumption Building
Burak Ölmez[1], Gül Nihal Güğül[2], Derek Baker[3], Gaye Demirhan Başbilen[4], Mustafa Kuru[5], Furkan Gökçül[6], Kenan Geçer[7]
[1] Akın Robotics, Konya, Turkey; [2] Selcuk University, Konya, Turkey; [3] Middle East Technical University, Ankara, Turkey; [4] Arti Energy, Ankara, Turkey; [5] Palamar Technology, İstanbul, Turkey; [6] Architecht Open Banking Infrastructures, İstanbul, Turkey; [7] Turkish Airlines Technology Building, İstanbul, Turkey

4BV.4.20 Guideline for the Realization of High PV Façades > 30 m
Urs Muntwyler[1]
[1] Dr. Schuepbach & Muntwyler, Bern, Switzerland

4BV.4.21 Challenges and Solutions in the Design and Construction of a Self-Sufficient Green H2 Laboratory Building
Isadora Custódio[1], Gustavo Carvalho[2], Rodrigo Garcia[2], Ricardo Rüther[1]
[1] Federal University of Santa Catarina, Florianópolis, Brazil; [2] BYD Energy of Brazil, Campinas, Brazil

4BV.4.22 Semi-Transparent CIGS Thin-Film PV Modules
Peter Borowski[1], Thomas Schutt[2], Julian Röder[1], Maik Schubert[2], Martin Hillmann[2], Kristian Herath[2], Subarna Sapkota[2], Volker Speer[2], Marko Stölzel[1], Rene Reichel[2], Thomas Dalibor[1]
[1] AVANCIS, Munich, Germany; [2] AVANCIS, Torgau, Germany

4BV.4.23 Assessing Photovoltaic-Thermal System Performance across Diverse Climates: An Economic and Environmental Comparative Analysis
Zain Ul Abdin[1], Olindo Isabella[1], Rudi Santbergen[1]
[1] Delft University of Technology, Delft, The Netherlands

4BV.4.24 Mass Customization 2.0 Project Produces BIPV Market Outlook Analysis and First Series of Semi-Fabricates based on Design Documents of Four BIPV-Products
Roland Valckenborg[1], Nikoleta Kyranaki[2], Simona Villa[1], Atse Louwen[3], Paolo Corti[4], Gernot Oreski[5], Davide Colla[6], Yuri van Bergen[7], Marton Berkers[8], Marc Meuris[9], Andreas Haller[10], Marcello LaRosa[11], Julian Witowski[12], Paolo Frigeri[13], Jan Teunis[14], Jan Mussche[15], Jochen Schuermans[16], Andreas Zimmerman[17], Filip Uyttenhove[18], Udo Buergel[19], Marc Koetse[1], David Moser[3], Francesco Frontini[4], Michael Daenen[20]
[1] TNO, Eindhoven, The Netherlands; [2] imo-imomec, Genk, Belgium; [3] Eurac Research, Bolzano, Italy; [4] SUPSI, Lugano, Switzerland; [5] PCCL, Leoben, Austria; [6] Applied Materials Italia, Trevisio, Italy; [7] Bouwhulp Groep, Eindhoven, The Netherlands; [8] Duflex, Eindhoven, The Netherlands; [9] EnFoil, Genk, Belgium; [10] Ernst Schweizer, Hedingen, Switzerland; [11] Glass to Power, Revereto, Italy; [12] Industry 4.0 Maturity Center, Aachen, Germany; [13] IWIN, Manno, Switzerland; [14] Maan Glueing Technologies, Raalte, The Netherlands; [15] BMI Monier, Montfoort, The Netherlands; [16] Roartis, Genk, Belgium; [17] Sunplugged, Wildermieming, Austria; [18] VDL ETG, Eindhoven, The Netherlands; [19] Vitronic, Wiesbaden, Germany; [20] imo-imomec, EnergyVille, Genk, Belgium

4BV.4.25 Rapid Shutdown System for PV Power Generation Using a Junction Box
Joonyoung Jeon[1], Minkook Kim[1], Yong Hyun Kim[1]
[1] KOPTI, Gwangju, South Korea

4BV.4.26 A Strategic Approach to Enable Large-Scale Photovoltaic Energy Systems Deployment in Urban Areas
Joyce Arthllan Oliveira de Sousa[1], Martin Thebault[2], Lamia Berrah[1], Zeinab Aldroubi[2]
[1] USMB, Annecy, France; [2] USMB, Le Bourget-du-Lac, France

4BV.4.27 Performance Assessment of Colorful BIPV Facade in Norway
Junjie Zhu[1], Jørgen Young[2]
[1] IFE Institute for Energy Technology, Kjeller, Norway; [2] Isola Solar, Larvik, Norway

4BV.4.28 Implementing Strain Relief for Improved Reliability of BIPV Modules Built on Aluminum Facade Elements
Wiebke Wirtz[1], Kevin Meyer[1], Susanne Blankemeyer[1], Thomas Daschinger[1], Henning Schulte-Huxel[1]
[1] ISFH, Emmerthal, Germany

4BV.4.29 CONIPHER BIPV Facades: Design and Performance Prediction
Ya-Brigitte Assoa[1], Philippe Thony[1], Emmanuel Schmitt[2], Olivier Bizzini[3], Stephane Gelibert[3], Vincent Bressy[4], Olivier Wiss[1], Alexandre Plissonnier[1]
[1] CEA, Le Bourget-du-Lac, France; [2] Vicat, L'Isle-d'Abeau, France; [3] Araymond, Grenoble, France; [4] Workspaces-architecture, Grenoble, France

4BV.4.30 The Potential of Plug&Plug PV in Switzerland
Jan Remund[1], Anne-Kathrin Weber[1], Lukas Meyer[1], Christof Bucher[2], David Joss[2], Theo Zwahlen[2]
[1] Meteotest, Bern, Switzerland; [2] BFH, Burgdorf, Switzerland

4BV.4.31 Colored Building Integrated Photovoltaic(BIPV) Demonstration in Aesthetic aspects and Power Generation Analysis for Korean School Buildings Case
Kyu-Jin Kim[1], Seungjoon Lee[1], Sangmoon Lee[1], Hyunwoo Jeon[2]
[1] Korea Conformity Laboratories, Geumcheon-gu, South Korea; [2] BIMS, Seoul, South Korea

VISUAL PRESENTATIONS 1BV.5

17:00 - 18:30 Silicon Material: Growth, Defects and Recycling | Manufacturing of Solar Cells and Related Tools & Processes

1BV.5.1 Dynamics of Plasma-Assisted Epitaxial Silicon Growth Driven by a Hydrogen-Incorporated Nanostructure for Novel Applications
Joon-Ho Oh[1], Tae Kyung Lee[2], Jeong-Ho An[1], Sung-In Mo[1], Ji-Eun Hong[1], Hee-eun Song[3], Ka-Hyun Kim[4]
[1] KIER, Ulsan, South Korea; [2] Gyeongsang National University, Jinju, South Korea; [3] KIER, Daejeon, South Korea; [4] Chungbuk National University, Cheongju, South Korea

1BV.5.2 Evaluation of Temperature Dependent Stress Around Electrodes in Crystalline Silicon Solar Cells by Raman Spectroscopy
Koki Hasebe[1], Koki Ide[1], Ryo Yokogawa[1], Kyotaro Nakamura[2], Yoshio Ohshita[2], Noboru Yamada[3], Atsushi Ogura[1]
[1] Meiji University, Kawasaki, Japan; [2] Toyota Technological Institute, Nagoya, Japan; [3] Nagaoka University of Technology, Nagaoka, Japan

1BV.5.4 Silicon Recovered from Photovoltaic Module for Lithium-Ion Battery
Gwan-Dong Cho[1], Jin-Seok Lee[1], Gi-Hwan Kang[1]
[1] KIER, Daejeon, South Korea

1BV.5.5 Investigation of Rapid Thermal Annealing (RTA) Effects on Behaviour Mechanisms of Oxygen and Carbon Impurities in Mono-Silicon Wafers
Nurhayat Yıldırım[1], Sertaç Eroğlu[2]
[1] Kalyon PV, Ankara, Turkey; [2] Eskisehir Osmangazi University, Eskisehir, Turkey

1BV.5.6 Metallurgical Recycling of Kerf Loss Waste
Tinotenda Mubaiwa[1], Jafar Safarian[1]
[1] NTNU, Trondheim, Norway

1BV.5.7 Increasing the Productivity of the Czochralski Process Applying Machine Learning
Frank Mosel[1], Lukas Kulhavy[2], Dorra Baccar[2]
[1] PVA Crystal Growing Sytems, Wettenberg, Germany; [2] THM, Friedberg, Germany

1BV.5.8 Thermal Deactivation of Boron-Oxygen Defects in Compensated n-Type Silicon
Rune Søndenå[1], Per-Anders Hansen[1], Bent Thomassen[1], Øyvind Mjøs[2], Tyke Naas[2]
[1] IFE, Kjeller, Norway; [2] REC Solar Norway, Kristiansand, Norway

1BV.5.15 Highest Throughput Laser Processing for Thin Plated Contacts
Eduardo Alvarez-Brito[1], René Haberstroh[1], Georg Hoppe[1], Andreas Brand[1], Sven Kluska[1], Fabian Meyer[1], Jale Schneider[1], Jan Nekarda[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BV.5.16 Enhancement of Photocurrent Generation in Amorphous Silicon Heterojunction (SHJ) Solar Cells Through the Integration of Plasmonic Nanoparticles
Brahim Aissa[1], Alessandro Sinopoli[1]
[1] QEERI, Doha, Qatar

1BV.5.17 Flexible A-Si Thin Film Solar Cell Using Multi-Layered Colored Transparent Electrodes of AZO Material
Jung-Dae Kwon[1], Soo-Won Choi[1], Myunghun Shin[2]
[1] KIMS, Changwon, South Korea; [2] Korea Aerospace University, Goyang, South Korea

1BV.5.18 Deep Learning-Based Wrap-around Classification in Passivated Contact Fabrication
Junhee Kim[1], Han-Jung Kim[1], Sang Hee Lee[2], Min Gu Kang[2]
[1] GERI, Gumi, South Korea; [2] KIER, Daejeon, South Korea

1BV.5.19 Mixture of Initiators with Different Initiation Temperatures for Low Temperature Curing Silver Pastes
Hyunsoo Lim[1], Sung Hyun Kim[1]
[1] KETI, Seongnam-si, South Korea

1BV.5.20 Impact of the Process Type on Contacting for Electrodeposition of Copper on Heterojunction and TOPCon Solar Cells
Agata Lachowicz[1], Nicolas Badel[1], Jun Zhao[1], Nurhayat Yildirim[2], Hatice Duman[2], Nastaran Hayati-Roodbari[3], Frank Reil[3], Krzysztof Krawczyk[3], Roman Trattnig[3], Reyu Sakakibara[4], Audrey Morisset[4], Sonja Feldbacher[5], Eyal Cohen[6], Natali Cohen[6], Tal Marcu[6], Dor Dror[6], Christophe Ballif[1], Bertrand Paviet-Salomon[1]
[1] CSEM, Neuchâtel, Switzerland; [2] Kalyon PV, Ankara, Turkey; [3] Joanneum Research, Weiz, Austria; [4] EPFL, Neuchâtel, Switzerland; [5] PCCL, Leoben, Austria; [6] DR Utilight, Yavne, Israel

1BV.5.21 Impact of Optimization for Mass Production PERC Solar Cell with Efficiency above 23%
Cheng-Wen Kuo[1], Ta-Ming Kuan[1], Yung-Chih Li[1], Chun-Wei Lee[1], Wei-Lo Chueh[1], Li-Guo Wu[1], Shih-Chieh Lin[1], Cheng-Yeh Yu[1]
[1] TSEC, Hsinchu, Taiwan

1BV.5.22 Overview of Mandatory and Optional Additives in Wet Chemical Process Steps in Manufacturing for Industrial TOPCon Solar Cells
Damian Brunner[1], Philipp Schmid[1], Jan Vollmer[1], Tobias Dannenberg[1], Benedikt Straub[1], Fabian Dorn[1], Michael Passig[1], Erdogan Celik[1], Martin Weber[1], Ahmed Eljaouhari[1]
[1] RENA Technologies, Freiburg, Germany

1BV.5.23 Poly-Si Removal for TOPCon Solar Cells: A Comprehensive Comparison of Different Approaches and their Cost-effectiveness
Jan Vollmer[1], Tobias Dannenberg[1], Philipp Schmid[1], Katrin Krieg[2], Sebastian Mack[2], Martin Zimmer[2], Damian Brunner[1]
[1] RENA Technologies, Freiburg, Germany; [2] Fraunhofer ISE, Freiburg, Germany

1BV.5.24 The Impact of Conductive Paste Composition on the LECO Process for TOPCon Solar Cells
Chun-Ping Lin[1], Chih-Jeng Huang[1], Han-Chen Chang[1], Sung-Yu Chen[1], Bang-Hao Wu[2], Cheng-Liang Cheng[2], Ying-Yuan Huang[3]
[1] ITRI, Tainan, Taiwan; [2] TeraSolar Energy Material, Miaoli, Taiwan; [3] National Cheng Kung University, Tainan, Taiwan

1BV.5.25 Improvement of the Industrial TOPCon Solar Cell Production by Novel Plasma Power Supply for Oxide Passivation and Silicon Deposition
Wojciech Gajewski[1], Jana-Isabelle Polzin[2], Marc Hofmann[2], Anna Wiktoria Oniszczuk[1], Jakub Studniarek[1]
[1] TRUMPF Huettinger, Zielonka, Poland; [2] Fraunhofer ISE, Freiburg, Germany

1BV.5.26 Improved Efficiency in Silicon Solar Cells using Nano Silver-doped Self-passivating Nickel Contacts
Melisa Korkmaz Arslan[1], Berkeli Akgayev[2], Serdar Akbayrak[2], Rasit Turan[1], Veysel Unsur[1]
[1] ODTÜ-GÜNAM, Ankara, Turkey; [2] Necmettin Erbakan University, Konya, Turkey

1BV.5.27 Investigations on Additives for Batch Cluster Processing for Industrial TOPCon Solar Cells
Philipp Schmid[1], Jan Vollmer[1], Tobias Dannenberg[1], Benedikt Straub[1], Fabian Dorn[1], Ahmed Eljaouhari[1], Damian Brunner[1]
[1] RENA Technologies, Freiburg, Germany

1BV.5.28 Realistic Estimation of Industrial TOPCon Cell Efficiencies
Mehul Raval[1], Pirmin Preis[2], Lejo Koduvelikulathu[2], Gourab Das[1], Wolfgang Jooß[1]
[1] RCT Solutions, Konstanz, Germany; [2] ISC Konstanz, Konstanz, Germany

1BV.5.29 Selective Laser Ablation of SiNx in PERC Solar Cells Via Green Femtosecond Ultrashort Pulsed Laser
Frank Reil[1], Nastaran Hayati-Roodbari[1], Agata Lachowicz[2], Valentin Satzinger[1], Wolfgang Nemitz[1], Roman Trattnig[1]
[1] Joanneum Research, Weiz, Austria; [2] CSEM PV, Neuchâtel, Switzerland

1BV.5.30 Optimizing Mechanical and Electrical Properties of Ni/Cu/Ag-Plated Contacts on i-TOPCon Solar Cells
Christian Schmiga[1], Abdelaziz Boudellioua[1], René Haberstroh[1], Jonas Eckert[1], Sven Kluska[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BV.5.31 Addressing Edge Recombination Losses in Shingle Cells by Holistic Optimization of the Process Sequence
Alexander Göbel[1], Elmar Lohmüller[1], Dirk Wagenmann[1], Norbert Kohn[1], Marc Hofmann[1], Jonas D.Huyeng[1], Ralf Preu[1]
[1] Fraunhofer ISE, Freiburg, Germany

1BV.5.32 Optimized Division-Conditions of ShinIged Heterojuntion Solar Cells by Infra Red Laser Irradiation
Eunbi Lee[1], Min-Joon Park[2], Sungmin Yoon[2], Eunae Jo[2], Kiseok Jeon[1], Minseob Kim[2], Jinho Shin[2], Yujin Kim[2], Chaehwan Jeong[2]
[1] Yonsei University, Seoul, South Korea; [2] Korea Institute of Industrial Technology, Gwangju, South Korea

1BV.5.33 Effective Contact Formation in Crystalline Silicon Solar Cells via Current Injection Methods
Soohyun Bae[1]
[1] KIER, Daejeon, South Korea

1BV.5.34 Characterization of TiOx as Electron Selective Contact Using Low-Temperature Oxidation Process via High-Pressure Sputtering
Franciso José Pérez Zenteno[1], Sabina Duarte[1], Rafael Benítez[1], G. Godoy[1], Ignacio Torres[2], Rocío Barrio[2], D. Caudevilla[1], Sari Algaidy[3], Rodgar García-Hernansanz[1], J. Olea[1], D. Pastor[1], Alvaro Del Prado[1], Eric García-Hemme[1], E. San Andrés[1]
[1] Complutense University of Madrid, Madrid, Spain; [2] CIEMAT, Madrid, Spain; [3] Polytechnical University of Madrid, Madrid, Spain

1BV.5.35 Production Perc Solar Cell Loss Analysis and Efficiency Improvement up to 23.2%
Mert Kahraman[1], Metehan Gülaydin[1], Mervenur Türkan[1], Burcu Gümüs Çiftci[1], T. Meriç Yanar[1]
[1] Kalyon PV, Ankara, Turkey

1BV.5.36 Synthesis of Nanoporous Black Silicon by Aluminium-Assisted Chemical Etching (AACE)
Shahnawaz Uddin[1], Md Roslan Hashim[2], Mohd Zamir Pakhuruddin[2]
[1] Aligarh Muslim University, Aligarh, India; [2] Science University Malaysia, Gelugore, Malaysia

1BV.5.37 Combined Laser Contact Opening and Plating Study on the Metallization of Tunnel Oxide Passivated Contact Solar Cells
Mutlu-Iskender Muglali[1], Jim Bovatsek[2], Irene Kubitza[1], Torsten Voss[1], Scott White[2]
[1] Atotech, Berlin, Germany; [2] Spectra-Physics Lasers, San Jose, United States of America

VISUAL PRESENTATIONS 4CV.1
13:30 - 15:00 Solar Resource and Forecasting

4CV.1.1 Analyses of the Correlation between Irradiance and Clouds based on Meteorological Datasets and All-Sky-Images to Understand the Most Significant Input Variable of PV-Systems
Fabian Pauls[1], Nils Laube[1], Mike Zehner[1], Gerhard Papst[2], Joe Schreder[2]
[1] Rosenheim Technical University of Applied Sciences, Rosenheim, Germany; [2] CMS Ing. Dr. Schreder, Kirchbichl, Austria

4CV.1.2 Enhancing Power Grid Resilience through Short Term Solar Irradiance Forecasting Using Convolutional Neural Networks
Khadija Barhmi[1], Sara Mirbagheri Golroodbari[1], Wilfried Van Sark[1]
[1] Utrecht University, Utrecht, The Netherlands

4CV.1.3 Enhancing Photovoltaic Power Forecasting Accuracy with a Network of All-Sky Imagers and Meteorological Sensors Deployed in a PV Test Field
Andreas Boschert[1], Mike Zehner[1], Grit Behrens[2], Florian Fehring[2], Alexander Kruse[2], Christian Kurz[3], Michele Rascher[4], Katrin Anneser[5]
[1] Technical University of Applied Sciences Rosenheim, Rosenheim, Germany; [2] University of Applied Sciences and Arts Bielefeld, Bielefeld, Germany; [3] meteocontrol, Augsburg, Germany; [4] Timeless Planet, Bad Wörishofen, Germany; [5] Deutsche Bundesstiftung Umwelt, Osnabrück, Germany

4CV.1.4 Detection of Clear Sky Using Hybrid Machine Learning
Maximilian Schönau[1], Darwin Daume[2], Markus Panhuysen[1], Achim Schulze[3], Bernd Hüttl[2], Dieter Landes[2]
[1] Smartblue, Munich, Germany; [2] Coburg University of Applied Sciences, Coburg, Germany; [3] Rosenheim Technical University of Applied Sciences, Rosenheim, Germany

4CV.1.5 Climate Clustering for PV Interest
Anastasios Kladas[1], Karel Lagast[1], Bert Herteleer[1], Jan Cappelle[1]
[1] KU Leuven, Leuven, Belgium

4CV.1.6 Advancing Solar Resource Data: The Validation Journey of 3E's Satellite-Based Irradiation Data
Philippe Malcorps[1], Gofran Chowdhury[1]
[1] 3E, Brussels, Belgium

4CV.1.7 Meteonorm Version 9.0
Graf Pascal[1], Jan Remund[1], Michael Schmutz[1], Mathias Aschwanden[1], David Urwyler[1], Gerhard Zaugg[1]
[1] Meteotest, Bern, Switzerland

4CV.1.8 Resource-efficient PV Energy Yield Nowcasting with Sky Images: A Hybrid Global Annealing Schedule
Markos Kousounadis-Knousen[1], Apostolos Bakovasilis[2], Francky Catthoor[3], Pavlos Georgilakis[1]
[1] NTUA, Athens, Greece; [2] imo-imomec, Genk, Belgium; [3] imec, Leuven, Belgium

4CV.1.9 Variability of Solar Radiation in the Context of a Flat Region Highly Loaded with Aerosols
Dunia Bachour[1], Daniel Perez-Astudillo[1]
[1] HBKU/Qatar Foundation, Doha, Qatar

4CV.1.10 Towards Climate-Neutral Energy: Assessing Equations for Solar Power Optimization
Mahesh Sutariya[1], Luiz Fonseca[2], Raphael Abrahão[2], Haresh Vaidya[1]
[1] University of Applied Sciences, Feuchtwangen, Germany; [2] Federal University of Paraíba, João Pessoa, Brazil

4CV.1.11 Site-Dependent Evaluation of the ECMWF IFS-HRES and IFS-COMPO Intra- and Day-ahead Forecasts with Respect to Surface Solar Irradiances
Jorge Lezaca[1], Marion Schroedter-Homscheidt[1], Yves-Marie Saint-Drenan[2]
[1] DLR, Oldenburg, Germany; [2] MINES Paristech, Sophia-Antipolis, France

4CV.1.12 Intraday Solar Irradiance Forecasting Using Public Cameras
Roy Sarkis[1], Ilker Oguz[1], Demetri Psaltis[1], Mario Paolone[1], Christophe Moser[1], Luisa Lambertini[1]
[1] EPFL, Lausanne, Switzerland

4CV.1.13 Enhancing Spatial Resolution and Expanding Spatiotemporal Coverage of PVGIS Datasets
Olympia Gounari[1], Nigel Taylor[2], Ana Martinez[2], Nikos Alexandris[2]
[1] TRASYS International, Greece, Greece; [2] European Commission JRC, Ispra, Italy

4CV.1.14 Irradiance Transposition and Reflections in BIPV Installations
Stefan Grünsteidl[1], Peter Borowski[1], Thomas Dalibor[1]
[1] Avancis, Munich, Germany

4CV.1.15 Exploring the Impact of Data Quality and Availability on PV Power Plant Yield Prediction Using Machine Learning and Analytical Models
Alexander Prueller[1], Marcus Rennhofer[1], Bernhard Kubicek[1], Martin Gröschl[2]
[1] AIT, Vienna, Austria; [2] TU Wien, Vienna, Austria

4CV.1.16 Enhancing Solar Radiation Accuracy Using High-Resolution Satellite Cloud Products
Yu Xie[1], Manajit Sengupta[1], Mike Foster[2], Coda Philips[2]
[1] NREL, Golden, United States of America; [2] University of Wisconsin, Madison, United States of America

4CV.1.17 On the Transferability of Graph Neural Networks for Multi-Site Solar Forecasting
Antoni Jubes Monforte[1], Rafael Carrillo[2], Baptiste Schubnel[2], Pierre-Jean Alet[2]
[1] EPFL, Lausanne, Switzerland; [2] CSEM, Neuchâtel, Switzerland

4CV.1.18 Evaluation of Some Linear Regression Models for the Prediction for Daily Global Solar Radiation in the VIlage of Koyli Alpha, District of Linguere, Louga Region, Senegal
Badara Mbow[1], Amy Sadio[1], Papa Lat Tabara Sow[1], Senghane Mbodji[1]
[1] Alioune Diop University of Bambey, Bambey, Senegal

4CV.1.19 Evaluation of the Impact of Local Sensing Data and Feature Extraction Techniques on High Frequency Intra-Hour Irradiance Forecasting
Erling Ween Eriksen[1], Heine Nygard Riise[1], Magnus Moe Nygård[1]
[1] Institute for Energy Technology, Kjeller, Norway

4CV.1.20 Tracking Shadow Band Methodology for Accurate and Cost-Effective Diffuse Horizontal Irradiance Measurements
Mário Pó[1], Erik Haverkamp[2], Kees Hoogendijk[1], Satoshi Nishikawa[3]
[1] EKO Instruments Europe, Den Haag, The Netherlands; [2] Radboud University, Nijmegen, The Netherlands; [3] EKO Instruments, Tokyo, Japan

4CV.1.21 Enhanced Topography and Irradiance Modeling for Integrated PV Applications Using OpenStreetMap Data
Michael Gordon[1], Evgenii Sovetkin[1], Andreas Gerber[1], Bart E. Pieters[1]
[1] Forschungszentrum Jülich, Jülich, Germany

4CV.1.22 A Simplified Spectral Model for Estimating Solar Irradiance
Marius Paulescu[1], Eugenia Paulescu[1], Sergiu-Mihai Hategan[1], Andreea Sabadus[1]
[1] West University of Timisoara, Timisoara, Romania

4CV.1.23 Availability of Solar Energy on Vehicle Roofs in German Road Network
Christian Braun[1], Christian Schill[1], Nicolas Holland[1], Elke Lorenz[1], Alexander Kleinhans[1], Felix Basler[1], Martin Kaiser[1]
[1] Fraunhofer ISE, Freiburg, Germany

4CV.1.24 METEOSAT Datasets in the NSRDB: An Introduction
Manajit Sengupta[1], Aron Habte[1], Grant Buster[1], Yu Xie[1], Brandon Benton[1], Michael Foster[2], Galen Maclaurin[1]
[1] NREL, Golden, United States of America; [2] University of Wisconsin, Madison, United States of America

4CV.1.25 Physics Informed Graph Neural Networks for Multi-site Solar Forecasting
Jelena Simeunovic[1], Baptiste Schubnel[1], Pierre-Jean Alet[1], Pascal Frossard[2], Rafael Carrillo[1]
[1] CSEM, Neuchâtel, Switzerland; [2] EPFL, Lausanne, Switzerland

4CV.1.26 Integrating Physical and Machine Learning Approaches for Enhanced Photovoltaic Power Output Prediction
Caixia Li[1], Ziheng Liu[1], Pengfei Zhang[1], Bohan Zhang[1], Xiaojing Hao[1]
[1] UNSW, Sydney, Australia

4CV.1.27 Dimensionality Reduction of Environmental Data for Long-Term PV Performance Analysis Using Graph Based Methods
Srijani Mukherjee[1], L. Vuillon[1], Ioannis (John) Tsanakas[1]
[1] CEA, Le Bourget-du-Lac, France

VISUAL PRESENTATIONS 1CV.2

15:15 - 16:45 Processing & Characterisation of Crystalline Si based Solar Cells | Silicon Bottom Cells for Tandem Photovoltaics | Advances in Silicon Solar Cells Characterisation and Simulation

1CV.2.1 N- and p-Type Si-Based Passivating Contacts by Sputtering
Christophe Allebé[1], Antoine Descoeudres[1], Patrick Wyss[1], Bertrand Paviet-Salomon[1], Christophe Ballif[1]
[1] CSEM, Neuchâtel, Switzerland

1CV.2.2 Approaches for Reducing Metallization-Induced Losses in Industrial TOPCon Solar Cells
Sebastian Mack[1], Daniel Ourinson[1], Marius Messmer[1], Christopher Tessmann[1], Katrin Krieg[1], Jonas Huyeng[1], Johannes Greulich[1], Andreas Wolf[1]
[1] Fraunhofer ISE, Freiburg, Germany

1CV.2.3 Universal Interface Treatment for Dopant-Free Materials Applied to Silicon Heterojunction Solar Cells
Liqi Cao[1], Paul Procel Moya[1], Yifeng Zhao[1], Luana Mazzarella[1], Katarina Kovačević[1], Engin Özkol[1], Miro Zeman[1], Olindo Isabella[1]
[1] TU Delft, Delft, The Netherlands

1CV.2.4 Effect of the Stack Passivation Multi-Layer on the Potential-Induced Degradation of Bifacial Crystalline Si Photovoltaic Cells and Modules
Pei-Ying Lin[1], Kai-Wei Yang Yang[1], Hung-Ming Lin[1], Hsiu-Hung Liu[1], Chen-Po Yu[1], Chun-Liang Chiang[1]
[1] United Renewable Energy, HSinchu, Taiwan

1CV.2.5 Unveiling the Synergy of Nanowires and PEDOT:PSS for Silicon Solar Cell Fabrication and Leading to Mechanical Flexibility
Deepak Sharma[1], Ruchi Kumari Sharma[2], Arman Ahnood[1], Sanjay Kumar Srivastava[2]
[1] RMIT University, Melbourne, Australia; [2] AcSIR, Ghaziabad, India

1CV.2.6 Enhancing Thermal Stability of SiOx/poly-Si Passivated Contacts: Investigating the Impact of Firing Peak Temperature
Yerin Lee[1], Dongjin Choi[1], Hoyoung Song[1], Youngho Choe[1], Yoonmook Kang[1], Hae-Seok Lee[1], Donghwan Kim[1]
[1] Korea University, Seoul, South Korea

1CV.2.7 Polysilicon Passivation - Tunneling Oxide Routes and Annealing Conditions Effect on Passivation
Per-Anders Hansen[1], Junjie Zhu[1], Rune Søndenå[1]
[1] IFE, Oslo, Norway

1CV.2.8 Forming Localised Direct Metal-Silicon Contacts Through Controlled Pinhole Formation in Si/Al2O3/HfO2 Stacks
Anup Yadav[1], Sophie L. Pain[1], Ailish Wratten[1], Luke Wilkins[1], Edris Khorani[1], Brendan F. M. Healy[1], Nicholas E. Grant[1], John D. Murphy[1]
[1] University of Warwick, Coventry, United Kingdom

1CV.2.9 Optimization and Integration of Room Temperature RF Sputtered ICO(:H) as TCO Layers in High-Performance SHJ Devices
Engin Özkol[1], Maria M. R. Magalhães[2], Yifeng Zhao[1], Liqi Cao[1], Paula Perez-Rodriguez[1], Katarina Kovačević[1], Paul Procel[1], Manuel João Mendes[2], Miro Zeman[1], Olindo Isabella[1]
[1] TU Delft, Delft, The Netherlands; [2] NOVA University, Lisbon, Portugal

1CV.2.10 Selective p+ Poly-Si Fingers for TOPCon Front Contact Passivation
Jan Hoß[1], Saman Sharbaf Kalaghichi[1], Mertcan Comak[1], Jonathan Linke[1], Jan Lossen[1], Lejo Koduvelikulathu[1]
[1] ISC Konstanz, Konstanz, Germany

1CV.2.11 Effect of Deposition Temperature, Power Density, SiH4 Flow Rate and PH3 Doping Concentration on the Nanocrystal Growth in n-Type Amorphous Silicon Layer
Milad Ghasemi[1], Arghavan Salimi[1], Hisham Nasser[1], Raşit Turan[1]
[1] ODTÜ-GÜNAM, Ankara, Turkey

1CV.2.12 Dipole Induced Work Function Shift at N-Side Back Contact in Dopant Free Si HJ Solar Cell
Laura Lancellotti[1], Eugenia Bobeico[1], Marco Della Noce[1], Lucia Vittoria Mercaldo[1], Giuseppe Nasti[1], Elena Santoro[1], Lurie Usatii[1], Paola Delli Veneri[1]
[1] ENEA, Portici, Italy

1CV.2.13 Transparent Base Contacts for Dopant Free Silicon Heterojunction Solar Cells
Luca Serenelli[1], Claudia Malerba[1], Luca Martini[1], Francesca Menchini[1], Enrico Salza[1], Glauco Stracci[1], Pietro Mangiapane[1], Mario Tucci[1]
[1] ENEA, Rome, Italy

1CV.2.14 Intrinsic Amorphous Silicon Bilayers for Surface Passivation in Silicon Heterojunction Solar Cells
Busra Altinsoy[1], Valerie Depauw[2], Devika Rajagopal[2], Hariharsudan Sivaramakrishnan Radhakrishnan[2], Hisham Nasser[1], Raşit Turan[1]
[1] METU, Ankara, Turkey; [2] imec, Leuven, Belgium

1CV.2.15 Bifacial a-Si:H Transparent Solar Cells for Building Integrated Phtovoltaics
Gustavo Álvarez[1], Pau Estarlich[2], Pablo Rafael Ortega[2], Gerard Masmitja[2], Cristobal Voz[2], Alex J. Lopez-Garcia[1], Joaquim Puigdollers[2], Alejandro Pérez-Rodríguez[1]
[1] IREC, Barcelona, Spain; [2] UPC, Barcelona, Spain

1CV.2.16 Review and Highlights of More Than 30 Years Research on Ever Improving Technology for PERC Solar Cells at Fraunhofer ISE
Elmar Lohmüller[1], Sabrina Lohmüller[1], Pierre Saint-Cast[1], Johannes Greulich[1], Stefan Glunz[1], Ralf Preu[1]
[1] Fraunhofer ISE, Freiburg, Germany

1CV.2.17 Investigating Interfacial Phenomena in Copper-Covered, n-Type Polysilicon-Based Contacts by Electron Microscopy
Reyu Sakakibara[1], Agata Lachowicz[2], Julien Hurni[1], Christophe Allebé[2], Bertrand Paviet-Salomon[2], Franz-Josef Haug[1], Christophe Ballif[1], Aïcha Hessler-Wyser[1], Audrey Morisset[1]
[1] EPFL, Neuchâtel, Switzerland; [2] CSEM, Neuchâtel, Switzerland

1CV.2.18 Introduction to SOLSTICE Project – Critical Material Substitution to Boost Photovoltaic Solar Cells Annual Production Capacities
Frédéric Jay[1], Sebastien Dubois[1], Jean-Luc Deschanvres[2], Daniel Bellet[2], Carmen Jimenez[2], David Muñoz-Rojas[2], Jean François Pierson[3], Alexandre Nomine[3], Arnaud Fouchet[4], Valerie Demange[5], Nathanaelle Schneider[6], Frederique Ducroquet[7], Thomas Fix[8], Mona Treguer-Delapierre[9]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] CNRS, Grenoble, France; [3] Institut Jean Lamour, Nancy, France; [4] CRISMAT, Caen, France; [5] CNRS, Rennes, France; [6] IPVF, Palaiseau, France; [7] CROMA, Grenoble, France; [8] ICube, Strasbourg, France; [9] ICMCB, Pessac, France

1CV.2.19 Robustness of Electrical Quality of Ion Implanted Black Silicon Emitters: Comparison Between Different Ion Implantation Service Providers
Olga Morozova[1], Kexun Chen[1], Behrad Radfar[1], Hele Savin[1], Ville Vähänissi[1]
[1] Aalto University, Espoo, Finland

1CV.2.20 Self-Developed GaN Like Passivating Layer on e-Beam evaporated in situ Doped Poly-Si:Ga Passivated Emitters with iVoc>704 mV
Salar Habibpur Sedani[1], Ilker Yildiz[1], Bülent Arıkan[1], Hasan Hüseyin Canar[1], Gökhan Altiner[1], Yiğit Mert Kaplan[1], Hisham Nasser[1]
[1] ODTÜ-GÜNAM, Ankara, Turkey

1CV.2.21 AZO Thin Films as a Low Work Function TCO For Heterojunction Solar Cells Applications
Claudia Malerba[1], Luca Serenelli[1], Luca Martini[1], Francesca Menchini[1], Alberto Mittiga[1], Enrico Salza[1], Galuco Stracci[1], Mario Tucci[1]
[1] ENEA, Rome, Italy

1CV.2.26 Design Rules for TOPerc Bottom Structures for Perovsite/ Silicon Solar Cells
Eni Muka[1], Hisham Nasser[1], Raşit Turan[1]
[1] ODTÜ GÜNAM, Ankara, Turkey

1CV.2.27 Titanium Silicide: A Promising Candidate of Recombination Layer for Perovskite/TOPCon Tandem Solar Cells
Dowon Pyun[1], Dongjin Choi[1], Soohyun Bae[2], Sang-Won Lee[3], Hoyoung Song[1], Seok Hyun Jeong[1], Solhee Lee[1], Jae-Keun Hwang[1], Sujin Cho[1], Huiyeon Lee[1], Myeongi Woo[1], Yerin Lee[1], Kyunghwan Kim[1], Youngmin Kim[1], Youngho Choe[1], Yoonmook Kang[1], Donghwan Kim[1], Hae-Seok Lee[1]
[1] Korea University, Seoul, South Korea; [2] KIER, Daejeon, South Korea; [3] Stanford University, Stanford, United States of America

1CV.2.28 Low Carbon and High Voltage Silicon Bottom Cells for 4 Terminals Perovskite-Silicon Tandem Modules
Thibaut Desrues[1], Alexis Chandezon[1], Franck Dhainaut[1], Barbara Bazer-Bachi[2], Samuel Williatte[2], Thomas Guillemot[3], Van-Son Nguyen[3], Marion Provost[3], Florian Hilt[3], Grégory Marque[3], Jean Rousset[3], Armelle Yaiche[3], Anne Kaminski[4], Quentin Rafhay[4]
[1] CEA-INES, Le Bourget-du-Lac, France; [2] EDF ENR PWT, Bourgoin Jallieu, France; [3] IPVF, Palaiseau, France; [4] CNRS, Grenoble, France

1CV.2.29 Aluminum Zinc Oxide Layers by High-Pressure Sputtering for TOPCon Solar Cells
Sebastian Duarte-Cano[1], Laura Torrecilla[1], Daniel Caudevilla[1], Francisco Perez-Zenteno[1], Rafael Benitez-Fernandez[1], Guillermo Godoy-Perez[1], Rodrigo Garcia-Hernansanz[1], Eric Garcia-Hemme[1], Javier Olea[1], David Pastor[1], Alvaro Del Prado[1], Enrique San Andres[1], Sari Algaidy[2]
[1] Complutense University of Madrid, Madrid, Spain; [2] Polytechnical University of Madrid, Madrid, Spain

1CV.2.35 A Comprehensive Analysis of the Series Resistance for Different Interdigitated Back Contact Solar Cell Geometries
Alona Otaegi[1], Telmo Isasi[1], Eneko Cereceda[1], Vanesa Fano[1], Eneko Ortega[1], Nekane Azkona[1], José Rubén Gutiérrez[1], Juan Carlos Jimeno[1]
[1] UPV/EHU, Bilbao, Spain

1CV.2.36 Advanced Preparation and Microscopic Analysis Methods for Protection of Intellectual Properties Related to Next-Generation Cell Technologies
Stefan Lange[1], Marko Turek[1], Stephan Großer[1], Debby Yang[1], Jan Hoß[2], Jonathan Linke[2], Christian Hagendorf[3], David Adner[4]
[1] Fraunhofer CSP, Halle (Saale), Germany; [2] ISC Konstanz, Konstanz, Germany; [3] Anhalt University of Applied Sciences, Koethen, Germany; [4] Martin-Luther-University Halle-Wittenberg, Halle (Saale), Germany

1CV.2.37 Accuracy of Hysteresis Correction for Silicon Heterojunction Solar Cells – A Simulation Study
Jonas Kern[1], Hannes Wagner-Mohnsen[2], Johannes Heitmann[1], Matthias Müller[1]
[1] Freiberg University of Mining and Technology, Freiberg, Germany; [2] WAVELABS Solar Metrology Systems, Leipzig, Germany

1CV.2.38 Contactless Carrier Lifetime Characterization of Silicon Heterojunction Structures at Elevated Temperatures
Gergely Havasi[1], David Krisztián[1], Zs. Gombás[2], Zoltan Adam[2], Ferenc Korsós[1]
[1] Semilab, Budapest, Hungary; [2] EcoSolifer Modulgyártó, Budapest, Hungary

1CV.2.39 Bias Light Intensity Effect on EQE Analysis for PERC Solar Cell
Hatice Duman[1], Güven Korkmaz[1]
[1] KalyonPV, Ankara, Turkey

1CV.2.40 Defect Analysis of Heterojunction Solar Cells Fabricated on Black Silicon Surface by Capacitance Spectroscopy
Arghavan Salimi[1], Ozan Aydin[1], Milad Ghasemi[1], Rasit Turan[1], Hisham Nasser[1], Alexander Gudovskikh[2], Artiom Baranov[2], Alexander V. Uvarov[2], E. A. Vyacheslavova[2], Alina A. Maksimova[2]
[1] ODTU-GUNAM, Ankara, Turkey; [2] Alferov University, Saint-Petersburg, Russia

1CV.2.41 Quality Control and Characterization in Industrial TOPCon Solar Cells Manufacturing
Jonas Haunschild[1], Christian Diestel[1], Saravana Kumar[1], Nico Wöhrle[1], Johannes Greulich[1], Sebastian Mack[1], Stefan Rein[1]
[1] Fraunhofer ISE, Freiburg, Germany

1CV.2.42 Improved Accuracy of Photoluminescence Images for Quality Control in Solar Cell Production
Robin Wienberg[1], Jonas Haunschild[1], Saravana Kumar[1], Jurriaan Schmitz[2], Stefan Rein[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] University of Twente, Enschede, The Netherlands

1CV.2.43 Wavelength and Magnetic Field Effects on the Spectral Response and External Quantum Efficiency of a Bifacial Silicon Solar Cell by using the Photoconductivity Method
Amadou Diao[1], Adama Ndiaye[1], Mountaga Boiro[1], Senghane Mbodji[2]
[1] Cheikh Anta Diop University, Dakar-Fann, Senegal; [2] Alioune Diop University, Bambey, Senegal

1CV.2.44 Simulation and Design Optimization of Interdigitated Back Contact Silicon Solar Cells with Dopant-Free Asymmetric Hetero-Contacts
You-An Li[1], Chun-Ping Lin[2], Ying-Yuan Huang[2]
[1] National Yang-Ming Chiao Tung University, Tainan, Taiwan; [2] National Cheng Kung University, Tainan, Taiwan

1CV.2.45 Numerical Modeling and Design Optimization of Industrial Tunnel Oxide Passivated Contact Solar Cells with Selective Passivated Contacts on the Front
Yi-Ping Lin[1], Chun-Ping Lin[2], Jin-Cheng Chen[1], Han-Chen Chang[3], Ying-Yuan Huang[2]
[1] National Yang Ming Chiao Tung University, Tainan, Taiwan; [2] National Cheng Kung University, Tainan, Taiwan; [3] ITRI, Tainan, Taiwan

1CV.2.46 Analysis of Efficiency and Property Changes with Si Solar Cell Degradation
Han-Yeol Kim[1], Jae-Hyeok Hur[1], Jeong-Eon Lee[1], Myoung-Geon Seo[1], Su-Mi Yang[1]
[1] Far East University, Eumseong-gun, South Korea

1CV.2.47 Modeling and Experimental Validation of Solar Cell Performance Across Varied Temperatures
Selin Cansu Gölboylu[1], Hatice Duman[1], Melisa Demir[1], Meriç Çalışkan Arslan[1]
[1] Kalyon PV, Ankara, Turkey

1CV.2.48 Impact of Regeneration Processes on Implied-V(OC) and Suns-V(OC) Values in Perc Solar Cells
Alihan Kumtepe[1], Özlem Coşkun[1], Çağdaş Eğin[1]
[1] Kalyon PV, Ankara, Turkey

VISUAL PRESENTATIONS 2CV.3

17:00 - 18:30 Perovskite-based Multijunctions | Perovskite Photovoltaics

2CV.3.1 Direct Incorporation of Hydrogen in Transparent Conductive Electrodes via Reactive Sputtering
Bruno Vicari Stefani[1], Timothy Jones[1], John O'Sullivan[2], Ruy Sebastian Bonilla[2], Matthew Wright[2], Thien Truong[3], Gregory J.Wilson[1]
[1] CSIRO Energy, Mayfield West, Australia; [2] University of Oxford, Oxford, United Kingdom; [3] NREL, Golden, United States of America

2CV.3.2 Industrial Scale Low Damage Sputter Deposition of Transparent Conductive Oxides (TCOs) as Front Electrode for Perovskite Solar Cells
Marlene Härtel[1], Katja Mayer-Stillrich[1], Pablo Reyes-Figueroa[2], Martin Dimer[3], Bernd Stannowski[1]
[1] HZB, Berlin, Germany; [2] Formerly: HZB, Berlin, Germany; [3] Von Ardenne, Dresden, Germany

2CV.3.3 Ambient-Processed Efficient 2T Perovskite/SHJ Tandem Solar Cell with Screen Printed Silver Grid
Yongcai He[1], Xiaobing Gu[1], Bochao Li[1], Bo Liu[1], Shijie Ju[1], Jiang Liu[1], Bo He[1], Xixiang Xu[1]
[1] LONGi Central R&D Institute, Xi'an, China

2CV.3.4 Simulations of The Electrical Behavior of Voltage-matched and Current-matched Monolithic Series-interconnected Two-terminal Perovskite-Cigse Tandem Solar Cells under Varying Outdoor Conditions
Nicolas Otto[1], Christof Schultz[1], Guillermo Farias-Basulto[2], Rutger Schlatmann[1], Eva Unger[2], Bert Stegemann[1]
[1] HTW Berlin, Berlin, Germany; [2] HZB, Berlin, Germany

2CV.3.5 The Role of Optical and Electrical Design on the Reverse Bias Stability of Perovskite / Silicon Tandem Solar Cells
Diego Di Girolamo[1], Olivier Duprè[2], Giuliana Giuliano[1], Giuseppe Bengasi[1], Jordi Veirman[2], Marina Foti[1], Cosimo Gerardi[1]
[1] 3SUN, Catania, Italy; [2] CEA, Chambery, France

2CV.3.6 Materials and Device Architectures for Monolithic Perovskite/Silicon-Heterojunction Tandem Solar Cells
Eugenia Bobeico[1], Maria Federica Caso[1], Antonella De Maria[1], Marco Della Noce[1], Manuela Ferrara[1], Vera La Ferrara[1], Laura Lancellotti[1], Lucia V. Mercaldo[1], Giuseppe Nasti[1], Gennaro V. Sannino[1], Elena Santoro[1], Pietro Scognamiglio[1], Gabriella Rametta[1], Iurie Usatii[1], Paola Delli Veneri[1]
[1] ENEA, Portici, Italy

2CV.3.7 Laser Processes for Tandem Perovskite Solar Cells and Modules in Glove Boxes and Air with Pico, Sub-nano and Nano Second Laser in IR, Green and UV
Stefan Bergfeld[1], Tsvetelina Merdzhanova[2]
[1] Aachen University of Applied Science, Jülich, Germany; [2] Bergfeld Lasertech, Aachen, Germany

2CV.3.8 Wafer-Sized Nanostructuring of Perovskite-Silicon Tandem Solar Cells
Adrian Callies[1], Jenny Norberg[1], Johannes Gry[1], Patricia S. C. Schulze[1], Juliane Borchert[1], Oliver Höhn[1]
[1] Fraunhofer ISE, Freiburg, Germany

2CV.3.9 Automated Fabrication and Characterization of Inorganic Halide Perovskite Absorbers
Hilal Aybike Can[1], Christian M. Wolff[1], Christophe Ballif[1]
[1] EPFL, Neuchâtel, Switzerland

2CV.3.10 Monolithic Perovskite/Silicon Tandem Solar Cells: ARC and Front Electrode Optimization
Xuzheng Liu[1], Mohammad Gholipoor[1], Faranak Sadegh[1], Ronja Pappenberger[1], Julian Petry[1], Rohit Chavan[1], Paul Fassl[1], Ulrich Wilhelm Paetzold[1]
[1] KIT, Karlsruhe, Germany

2CV.3.11 Optimisation of MA-free Lead-tin Perovskite Absorber and Interfaces in All Perovskite Tandem Solar Cells
Jules Allegre[1], Polyxeni Tsoulka[1], Baptiste Berenguier[2], Mathieu Frégnaux[3], Muriel Bouttemy[3], Philip Schulz[2], Noëlla Lemaitre[1], Solenn Berson[1]
[1] CEA-INES, Le Bourget du Lac, France; [2] IPVF, Palaiseau, France; [3] ILV, Versailles, France

2CV.3.12 PV Multiscale Modelling of Perovskite / Silicon Two-Terminal Devices: from Accurate Cell Performance Simulation to Energy Yield Prediction
Paul Procel[1], Maarten Verkou[2], Bianca Passarella[3], Diego Di Girolamo[3], Giuliana Giuliano[3], Olivier Dupré[4], Youri Blom[1], Malte Vogt[1], Rudi Santbergen[1], Francesco Rametta[3], Cosimo Gerardi[3], Miro Zeman[1], Olindo Isabella[1]
[1] TU Delft, Delft, The Netherlands; [2] PV Works, Delft, The Netherlands; [3] 3Sun, Catania, Italy; [4] CEA-INES, Le Bourget du Lac, France

2CV.3.13 Scalable Room Temperature Pulsed Laser Deposition of Metal Oxide Charge Transport Layers in P-I-N Perovskite Solar Cells towards Tandem with Silicon
Kilian Alcocer[1], Florian Dupont[2], Solenn Berson[1]
[1] CEA-INES, Le Bourget du Lac, France; [2] CEA-LETI, Grenoble, France

2CV.3.14 PEAI - Indeed an Effective Synergistic Modification Material to Improve All Perovskite Tandem Solar Cell Efficiency to Nearly 27%
Huan BI[1], Hiroshi SEGAWA[2], Qing SHEN[1], Hayase SHUZI[1]
[1] The University of Electro-Communications, Tokyo, Japan; [2] The University of Tokyo, Tokyo, Japan

2CV.3.15 Synergic Use of Bi-Dimensional Materials for Large Area Perovskite/Silicon Tandem Devices
Antonio Agresti[1], Sara Pescetelli[1], Enrico Leonardi[2], Hanna Pazniak[3], Francesco Bonaccorso[4], Marina Foti[5], Emmanuel Kymakis[6], Aldo Di Carlo[1]
[1] University of Rome Tor Vergata, Rome, Italy; [2] GreatCell Solar Italia, Rome, Italy; [3] The University of Grenoble Alpes, Grenoble, France; [4] BeDimensional, Genova, Italy; [5] Enel Green Power, Catania, Italy; [6] Hellenic Mediterranean University, Heraklion, Greece

2CV.3.16 Construction of a Linear PVD Evaporator for the Deposition of C60/SnO2 Electron Contact Layers in a SALD Hybrid System
Volker Sittinger[1], Tino Harig[1], Tobias Graumann[1], Sven Pleger[1], Christian Beyen[1]
[1] Fraunhofer IST, Braunschweig, Germany

2CV.3.17 Potential Induced Degradation Free Perovskite-Silicon Tandem Solar Cells
Kristijan Brecl[1], Matevž Bokalič[1], Gašper Matič[1], Lisa Champault[2], Quentin Jeangros[2], MArko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia; [2] CSEM, Neuchâtel, Switzerland

2CV.3.18 Experimental Analysis and Modelling of Metastability Behavior in Perovskite-based Solar Cells for Accurate Energy Yield Estimation in Real-world Operating Conditions
Špela Tomšič[1], Matija Pirc[1], Matej Planinšek[1], Marko Jošt[1], Benjamin Lipovšek[1], Marko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia

2CV.3.19 First Perovskite Thin Films Elaborated Entirely by Close Space Sublimation on Si Textured Wafers for Upscaling Si/Perovskite Tandem Devices
Polyxeni Tsoulka[1], Gauthier Lefevre[2], Stephanie Pouget[3], Ferdinand Ledee[2], Frederic Roux[2], Louis Grenet[2], Solenn Berson[1]
[1] CEA-INES, Le Bourget-du-lac, France; [2] CEA-LITEN, Grenoble, France; [3] CEA-IRIG-MEM-NRX, Grenoble, France

2CV.3.20 Opto-Electrical Simulation of Perovskite / Perovskite / Silicon Triple Junction Solar Cells
Youri Blom[1], Malte Ruben Vogt[1], Hisashi Uzu[2], Gensuke Koizumi[2], Kanji Yamamoto[2], Olindo Isabella[1], Rudi Santbergen[1]
[1] TU Delft, Delft, The Netherlands; [2] Kaneka, Tokyo, Japan

2CV.3.21 PK-Si Tandem Solar Cells Encapsulation: Towards Industrial Packaging and Reliability
Claire Audoin[1], Vincent Barth[1], Amandine Boulanger[1], Guillaume Capron[1], Matthias Demuylder[1], Noëlla Lemaitre[1], Adrien Rivalland[1], Joel Wyttenbach[1]
[1] CEA-LITEN-INES, Le Bourget du Lac, France

2CV.3.22 Multi-Scale Simulation of Non-Idealities in All-Perovskite Tandem Photovoltaic Modules
Urs Aeberhard[1], Nelly Natsch[1], Andrin Schneider[1], Simon Zeder[1], Beat Ruhstaller[1]
[1] Fluxim, Winterthur, Switzerland

2CV.3.28 Development of High Efficiency Perovskite Solar Cells by Bayesian Optimization
Naoto Eguchi[1], Fukazawa Taro [1], Hiroyuki Kanda[1], Kohei Yamamoto[1], Takashi Miyake[1], Takurou Murakami[1]
[1] National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

2CV.3.29 Beyond Lead: The Influence of Composition and the Crystallization Step on the Photovoltaic Performance of Tin Halide Perovskite Films
Stefan Moscher[1], Konrad Binter[1], Lukas Troi[1], Fernando Warchomicka[1], Gregor Trimmel[1], Thomas Rath[1]
[1] Graz University of Technology, Graz, Austria

2CV.3.30 Room Temperature Deposition of n-Type TiO2 for Inverted Perovskite Solar Cells
Atsushi Kogo[1], Takurou N. Murakami[1]
[1] AIST, Tsukuba, Japan

2CV.3.31 Thermal Stability of Perovskite Solar Cells Effected by Ionic Liquid Dopant Fixed in Spiro-OMeTAD
Kohei Yamamoto[1], Takurou N. Murakami[1]
[1] AIST, Tsukuba, Japan

2CV.3.32 Highly Stable and Luminescent CsPbBr3/Ethylene Vinyl Acetate (EVA) Composite Film for Realizing Coloured PV
Minya Zhou[1], Yuanxun Liao[1], Shujuan Huang[2], Martin Green[1], Yajie Jiang[1]
[1] UNSW, Sydney, Australia; [2] Macquarie University, Sydney, Australia

2CV.3.33 Beyond the Lab-Scale: Perovskite Photovoltaic Fabrication and Industrial Assessment with Automatic Slot-Die Coater
Maurizio Stefanelli[1], Simon Ternes[1], Luigi Vesce[1], Marco Balucani[2], Aldo Di Carlo[1]
[1] University of Rome Tor Vergata, Rome, Italy; [2] RISE Technology, Padova, Italy

2CV.3.34 Reasoning the Change in Device Parameters with Deposition Power of NiOx for Low-Dimensional Perovskite Solar Cells
Bhumika Sharma[1], Vani Pawar[1], Sushobhan Avasthi[1]
[1] Indian Institute of Science, Bengaluru, India

2CV.3.36 Analysis of Reverse-Bias Stability of FAPbBr3 Semi-Transparent Perovskite Solar Cells
Noah Tormena[1], Alessandro Caria[1], Matteo Buffolo[1], Carlo De Santi[1], Nicola Trivellin[1], Andrea Cester[1], Gaudenzio Meneghesso[1], Enrico Zanoni[1], Fabio Matteocci[2], Aldo Di Carlo[2], Matteo Meneghini[1]
[1] University of Padova, Padova, Italy; [2] University of Rome, Rome, Italy

2CV.3.37 Overcoming Stability Limitations of Efficient, Flexible Perovskite Solar Modules
Da Seul Lee[1], Ki Woong Kim[2], You-Hyun Seo[2], Myung Hyun Ann[2], Wonkyu Lee[3], Jiyeon Nam[3], Jaehoon Chung[2], Gabkyung Seo[2], Seongsik Nam[4], Boo Soo Ma[5], Teak-Soo Kim[5], Yoonmook Kang[3], Nam Joong Jeon[2], Jangwon Seo[5], Seong Sik Shin[6]
[1] Sungkyunkwan University, Suwon, South Korea; [2] Korea Research Institute of Chemical Technology, Daejeon, South Korea; [3] Korea University, Seoul, South Korea; [4] University of Sungkyunkwan, Suwon, South Korea; [5] Korea Advanced Institute of Science and Technology, Daejeon, South Korea; [6] Sungkyunkwan University, Suwon , South Korea

2CV.3.38 Al2O3 Capping Layer for Improved Performance of Perovskite Solar Cells
Zan Ajdic[1], Marko Jost[1], Marko Topic[1]
[1] University of Ljubljana, Ljubljana, Slovenia

2CV.3.39 Optimizing Performance in CsPbI3 Perovskite Quantum Dots through Pb-Site Ion-Doping Strategy
Pouriya Naziri[1], Umut Aydemir[1], Naeimeh Sadat Peighambardoust[1]
[1] Koc University, Istanbul, Turkey

2CV.3.40 Optimizing Perovskite Solar Cell Performance Through Tailored Variations in Thickness and Bandgap: A TCAD Simulation Study
Amaan Chougle[1], Muntaser Almansoori[1], Ayman Rezk[1], Ammar Nayfeh[1]
[1] Khalifa University, Abu Dhabi, United Arab Emirates

2CV.3.41 Perovskite Solar Cell Production via Thermal Evaporation: Obstacles to Accelerate Absorber Deposition
Julian Petry[1], Alexander Diercks[1], Thomas Feeney[1], Ulrich W. Paetzold[1], Paul Fassl[1]
[1] KIT, Karlsruhe, Germany

2CV.3.42 Perovskite Solar Cells Prepared in a Hybrid Process that Uses Ambient and Moisture-Free Conditions to Produce HTM-Free Architectures with Back Contacts Based on Carbon Compounds
Carlos González Montesdeoca[1], Luis Manuel Ocaña González[1], Benjamín Jesús González Díaz[2], Sara González Pérez[2], María Elena Llarena García[1]
[1] Technological Institute for the Renewable Energies, Granadilla de Abona, Spain; [2] University of La Laguna, San Cristobal de La Laguna, Spain

2CV.3.43 Enhancing Efficiency and Stability of CsPbI3 Perovskite Quantum Dots Through Co2+-Doping
Pouriya Naziri[1], Naeimeh Sadat Peighambardoust[1], Umut Aydemir[1]
[1] Koc University, Istanbul, Turkey

2CV.3.44 Standardized Test Routines for the Assessment of Potential Induced Degradation of Perovskite Solar Cells
Beyza Durusoy[1], David Adner[2], Marko Turek [3]
[1] METU, Ankara, Turkey; [2] Martin-Luther-University, Halle, Germany; [3] Fraunhofer CSP, Halle, Germany

2CV.3.45 Evaluation of Perovskite Devices Under Real and Extreme Operating Conditions - A Fundamental Step Toward Practical Applications
Marília Braga[1], Lucas Augusto Zanicoski Sergio[1], Anelise Medeiros Pires[1], Ricardo Rüther[1]
[1] Federal University of Santa Catarina (UFSC), Florianópolis, Brazil

2CV.3.46 Enhancing Measurement Protocols for Perovskite Photovoltaic Devices: Insights from the VIPERLAB Projec
Eugenia Zugasti[1], Javier Diaz[1], Natalia Maticiuc[2], Stephane Cross[3]
[1] CENER, Sarriguren, Spain; [2] HZB, Berlin, Germany; [3] CEA-INES, Le Bourget du Lac, France

2CV.3.47 A Clean Doping Strategy of Spiro-OMeTAD for Efficient and Stable Perovskite Solar Cells
Feng Wang[1], Tiankai Zhang[1], Feng Gao[1]
[1] Linköping University, Linköping, Sweden

2CV.3.48 Sequentially Hybrid Vacuum-Processed Multi-Cation Halide Perovskite
Felix Battran[1], Erik Ahlswede[1], Micheal Powalla[1]
[1] ZSW, Stuttgart, Germany

2CV.3.50 Unveiling the Charge Transport Mechanism in Quasi-2D Halide Perovskites Through KPFM and c-AFM Analysis
Hongjae Shim[1], Jonghoon Han[2], Jihoo Lim[1], Jan Seidel[1], Martin Green[1], Shujuan Huang[2], Jae Sung Yun[3], Jincheol Kim[2]
[1] UNSW, Sydney, Australia; [2] Macquarie University, Sydney, Australia; [3] University of Surrey, Guildford, United Kingdom

2CV.3.51 Solvent Engineering Driven Morphology Control of Perovskite Under Air Ambient Device Fabrication
Nitin Bansal[1], Shivam Porwal[2], Trilok Singh[1]
[1] IIT Delhi, New Delhi, India; [2] IIT Kharagpur, Kharagpur, India

2CV.3.52 Scaling up Thermal Evaporation Processes for Perovskite Photovoltaics - From Point Sources to Linear Evaporators
Bruno Heimke[1], Carsten Deus[1], Jens Baumann[1], Paul Faßl[2], Julian Petry[2], Ullrich Wilhelm Paetzold[2], Marcel Ross[3], Steve Albrecht[3], Jona Kurpiers[3]
[1] VON ARDENNE, Dresden, Germany; [2] KIT, Karlsruhe, Germany; [3] HZB, Berlin, Germany

2CV.3.53 Novel Sn CVD Precursor for Depositing SnO2 Thin Film as Transparent Conductive Oxide
Yoshio Ohshita[1], Toshinori Numata[1], Atsushi Ogura[2], Hyunju Lee[2], Hideaki Machida[3]
[1] Toyota Technological Institute, Nagoya, Japan; [2] Meiji University, Kawasaki, Japan; [3] Gas-Phase Growth, Koganei, Japan

2CV.3.54 Development of MAPbI3 Films via Evaporation Methods as Photoactive Layer in Perovskite Solar Cells
Lucia V. Mercaldo[1], Manuela Ferrara[1], Maria Federica Caso[1], Giuseppe Nasti[1], Corinna Ponti[2], Gennaro V. Sannino[2], Carmen Serpico[2], Paola Delli Veneri[1]
[1] ENEA, Portici, Italy; [2] University of Naples Federico II, Naples, Italy

2CV.3.55 Roll-to-roll Printed SnO2 for Flexible n-i-p Perovskite PV
Thomas Kraft[1], Ville Holappa[1], Riikka Suhonen[1]
[1] VTT Technical Research Centre of Finland, Oulu, Finland

2CV.3.56 The Interface Engineering and the Use of 2D Materials to Scaling up the Production of Perovskite Solar Modules
Sara Pescetelli[1], Antonio Agresti[1], Paolo Mariani[1], Hanna Poznyak[2], Enrico Leonardi[3], Francesco Bonaccorso[4], Emmanuel Kymakis[5], Aldo Di Carlo[1]
[1] University of Rome Tor Vergata, Rome, Italy; [2] Grenoble Alpes University, Grenoble, France; [3] GreatCell Solar Italia, Rome, Italy; [4] BeDimensional, Genoa, Italy; [5] Hellenic Mediterranean University, Heraklion, Greece

2CV.3.57 Wide Bandgap Perovskite Solar Module Geometry Optimization by Single-diode Modeling Leading >98% Geometrical Fill Factor >80% Fill Factor
Bahri Eren Uzuner[1], Amir Zarean Afshord[1], Aranzazu Aguirre[2], Tom Aernouts[2], Görkem Günbaş[1], Yinghuan Kuang[2], Selçuk Yerci[1]
[1] METU, Ankara, Turkey; [2] Hasselt University/Imo-Imomec, Genk, Belgium

2CV.3.58 Improving Efficiency of Film-Type Perovskite Solar Cells with Current Collection Through-hole Electrodes
Makoto Konagai[1], Yuya Momose[1], Naoki Suyama[1], Ryousuke Ishikawa[1]
[1] Tokyo City University, Tokyo, Japan

2CV.3.59 A Strategy for Improving Perovskite Film Characteristics through MACl Vapor Annealing
Youngmin Kim[1], Sujin Cho[1], Wonkyu Lee[1], Jae-Keun Hwang[1], Solhee Lee[1], Dowon Pyun[1], Ji-Seong Hwang[1], Jiyeon Nam[1], Seok-Hyun Jeong[1], Kyunghwan Kim[1], Sang Won Lee[1], Youngho Choe[1], Donghwan Kim[1], Yoonmook Kang[1], Hae-Seok Lee[1]
[1] Korea University, Seoul, South Korea

2CV.3.60 Mitigation of Parasitic Leakage Current in Indoor Perovskite Photovoltaic Modules Using Porous Alumina Interlayer
Gyeong G. Jeon[1], Da Seul Lee[2], Min Jun Choi[1], You-Hyun Seo[3], Shujuan Huang[4], Jong H. Kim[1], Seong Sik Shin[2], Jincheol Kim[4]
[1] Ajou University, Suwon, South Korea; [2] Sungkyunkwan University, Suwon, South Korea; [3] Korea Research Institute of Chemical Technology, Daejeon, South Korea; [4] Macquarie University, Sydney, Australia

2CV.3.61 Micro Inverted Pyramid Formation in Titanium Dioxide Layer by Pulsed Laser Irradation to Improved Electron Transport in MAPBI3-Based Photovoltaic Devices
Luis Ocaña[1], Carlos Montes[1], Benjamín González-Díaz[2], Sara González-Pérez[2], Elena Llarena[1]
[1] ITER, Granadilla de Abona, Spain; [2] University of La Laguna, San Cristóbal de La Laguna, Spain

2CV.3.63 Improving Efficiency and Stability of Perovskite Solar Cells Using Interface Passivation with 2D Perovskite Films
Shahriyar Safat Dipta[1], Ashraful Hossain Howlader[1], Walia Binte Tarique[1], Ashraf Uddin[1]
[1] UNSW, Sydney, Australia

2CV.3.64 Photoluminescence and Lifetime Stability of Pentacene and Oxide Perovskites Nanoparticles Films on Nanotextured Silicon Substrate
Rémi Ndioukane[1], Abdoul Kadri Diallo[1], Diouma Kobor[1], Sergio de Armas Rillo[2], Fernando Lahoz Zamarro[2]
[1] Ziguinchor University, Ziguinchor, Senegal; [2] Universidad de La Laguna, Santa Cruz de Tenerife, Spain

Thursday, 26. September 2024

VISUAL PRESENTATIONS 4DV.1

08:30 - 10:00 Dual Use (Floating PV, Agrivoltaics, VIPV) and other Innovative PV Applications

4DV.1.1 Enhancing Agrivoltaic Performance with Bifacial Photovoltaic Modules and Concentration
Elmehdi Mouhib[1], Leonardo Micheli[2], Florencia Almonacid[1], Eduardo F. Fernández[1]
[1] University of Jaén, Jaén, Spain; [2] Sapienza University of Rome, Rome, Italy

4DV.1.2 Modelling, Design, and Performance Evaluation of Agri-PV Orchards
Odysseas Alexandros Katsikogiannis[1], Olindo Isabella[1], Hesan Ziar[1]
[1] TU Delft, Delft, The Netherlands

4DV.1.3 Bifacial Panels for Agrivoltaics and Crop Influence: Expected Benefits
Miguel-Ángel Muñoz-García[1], María Beatriz Nieto[1], Guillermo Pedro Moreda-Cantero[1], Carmen Alonso-García[2], Luís Fialho[3], Fátima Baptista[3]
[1] UPM, Madrid, Spain; [2] CIEMAT, Madrid, Spain; [3] University of Évora, Évora, Portugal

4DV.1.4 Analysis of the Use of Bifacial Solar Panels in Vertical Placement and Their Temporal Coupling in Agrivoltaic Irrigation
Guillermo-Pedro Moreda-Cantero[1], Raúl Sánchez-Calvo[1], Luis Juana-Sirgado[1], Delia Rodríguez Lucas[2], Miguel-Ángel Muñoz-García[1]
[1] UPM, Madrid, Spain; [2] Harvard University, Cambridge, United States of America

4DV.1.5 Comparison of Photovoltaic Green Roofs and Agricultural Photovoltaics Across Climate Zones – Benefits and Recommendations
Faizatuzzahrah Rahmaniah[1], Stephen Tay[1]
[1] National University of Singapore, Singapore, Singapore

4DV.1.6 Design and Methodology for an Agrovoltaic Pilot Project in the Alentejo Region
Helena Oliveira[1], Lisa Bunge[1], Luís Fialho[1], Paulo Infante[1], Pedro Horta[1]
[1] University of Evora, Evora, Portugal

4DV.1.7 Technical and Agronomic Performance of Interspace Agrivoltaics
Erion Bousi[1], Stephan Schindele[1], Martin Dennemoser[1]
[1] BayWa r.e., Munich, Germany

4DV.1.8 Growing Greener. First Step on the Journey to Maximize Agri-Voltaic Potential
Gofran Chowdhury[1], Giovanni Borz[2], David Moser[2]
[1] 3E, Brussels, Belgium; [2] Eurac Research, Bolzano, Italy

4DV.1.9 Assessing the Agrivoltaic Potential in Hot Desert Climates
Juan Lopez-Garcia[1], Sachin Jain[1], Daniel Perez-Astudillo[1], Dunia Bachour[1], Dhanup Pillai[1], Veronica Bermudez-Benito[1]
[1] HBKU, Doha, Qatar

4DV.1.10 AgriPV in Norway: Evaluating the Initial Performance and Lessons Learned
Steve Völler[1], Marisa Di Sabatino[1], Gaute Stokkan[2]
[1] NTNU, Trondheim, Norway; [2] SINTEF Industry, Trondheim, Norway

4DV.1.11 Comprehensive Simulation Method for Analyzing the Land-Use Efficiency of Agrivoltaics Across Diverse Agricultural Landscapes
Leonhard Gfuellner[1], Lisa-Marie Bieber[1], Maddalena Bruno[1], Adrian Ernst[1], Matthew Berwind[1]
[1] Fraunhofer ISE, Freiburg, Germany

4DV.1.12 Dual-Use Potential of AgriVoltaics in Portugal – Case Study of Herdade da Sobreira de Baixo
Lisa Bunge[1], Cláudia Fernandes[2], Filipe Serra[2], Daniel Albuquerque[2], João Formiga[2], Diogo Cordeiro[3], André Soeiro[3], Luís Fialho[1]
[1] University of Évora, Évora, Portugal; [2] EDP NEW, Sacavém, Portugal; [3] EDP, Lisbon, Portugal

4DV.1.13 Resilience Using Vehicle-Mounted PV: Required Number of Vehicles
Soma Kawate[1], Kenji Araki[1], Yasuyuki Ota[1], Kensuke Nishioka[1]
[1] University of Miyazaki, Miyazaki, Japan

4DV.1.14 VIPV: Implementing New Shading Model in Energy Flow Model
Anna J. Carr[1], Ashish Binani[1], Sanne van den Broek[2], Lenneke Slooff-Hoek[1], Arthur Weeber[2]
[1] TNO, Petten, The Netherlands; [2] TU Delft, Delft, The Netherlands

4DV.1.15 High Power Photovoltaic of Flexible c-Si Shingled Photovoltaic Modules for Mobility Integrated Photovoltaic
Jinho Shin[1], Sung-Min Youn[2], Min Joon Park[2], Eunae Jo[2], Ki seok Jeon[2], Min Seob Kim[1], Eun bi Lee[2], Chaehwan Jeong[2]
[1] Chonnam National University, Gwangju, South Korea; [2] KITECH, Gwangju, South Korea

4DV.1.16 IEA HEV TCP PVPS Task 17: VIPV Business Plan - The Long Way to the Mass Market
Urs Muntwyler[1]
[1] Dr. Schüpbach & Muntwyler, Bern, Switzerland

4DV.1.17 Cost-Competitiveness Analysis for Infrastructure Integrated PV
Jose Maria Vega de Seoane[1], Elina Bosch[2], André Penas[2], Philippe Macé[2], Gaëtan Masson[2]
[1] Becquerel Institute España, San Sebastian, Spain; [2] Becquerel Institute, Brussels, Belgium

4DV.1.19 Hydroecological Monitoring of Floating Solar Power Plants in the Context of Climate Change
Konstantin Ilgen[1], Dirk Schindler[2], Christian Braun[1], Robert Ladwig[3], Ralph Zähringer[1], Jan Wannenwetsch[1], Marco Lennard Trentmann[1], Alexander Kleinhans[1], David Melgar[1], Leonhard Gfuellner[1], Matthew Berwind[1], Jens Lange[2]
[1] Fraunhofer ISE, Freiburg, Germany; [2] University of Freiburg, Freiburg, Germany; [3] University of Aarhus, Aarhus, Denmark

4DV.1.20 Quantifying Thermal Dynamics: FPV System Analysis in Lake Beilen Based on Measured Data
Niek van den Nobelen[1], Annanta Kaul[1], Sara Golroodbari[1], Wilfried van Sark[1]
[1] Utrecht University, Utrecht, The Netherlands

4DV.1.21 Comparative Thermal Analysis: Evaluation of System Configuration Differences in FPV Power Plants
Monica Nicola[1], Konstantin Ilgen[1], Matthew Berwind[1]
[1] Fraunhofer ISE, Freiburg, Germany

4DV.1.22 Sierra Brava Floating Photovoltaic Plant: Real Data vs Simulation Software
Dorivaldo Duarte[1], Luis Fialho[1], Manuel Pedro Ivens Collares-Pereira[1], Pedro Horta[1], Sara Pereira[1], Maria Cebria[2], Nerea Vidal[2]
[1] University of Évora, Évora, Portugal; [2] Acciona, Madrid, Spain

4DV.1.23 Numerical Model for Wave Motions and Loads of Multibody Floating Photovoltaic Structures
Antonio Mikulić[1], Ivan Catipovic[1], Neven Alujević[1], Inno Gatin[2]
[1] University of Zagreb, Zagreb, Croatia; [2] Cloud Towing Tank, Zagreb, Croatia

4DV.1.24 Port of Sines Energy Transition: Photovoltaic Solutions Addressing R4 Concept
Joana Correia[1], Luís Fialho[1], Pedro Horta[1]
[1] University of Évora, Évora, Portugal

4DV.1.25 Power Supply System for the PV Plants Cleaning Drones
Narek K. Badalyan[1], Ruben R. Vardanyan[1]
[1] National Polytechnic University of Armenia, Yerevan, Armenia

4DV.1.26 Integrating PVs in Nature Based Solutions: The Case of the Urban Green Spaces New Plan in Rimini, Italy
Paolo Picchi[1], Maurizio Cocchi[1], Filippo Piva[2]
[1] ETA Florence, Florence, Italy; [2] PAMPA Studio, San Marino, San Marino

4DV.1.27 Accelerate Product Development for PV in Alpine Installations
Anika Gassner[1], Gabriele Eder[1], Ebrar Özkalay[2], Gabi Friesen[2], Markus Feichtner[3], Mauro Caccivio[2], Friedrich Bleicher[4]
[1] OFI, Vienna, Austria; [2] SUPSI PVLab, Mendrisio, Switzerland; [3] Sonnenkraft Energy, St. Veit a.d. Glan, Austria; [4] TU Wien, Vienna, Austria

4DV.1.28 A Brief Investigation on Agrivoltaic in European Countries
Sara Mirbagheri Golroodbari[1], Nabih Cherradi[2], Kay Cesar[3], Bas van Aken[3], Tim Kaasjager[3], Paolo Picchi[4], Bonna Newman[5]
[1] Utrecht University, Utrecht, The Netherlands; [2] Empower Sun, Baar, Switzerland; [3] TNO, Petten, The Netherlands; [4] ETA-Florence Renewable Energies, Florence, Italy; [5] LightYear, Helmond, The Netherlands

4DV.1.29 Back Irradiance Measurements and Influence of the Ground Coverage on the Production of a Bifacial Agri-PV System
Diogo Vicente[1], Dmitri Boutov[1], João Serra[1]
[1] University of Lisbon, Lisbon, Portugal

4DV.1.30 Field Characterization of Vertical and Tilted Agrivoltaic Installations
Kamran Ali Khan Niazi[1], Marta Victoria[1]
[1] Aarhus University, Aarhus, Denmark

4DV.1.31 Assessing the Impact of Open Field Agrivoltaics on Microclimates; Modelling the Potential Heat Flux and Evapotranspiration
Richmond Kuleape[1], Matthew Berwind[2], Brendon Bingwa[2], Max Trommsdorff[2], Anna Heimsath[2], Martine van der Ploeg[3], Werner Platzer[2], Dierk Bauknecht[1]
[1] University of Freiburg, Freiburg, Germany; [2] Fraunhofer ISE, Freiburg, Germany; [3] Wageningen University & Research, Wageningen, The Netherlands

4DV.1.32 Analysis and Comparison of Solar Data Retrieved from Buses in Funchal, Madeira and Lisbon, Portugal
Guus Janssen[1], Miguel Centeno Brito[2], Angele Reinders[1]
[1] Eindhoven University of Technology, Eindhoven, The Netherlands; [2] University of Lisbon, Lisbon, Portugal

4DV.1.33 Assessing the Energy Yield and Irradiance Distribution in Complex Crop Canopies Under Fixed and Tracking Agrivoltaic Systems
Shu-Ngwa Asa'a[1], Ismail Kaaya[1], Olivier Dupon[1], Richard de Jong[1], Sara Bouguerra[1], Arvid van der Heide[1], Arnaud Morlier[1], Hariharsudan Sivaramakrishnan Radhakrishnan[1], Jef Poortmans[1], Michael Daenen[1]
[1] Hasselt University/Imo-Imomec, Genk, Belgium

4DV.1.34 Economic Attractiveness of Agrivoltaics in Different Regulation Status – Case Study
Elina Bosch[1], André Penas[1], Carolina Plaza[2], Philippe Macé[1], Gaëtan Masson[1]
[1] Becquerel Institute, Brussels, Belgium; [2] Becquerel Institute France, Lyon, France

4DV.1.35 The Impact of the Placement of Albedo Boosters on the Energy Yield in Fixed and Tracking Agrivoltaic Systems
Shu-Ngwa Asa'a[1], Ismail Kaaya[1], Olivier Dupon[1], Richard de Jong[1], Sara Bouguerra[1], Arvid van der Heide[1], Arnaud Morlier[1], Hariharsudan Sivaramakrishnan Radhakrishnan[1], Jef Poortmans[1], Michael Daenen[1]
[1] imo-imomec, Genk, Belgium

4DV.1.36 PV on Infrastructure in the Netherlands
Corry de Keizer[1], Maarten Dörenkämper[1], Minne de Jong[1]
[1] TNO, Eindhoven, The Netherlands

4DV.1.37 Concentrated and Cascaded Solar PV Standalone System for Sustainable Energy Buildings
Mayank Gupta[1], Zala ParamSinh BharatSinh[1]
[1] Pandit Deendayal Energy University, Gujarat, India

VISUAL PRESENTATIONS 5DV.2

10:30 - 12:00 Energy System Integration; Resilience and Security of Supply; Solar Fuels, Storage | PV Sustainability

5DV.2.1 Techno-Economic Analysis of Residential PV-Battery Energy System in Nordics
Lauri Karttunen[1], Sami Jouttijärvi[1], Johannes Niskanen[1], Hugo Huerta[2], Samuli Ranta[2], Kati Miettunen[1]
[1] University of Turku, Turku, Finland; [2] Turku University of Applied Sciences, Turku, Finland

5DV.2.2 On the Statistics of Photovoltaics in Europe
Wilfried van Sark[1], Anton Driesse[2]
[1] Utrecht University, Utrecht, The Netherlands; [2] PV Performance Labs, Freiburg, Germany

5DV.2.3 Possibilities of PV Maximization for Achieving Positive Energy Districts with Respect to Building Density
Helmut Bruckner[1], Maarten Verkou[2], Simon Schneider[3], Miro Zeman[2], Zain Ul Abdin[4], Rudi Santbergen[4], Olindo Isabella[4]
[1] Sonnenplatz Grossschoenau, Grossschoenau, Austria; [2] PV Works, Delft, The Netherlands; [3] FH Technikum Wien, Wien, Austria; [4] TU Delft, Delft, The Netherlands

5DV.2.4 Sizing of Energy Storage Systems for Different Levels of PV and Wind Power in Combined PV–Wind Power Plants
Micke Talvi[1], Kari Lappalainen[1]
[1] Tampere University, Tampere, Finland

5DV.2.5 Integration of Supercapacitors in a Solar Photovoltaic Water Pumping System: Case of Koyli Alpha Village, in Ferlo, Senegal
Badara Mbow[1], Serigne Ndiangue Leye[1], Papa Lat Tabara Sow[1], Senghane Mbodji[1]
[1] University of Alioune DIOP, Bambey, Senegal

5DV.2.6 Quantitative Evaluation Method for Regional Variations in Electricity Supply-Demand Balance Fluctuation by Weather Forecast Error
Issei Suemitsu[1], Tohru Kohno[1], Jun Tsunoda[1], Kengo Kumano[1]
[1] Hitachi, Tokyo, Japan

5DV.2.7 Batteries in Direct-Coupled PV-Driven Water Splitting Systems: Stability and Synergistic Efficiency Gain
Oleksandr Astakhov[1], Uchechi Chibuko[1], Florian Seidler[1], Sergey Shcherbachenko[1], Uwe Rau[1], Tsvetelina Merdzhanova[1]
[1] FZJ, Jülich, Germany

5DV.2.8 From Predictions to Profit of a Hybrid Prosumer Pilot: A Forecast-based Robust Battery Dispatch
Mojtaba Eliassi[1], Anouk Hut[1], Gofran Chowdhury[1]
[1] 3E Belgium, Brussels, Belgium

5DV.2.9 Hybrid Energy Storage Systems Design Tool
Ana Catarina Neves Foles[1], Luís Fialho[1], Luís Fava[1], Pedro Matos[2], Pedro Horta[1]
[1] University of Évora, Évora, Portugal; [2] Capwatt Services, Maia, Portugal

5DV.2.10 Solar PV and Battery Microgrid for Electric Cooking - Case Study Eco Moyo Education Centre in Kenya
Audun Bangsund[1], Stian Rummelhoff[1], Ida Fuchs[1]
[1] NTNU, Trondheim, Norway

5DV.2.11 Integrating Bifacial PV Forecast to Energy Management System for Mixed-Use Buildings
Hugo E. Huerta[1], Shuo Wang[1], Samuli Ranta[1]
[1] Turku UAS, Turku, Finland

5DV.2.12 Optimization of Vanadium Redox Flow Battery Performance for Solar PV Integrated Electric Vehicle Charging Station
Ankur Bhattacharjee[1]
[1] BITS Pilani, Hyderabad, India

5DV.2.13 First Experimental Approach to Copper-based Flow Batteries for Energy Storage and Renewables Integration [CuBER]
Raquel Simón Allué[1], Isabel Guedea Medrano[1]
[1] ENDEF Solar Solutions, Zaragoza, Spain

5DV.2.14 Challenges and Learning Lessons in Residential Energy Storage Projects
Amanda Mendes Ferreira Gomes[1], Aline Kirsten Vidal de Oliveira[1], Marília Braga[1], Ricardo Rüther[1]
[1] UFSC, Florianopolis, Brazil

5DV.2.15 Testing a Segmented Approach for Regional PV Modelling in Italy: PV Has More Than One Face
Rodrigo Amaro e Silva[1], Yves-Marie Saint-Drenan[1]
[1] MINES Paris- PSL Resarch University, Sophia Antipolis, France

5DV.2.16 Let's Discuss Regional PV Modelling: Lessons Learned from the Development of an Operational Model
Rodrigo Amaro e Silva[1], Yves-Marie Saint-Drenan[1]
[1] MINES Paris - PSL Resarch University, Sophia Antipolis, France

5DV.2.17 Load Shifting in Energy Communities by Providing User-Centered Recommendations – Forecast, Optimization and Potential
Lukas Gaisberger[1], Georgios Chasparis[2], Wolfgang Traunmüller[3]
[1] University of Applied Sciences Upper Austria, Wels, Austria; [2] Software Copetence Center Hagenberg, Hagenberg, Austria; [3] BLUE SKY Wetteranalysen, Attnang, Austria

5DV.2.18 Fast Oscillations Damping Control for PV-BESS Power Plants
Alex Renan Arrifano Manito[1], Pedro Torres[1], Marcelo Pinho Almeida[1], Gilberto Figueiredo[2], José Cesar Almeida[3], Roberto Zilles[1]
[1] USP, São Paulo, Brazil; [2] Fluminense Federal University, Niterói, Brazil; [3] Mackenzie Presbyterian University, São Paulo, Brazil

5DV.2.19 Optimal Use of Batteries on PV Systems for Solving Problems Caused by Predictable Partial Shadings
Rosario Carbone[1], Cosimo Borrello[1], Ferdinando Gioia[1]
[1] University "Mediterranea" of Reggio Calabria, Reggio Calabria, Italy

5DV.2.20 Techno-Economic Assessment of Pumped Storage Hydro Power in Hybrid Operation with Floating Photovoltaic and Battery Energy Storage
Andreas Patha[1], Sebastian Steinlechner[1], Johannes Kathan[1], Antonia Golab[2], Johann Auer[2]
[1] AIT, Vienna, Austria; [2] Vienna University of Technology, Vienna, Austria

5DV.2.25 Ecological Evaluation of Novel Agrivoltaic Systems: A Comparative Life Cycle Assessment
Miriam Godinez[1], Marc-Andre Schnaiker[1], Anna Heimsath[1], Kamran Ali Khan Niazi[2], Marta Victoria[2], Jan Cappelle[3], Cas Lavaert[3], Matthew Berwind[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] Aarhus University, Aarhus, Denmark; [3] KU Leuven, Leuven, Belgium

5DV.2.27 Guideline on Life Cycle Assessment of Agrivoltaic Systems
Maria Anna Cusenza[1], Andrea Danelli[1], Pierpaolo Girardi[1]
[1] RSE, Milan, Italy

5DV.2.28 Are Bio-Based Materials Suitable for PV?
Lison Marthey[1], Sonja Feldbacher[2], Olatz Arriaga Arruti[1], Xavier Bulliard[1], Pierrick Duvoisin[1], Alexis Barrou[1], Laurie-Lou Senaud[1], Bertrand Paviet-Salomon[1], Matthieu Despeisse[1], Gernot Oreski[2], Christophe Ballif[1]
[1] CSEM SA, Neuchâtel, Switzerland; [2] PCCL, Leoben, Austria

5DV.2.29 Cradle-to-Cradle Recycling to Support the Transition to 100% Renewable Energies
Ian Marius Peters[1]
[1] FZJ - HI ERN, Erlangen, Germany

5DV.2.30 Enhanced Solar Grade Film Separation Process for Recycling of Photovoltaic Modules
Merve Çorak[1], Bedrettin Aydoğan[1], Hatice Duman[1], Meriç Çalışkan Arslan[1], Ramazan Alpay[2], Nihan Akın Sönmez[2]
[1] Kalyon PV, Ankara, Turkey; [2] Gazi University, Ankara, Turkey

5DV.2.31 Life Cycle Assessment of Processing and Refining Secondary Raw Materials from Silicon PV Manufacturing in the ICARUS Project
Rene Peche[1], Matthias Seitz[1], Karsten Wambach[1]
[1] Bifa Environmental Institute, Augsburg, Germany

5DV.2.32 A Prospective Life Cycle Assessment of Silicon-Perovskite Tandem Photovoltaics
Mitchell Van der[1], Mirjam Theelen[2], Dorottya Magoss[1], Yiri Massop[1], Sjoerd Veenstra[2], Niels Van Loon[2], Ilker Dogan[2], Gianluca Coletti[3], Mark A.J. Huijbregts[1], Rosalie Van Zelm[1], Mara Hauck[4]
[1] Radboud University, Nijmegen, The Netherlands; [2] TNO partner in Solliance, Eindhoven, The Netherlands; [3] UNSW, Sydney, Australia; [4] TNO, Utrecht, The Netherlands

5DV.2.33 Beyond the Material Recovery: Exergy and Environmental Analysis of Solar Panel Recycling
Simon Jech[1], Neha Garg[1], Kati Miettunen[2], Annukka Santasalo-Aarnio[1]
[1] Aalto University, Espoo, Finland; [2] University of Turku, Turku, Finland

5DV.2.34 Energy Harvesting in Cities with Transparent and Highly Efficient Window-Integrated Multi-Junction Solar Cells
Francesco Viero[1], Letizia Bua[1], Paolo Biagini[2], Aldo Di Carlo[3]
[1] Eni, San Donato Milanese, Italy; [2] Eni, Novara, Italy; [3] CHOSE, Rome, Italy

5DV.2.35 Life Cycle Assessment of a High-Altitude Photovoltaic Power Plant in the Swiss Alps
Fabian Elsener[1]
[1] ZHAW, Baar, Switzerland

5DV.2.36 Comparison of Organic Solvents for Chemical Recycling of Photovoltaic Panels
Olivia Bowen[1], Anna Kuczynska-Lazewska[2], Rong Deng[1]
[1] UNSW, Sydney, Australia; [2] Gdansk University of Technology, Gdansk, Poland

5DV.2.37 Holistic Assessment of Scenarios for Future PV Deployment Considering Circular Economy in the EU Using PV ICE
Fabian Spera[1], Andreas Schwarz[1], Robin Graeber[1], Oliver Pfeiffer[1], Ulf Blieske[1]
[1] Cologne University of Applied Sciences, Cologne, Germany

5DV.2.38 Development and Testing of a Thermomechanical Procedure to Assess the Disassembly Potential of a Photovoltaic Module
Asier Murillo[1], Cristina Pinto[1], Alicia Buceta[1], Eugenia Zugasti[1], Antonio Urbina[2], Jaione Bengoechea[1]
[1] CENER, Sarriguren, Spain; [2] Public University of Navarre, Pamplona, Spain

5DV.2.39 Assessment of the Performance and Potential Reuse of Repaired Photovoltaic Modules in Real Operating Conditions
María Beatriz Nieto-Morone[1], Carmen Alonso-García[1], Félix García-Rosillo[1], Miguel Ángel Muñoz-García[2]
[1] CIEMAT, Madrid, Spain; [2] UPM, Madrid, Spain

5DV.2.40 Which is the Most Environmentally Friendly PV Technology: c-Si Solar Cells or Perovskite Silicon Tandem Solar Cell?
Elisabetta Brivio[1], Andrea Danelli[1], Pierpaolo Girardi[1]
[1] RSE, Milan, Italy

5DV.2.41 Considering the Environmental Consequences of the Evolution of the Risk of Extreme Natural Events on a PV Installation: A Morphological Analysis-based Prospective Method Applied to Life Cycle Assessment
Alejandra Cue Gonzalez[1], Eric Rigaud[1], Paula Perez-Lopez[1], Philippe Blanc[1]
[1] PSL University, Valbonne, France

5DV.2.42 Riding The Wave: Opportunities and Constraints to Reuse and Resale of Photovoltaic PV Modules in South Africa
Nicole Crozier[1], Jacqueline Crozier McCleland[2], Ernest van Dyk[2], Catherina Schenck[1], Palisa Ntsala[2]
[1] University of the Western Cape, Cape Town, South Africa; [2] Nelson Mandela University, Nelson Mandela Bay, South Africa

5DV.2.43 Comprehensive Analysis on Mechanical Methods for Recycling Photovoltaic Modules
Josefina Ottitsch[1], Matthias Thin[1], Anika Gassner[1], Gerhard Wiesinger[1], Christoph Einspieler[1], Friedrich Bleicher[1]
[1] TU Wien, Vienna, Austria

5DV.2.44 Future Material Demand for Global Silicon-based Photovoltaic Systems
Chengjian Xu[1], Olindo Isabella[1], Malte Ruben Vogt[1]
[1] Delft University of Technology, Delft, The Netherlands

5DV.2.45 Reducing Risk and Environmental Impact of Floating Offshore Hybrid Renewable Energy Farm
Nisha Kaur[1], Sudhakar Kumarasamy[1], M.R. Mohamed[1]
[1] UMPSA, Pekan, Malaysia

5DV.2.46 Water Jet Cutting for Multi-Stage Delamination of Si-based Photovoltaic Modules: Practical Experimentation
Ferozan Azizi[1], Ulrich Spitzer[1], Ewald Perndorfer[2], Thomas Nigl[1]
[1] Montanuniversity Leoben, Leoben, Austria; [2] Perndorfer Maschinenbau, Kallham, Austria

5DV.2.47 Circularity in the PV Industry – Detailed Analysis of Environmental Impacts for Reused PV Panels
Alejandra Galarza[1], Pierre-Philippe Grand[1], Nicolas Vandamme[1], Anaïs Gouabault[2], Juan Alzate[2], Nicolas Defrenne[2], Marie Lacombe[2], Lars Oberbeck[3]
[1] IPVF, Palaiseau, France; [2] SOREN, Paris, France; [3] IPVF, Paris, France

5DV.2.48 Multi-Loop Recycling of Perovskite Solar Cells
Yanxue Wang[1], Zhenni Wu[2], Mykhailo Sytnyk[1], Jiyun Zhang[2], Gülüsüm Babayeva[1], Jens Hauch[1], Christoph Brabec[2], Ian Marius Peters[2]
[1] HI ERN, Erlangen, Germany; [2] FAU, Erlangen, Germany

5DV.2.49 Metal and Silicon Recovery from Discarded Perovskite-On-Silicon Tandem Photovoltaic Panels: An Experimental Study
George Wong[1], Lian Duan[1], Nicolas Loones[1], Iwan Zimmermann[1], Karsten Wambach[2], Lars Oberbeck[1]
[1] IPVF, Palaiseau, France; [2] Bifa Umweltinstitut, Augsburg, Germany

5DV.2.50 Assessment of EU PV Circular Supply Chain Circularity Constraints
Tadas Radavicius[1], Stefan Groesser[2]
[1] SoliTek/VIlnius TECH, Vilnius, Lithuania; [2] Bern University of Applied Sciences, Bern, Switzerland

5DV.2.51 Environmental Analysis of High Vacuum Flat Plate Hybrid Photovoltaic-Thermal Collectors
Annalisa Di Napoli[1], Paolo Strazzullo[1], Roberto Russo[2], Marilena Musto[1]
[1] University of Naples Federico II, Naples, Italy; [2] National Research Council of Italy, Naples, Italy

5DV.2.52 LCA-Informed Approach for Lower Environmental Impact Recycling of Crystalline Silicon Solar Cells
Bashayer Alsulami[1], Jonathon Harwell[1], Guillaume Zante[2], Andrew Abbott[2], Andrew Feeney[1], Jeff Kettle[1]
[1] University of Glasgow, Glasgow, United Kingdom; [2] University of Leicester, Leicester, United Kingdom

5DV.2.53 Separation of EoL PV Modules Using Liquid-Based Methods to Achieve Better Recycling Quality
Sonja Feldbacher[1], Daniel Schwabl[2], Ferozan Azizi[3], Gabriele Eder[4], Anika Gassner[4], Thomas Nigl[3], Gernot Oreski[1]
[1] PCCL, Leoben, Austria; [2] Circulyzer, Leoben, Austria; [3] University of Leoben, Leoben, Austria; [4] OFI, Vienna, Austria

5DV.2.54 Adapted Application of Photovoltaic Solar Panels ine the Field of Agro-Industry
Aliou Badji[1], Diouma Kobor[1]
[1] Ziguinchor University, Ziguinchor, Senegal

5DV.2.55 Managing Potential Environmental and Human Health Risks of Potential Hazardous Material Leaching from Photovoltaic Modules
Mitchell Rencheck[1], Cara Libby[1], Angelique Montgomery[2], Joshua S. Stein[2]
[1] EPRI, Palo Alto, United States of America; [2] Sandia National Laboratories, Albuquerque, United States of America

VISUAL PRESENTATIONS 5DV.3

13:30 - 15:00 PV Diversification Upstream and Downstream - from Industry to Applications | Costs, Economics, Finance and Markets | The Revolution of PV

5DV.3.1 An In-Depth Look at the European Ingot-Wafer Supply Chain
Oscar Rodolfo Ortega Alvarado[1], Estelle Gervais[1], Johan Lindahl[2], Baljeet Goraya[1], Peter Brailovsky[1], Sebastian Nold[1]
[1] Fraunhofer ISE, Freiburg, Germany; [2] ESMC, Brussels, Belgium

5DV.3.2 Economic Analysis of Solar PV Industrialization
Thibault Deletombe[1], Hyun Jin Julie Yu[1], Patrice Geoffron[2]
[1] CEA, Gif sur yvette, France; [2] Paris-Dauphine University, Paris, France

5DV.3.3 Drivers and Challenges of Solar Photovoltaics Adoption by Turkish Manufacturers
Furkan Tüzün[1], Pinar Derin Güre[2], Besim Can Zırh[2]
[1] University of Ankara, Ankara, Turkey; [2] METU, Ankara, Turkey

5DV.3.4 PV as a Building Material for the Energy Transition: Creation of a European BIPV Platform for Solar Architecture
Pierluigi Bonomo[1], Francesco Frontini[1], Angela Grassi[2], Heinz Ossenbrink[2], Giulio Poggiaroni[2], Lucia Montoni[2]
[1] SUPSI, Mendrisio, Switzerland; [2] ETA-Florence Renewable Energies, Florence, Italy

5DV.3.6 The Role and Impact of Building-Applied PV in the Norwegian Energy System Under Different Transition Pathways
Stine Fleischer Myhre[1], Eva Rosenberg[1]
[1] IFE, Lillestrom, Norway

5DV.3.7 Towards a Common Strategy for Agri-PV in Europe - The Italian Perspective
Celeste Mellone[1], Alessandra Scognamiglio[2], Giancarlo Ghidesi[3], Giulia Guidetti[4]
[1] Green Horse Advisory, Rome, Italy; [2] ENEA, Rome, Italy; [3] REM Tec, Rome, Italy; [4] Green Horse Advisory, Milan, Italy

5DV.3.8 Comparative Legal and Administrative Aspects of Agri-PV
Michael Frey[1], Antonia Kallina[1], Rahel Alia Müller[1]
[1] University of Applied Sciences Kehl, Kehl, Germany

5DV.3.9 The Impacts of Large-Scale Implementation of Solar Power in the Nordic Power Market
Dilshika Kavishani Heenatigala Kankanamge[1], Jaakko Jääskeläinen[1], Sanna Syri[1]
[1] Aalto University, Espoo, Finland

5DV.3.10 Integration of Photovoltaic Systems in the Austrian Power Plant Portfolio – A Geospatial Data Analysis
Stefan Übermasser[1], Fabian Leimgruber[1]
[1] AIT Austrian Institute of Technology, Vienna, Austria

5DV.3.11 Technical and Economic Analysis of the Implementation of Battery Energy Storage Systems (BESS) for Nodes in the National Electric System (SEN) with High Concentration of Solar Energy
Fernando Flores Lizana[1], Patricio Valdivia-Lefort[1], Rodrigo Barraza Vicencio[1]
[1] Federico Santa Maria Technical University, Santiago, Chile

5DV.3.12 Global Warming as a Solar Heat Engine Problem: Using Photovoltaics to Reverse Climate Change
Christiana Honsberg[1], Stuart Bowden[2], Ian Sellers[3], Richard King[1], Stephen Goodnick[1]
[1] Arizona State University, Tempe, United States of America; [2] Solestial Solar, Tempe, United States of America; [3] University of Buffalo, Buffalo, United States of America

5DV.3.13 The Role of Coupling the Heating, Cooling and Power Sectors to Achieve 100% Renewable Heating and Cooling in Europe
Olgu Birgi[1], Dominik Rutz[1], Rainer Janssen[1]
[1] WIP Renewable Energies, Munich, Germany

5DV.3.20 Analysis of Transport Costs of Solar Modules and Components
Max Mittag[1], Tim Straube[1], Christian Reichel[1]
[1] Fraunhofer ISE, Freiburg, Germany

5DV.3.21 Fabrication Planning of Module Manufacturing Plants – Parameter Analysis of Site Parameters and Modelling Tools
Max Mittag[1], Christian Reichel[1], Hannah Hoffman[1], Holger Neuhaus[1]
[1] Fraunhofer ISE, Freiburg, Germany

5DV.3.22 Economic Estimation of Electric Vehicles and PV Parks Operations at a City Scale for Frequency Regulation Markets with Vehicle-to-Grid
Mohamad Koubar[1], Reza Fachrizal[2], Oskar Lindberg[1], David Lingfors[1], Pei Huang[3], Magnus Berg[4], Joakim Munkhammar[1]
[1] Uppsala University, Uppsala, Sweden; [2] Mälardalen University, Västerås, Sweden; [3] Dalarna University, Dalarna, Sweden; [4] Vattenfal R&D, Stockholm, Sweden

5DV.3.23 How the End of Net-Metering Affects Your Energy Bill: A Case Study for the Netherlands
Minne M. de Jong[1], Sebastiaan la Fleur[1]
[1] TNO, Eindhoven, The Netherlands

5DV.3.24 Economic Estimations of a Stationary Battery Storage Operates on Frequency Regulation Markets in a Church Powered with PV System
Mohamad Koubar[1], Elaheh Jalilzadehazhari[1], Magnus Wessberg[2], Joakim Munkhammar[1]
[1] Uppsala University, Uppsala, Sweden; [2] Uppsala University, Gotland, Sweden

5DV.3.25 Macroeconomic Analysis of the Effects of Solar Photovoltaic Energy in Turkiye: A Computable General Equilibrium Model Approach
Pinar Derin Gure[1], Ezgi İpek[1]
[1] METU, Ankara, Turkey

5DV.3.26 Techno-Economic and Life-Cycle Assessment of Recycling Pathways for Perovskite on Silicon Tandem Modules
Lian Duan[1], George Wong[1], Lars Oberbeck[2]
[1] IPVF, Palaiseau, France; [2] TotalEnergies OneTech, Paris La Défense, France

5DV.3.27 Sensitivity of Electricity Price in the Finnish Market with Increasing Solar Energy Production
Sami Jouttijärvi[1], Seela Tervo[2], Lauri Karttunen[1], Hugo Huerta[3], Samuli Ranta[3], Kati Miettunen[1]
[1] University of Turku, Turku, Finland; [2] Aalto University, Espoo, Finland; [3] TUAS, Turku, Finland

5DV.3.28 Potential for International Policy and Industry Measures Across Diverse BIPV Markets
Momir Tabakovic[1], Michiel van Noord[2], Nuria N. Martín-Chivelet[3], Wilfried van Sark[4], Otto Bernsen[5], Francesca Tilli[6], Angelo Baggini[6], Rebecca Yang[7], Janne Halme[8], Elin Daun[9]
[1] FH Technical Wien, Vienna, Austria; [2] RISE Research Institutes of Sweden, Stockholm, Sweden; [3] CIEMAT, Madrid, Spain; [4] Utrecht University, Utrecht, The Netherlands; [5] The Netherlands Enterprise Agency (RVO), Utrecht, The Netherlands; [6] University of Bergamo, Roma, Italy; [7] RMIT University, Melbourne, Australia; [8] Aalto University, Aalto, Finland; [9] RISE Research Institutes of Sweden, Lund, Sweden

5DV.3.29 The Optimal Azimuth and Tilt Angle of BIPV Panels Considering the Prices at Electricity Spot Market
Iva Batic[1]
[1] University of Belgrade, Belgrade, Serbia

5DV.3.30 Assessing the Role of Photovoltaic Systems in Meeting the Energy Needs of Data Centers in Africa: A Bottom-Up Analysis
Marco Pittalis[1]
[1] European Commission JRC, Ispra, Italy

5DV.3.32 Rules, Regulations, Taxes and Subsidies Versus Globalisation and Events: Evaluating the Impact of Policymaking on Residential PV Deployment
Bert Herteleer[1], Wilfried van Sark[2]
[1] KU Leuven, Ghent, Belgium; [2] Utrecht University, Utrecht, The Netherlands

5DV.3.33 The Benefits of a Hybrid Wind-PV Power Plant at Competitive Wholesale Electricity Market – Case Finland
Simeon Seppälä[1], Sanna Syri[1], Iraj Moradpoor[1]
[1] Aalto University, Helsinki, Finland

5DV.3.34 Profitability of Utility-Scale Photovoltaic Systems in Finland
Seela Tervo[1], Sami Jouttijärvi[2], Kati Miettunen[2], Sanna Syri[1]
[1] Aalto University, Espoo, Finland; [2] University of Turku, Turku, Finland

5DV.3.35 Enhancing Energy Generation of Bifacial Photovoltaic Systems with Permeable Albedo Enhancement Composite
Filippos Farmakis[1], Alexandros I. Droudakis[2], George I. Tzinoglou[2]
[1] Democritus University of Thrace, Xanthi, Greece; [2] Thrace NG, Alimos (Athens), Greece

5DV.3.40 Empowering Energy: The Rise of Community-driven Solutions in a Decentralized Landscape
Domenico Vito[1], Martina Bosone[2], Barbara Pirelli[3]
[1] SDSU, San Diego, United States of America; [2] CNR, Naples, Italy; [3] Independent Lawyer, Taranto, Italy

5DV.3.41 Public Acceptance of Energy-Efficient Buildings
Duygu Celik[1], Silvia Caneva[1], Nicholas de la Vega[2], Gregory (Greg) Arrowsmith[2], Céline Suchet[2], Nathalie Richet[2], Riccardo Pinotti[2], Roberto Lollini[3], Mayam Fakhari[3], Cornelia Partsch[4], Alain Zarli[4], Nerea Gomez[4]
[1] WIP Renewable Energies, Munich, Germany; [2] EUREC, Brussels, Belgium; [3] Eurac Research, Bolzano, Italy; [4] ECTP, Brussels, Belgium

5DV.3.42 Hands-On Training in Photovoltaic Reliability Assessment: A Multinational Educational Approach under the PROMISE Project
Carlos Meza[1], Brian Azzopardi[2], Bernhard Kubicek[3], Aritz Legarrea Oyarzun[4], Ana Gracia Armillo[4], Melodie de L'Epine[5], Steve Zerafa[6], Austeja Mockeviciute-Azzopardi[2], Carmel Azzopardi[2], Brian Bartolo[2]
[1] Anhalt University of Applied Sciences, Koethen, Germany; [2] The Foundation for Innovation and Research, Valletta, Malta; [3] AIT, Vienna, Austria; [4] CENER, Sarriguren, Spain; [5] ICARES Consulting, Brussels, Belgium; [6] PIXAM, Valletta, Malta

5DV.3.43 Challenges of Energy Communities at Universities – A Virtual Approach
Matevž Bokalič[1], Matej Guštin[1], Ana Belen Cristóbal[2], Marta Victoria[3], Afonso Cavaco[4], Luís Fialho[4], Alexander Gerber[5], Marko Topič[1]
[1] University of Ljubljana, Ljubljana, Slovenia; [2] UPM, Madrid, Spain; [3] Aarhus University, Aarhus, Denmark; [4] University of Évora, Évora, Portugal; [5] inscico, Kleve, Germany

5DV.3.44 The Early History of Photovoltaics in Portugal: Every Country Has a Story to Tell
Rodrigo Amaro e Silva[1]
[1] MINES Paris-PSL Resarch University, Sophia Antipolis, France

5DV.3.45 Developing Communication Formats for a Positive Energy Transition Focusing on Photovoltaic – A Delphi Design Sprint Approach
Anne Karrenbrock[1], Laura Züll[1], Eva-Maria Grommes[1], Stefanie Könen[1], Anne-Maren Feldhof[1], Ulf Blieske[1], Thorsten Schneiders[1], Valérie Varney[1], Laura Popplow[1]
[1] University of Applied Sciences Cologne, Cologne, Germany

5DV.3.46 TRANSIT: Empowering Sustainable Energy Futures through Innovative Education and Grid-Integrated Roadmap Development
Brian Azzopardi[1], Daniel Busuttil[2], Araceli Hernandez Bayo[3], Ali Ehsan[4], Eduardo Maritinez Cesenia[4]
[1] The Foundation for Innovation and Research, Birkirkara, Malta; [2] MCAST, Paola, Malta; [3] Madrid Polytechnic University, Madrid, Spain; [4] The University of Manchester, Manchester, United Kingdom

5DV.3.47 Development of Sustainable BM by Securing RE100 Resources and Improving Local Residents' Acceptance Led by Local Governments
Cheolhyun Lim[1], Yoonchan Shin[2], Jeonghack Yoo[2], Taiwon Choi[3]
[1] Green Energy Institute, Mokpo, South Korea; [2] Green energy institute, Mokpo, South Korea; [3] U-energy, Suncheon-Si, South Korea

VISUAL PRESENTATIONS 4DV.4

15:15 - 16:45 PV System Engineering | Control and Systems for Power Systems with Renewables Integration

4DV.4.1 Assessing Glare Hindrance Three Ways in Fixed Tilt and Tracking PV Systems
Ashish Binani[1], Antonius R. Burgers[1], Kay Cesar[1], Bas Van Aken[1]
[1] TNO, Petten, The Netherlands

4DV.4.2 ALIENCE- Alpine PV Competence
Hartmut Nussbaumer[1], Roger Hiltebrand[1], Selina Pfyffer[1], Markus Klenk[1], Christof Bucher[2], Matthias Hügi[2], Sina Spring[2], Gabi Friesen[3], Mauro Caccivio[3], Ebrar Özkalay[3], Evelyn Bamberger[4], Christof Biba[4]
[1] ZHAW, Winterthur, Switzerland; [2] BUAS, Bern, Switzerland; [3] SUPSI, Mendrisio, Switzerland; [4] OST, Rapperswil, Switzerland

4DV.4.3 Complementary Guide for the Electrical Design of Grid-Connected PV Systems
Bruno Gaiddon[1], Marielle Perrin[1], Elika Saidi-Chalopin[2], Salomé Durand[3], David Gréau[4], Bakari Soumare[5], Mathieu Mansouri[6], François Saugues[7], Olivier Verdeil[8], Gérard Moine[9]
[1] Hespul, Lyon, France; [2] Consuel, Paris, France; [3] SER, Paris, France; [4] Enerplan, La Ciotat, France; [5] INES PFE, Le Bourget-du-Lac, France; [6] CRER, La Crèche, France; [7] Stäubli, Hésingue, France; [8] Independent PV expert, Lyon, France; [9] Solarcoop, Mornant, France

4DV.4.4 Electricity Market Driven Net Present Value Optimization for PV Plants Across Europe
Marta Irena Murkowska[1]
[1] EMD International, Aalborg, Denmark

4DV.4.5 Increasing the Proportion of Winter Electricity through Design Optimisation of Photovoltaic Roof Systems
Hartmut Nussbaumer[1], Roger Hiltebrand[1], Selina Pfyffer[1], Andreas Dreisiebener[2], Markus Klenk[1]
[1] ZHAW, Winterthur, Switzerland; [2] A777 Gartengestaltung, Seuzach, Switzerland

4DV.4.6 Items Neglected When Estimating the Energy Production of a PV Plant with Trackers
Cesar Hidalgo López[1]
[1] DNV Solar, Barcelona, Spain

4DV.4.7 Implementation of a Sub-Hourly Clipping Correction in PVsyst
Michele Oliosi[1], André Mermoud[1], Bruno Wittmer[1], Agnes Bridel-Bertomeu[1], Robin Vincent[1]
[1] PVsyst, Satigny, Switzerland

4DV.4.8 Design and Multi-Objective Optimization of a Photovoltaic System by a Genetic Algorithm
Khadidjatou Thiaw[1], Amadou Diao[2], Amy Sadio[1], Senghane Mbodji[1]
[1] Alioune Diop University of Bambey, Bambey, Senegal; [2] Cheikh Anta Diop of University of Dakar, Dakar, Senegal

4DV.4.9 Finding the Optimal Size and Design of a Microgrid Energy System Using Genetic Algorithm
Josselin Le Gal La Salle[1], Mathieu David[1], Philippe Lauret[1]
[1] University of La Reunion, Saint-Pierre, Réunion

4DV.4.10 Highest Energy Yields per Area for PV Systems on Flat Roofs
Hartmut Nussbaumer[1], Roger Hiltebrand[1], Selina Pfyffer[1], Lona Tulinski[1], Janis Preisig[1], Markus Klenk[1]
[1] ZHAW, Winterthur, Switzerland

4DV.4.11 Optimization of the Size of Offshore Floating PV in a Windfarm in Belgium
Katrien Van Buekenhout[1], Jens Moschner[1], Oscar Delbeke[1], Johan Driesen[1]
[1] KU Leuven, Leuven, Belgium

4DV.4.12 Impacts of Measures to Achieve Dispachability on the Cost of PV-Bess Power Plants
Alex Renan Arrifano Manito[1], Pedro Torres[1], Marcelo Pinho Almeida[1], Gilberto Figueiredo[2], José Cesar Almeida[3], Roberto Zilles[1]
[1] USP - University of São Paulo, Sao Paulo, Brazil; [2] Fluminense Federal University, Niterói, Brazil; [3] Mackenzie Presbyterian University, Sao Paulo, Brazil

4DV.4.13 Analysis of Irradiation Differences on Substring Level of Modules in Solar Parks
Sascha Eckerter[1], Krisztián Kerekes[2], Patrick Mader[2], Rainer Merz[2]
[1] HKA, Ettlingen, Germany; [2] HKA, Karlsruhe, Germany

4DV.4.14 Using Standard PV Mounting Structures with Spaced Modules in Agrivoltaic Applications
Alex Renan Arrifano Manito[1], Marcelo Pinho Almeida [1], Bruno Vieira[1], Maria Cristina Fedrizzi[1], Roberto Zilles[1]
[1] USP, São Paulo, Brazil

4DV.4.15 Optimization Analysis for the Best Sizing and Operation of Photovoltaic Generators in Distributed Electricity Systems
Jacopo Baldacci[1], Ciro Lanzetta[1], Antonio Piazzi[1], Nabi Taheri[2], Mauro Tucci[2]
[1] i-EM, Livorno, Italy; [2] University of Pisa, Pisa, Italy

4DV.4.17 A New Approach to Floating Solar: An All-Plastic Design for Challenging Inland Waters
Maarten Dörenkämper[1], Jan Willem Heuseveldt[2], Marcel Brounne[2], Roel Verlaek[3], Paul de Blok[4], Menno van den Donker[3], Marcel van Pagee[4], Minne de Jong[1]
[1] TNO, Pattern, The Netherlands; [2] SABIC Europe, Bergen op Zoom, The Netherlands; [3] Solarge, Weert, The Netherlands; [4] RKT, Tholen, The Netherlands

4DV.4.18 Quantifying the Global Potential of Albedo Enhancing Materials
Thore Müller[1], Franco Vicente Clandestino Muñoz[1], Kostiantyn Pogorelov[1]
[1] PVRADAR Labs, Ebersberg, Germany

4DV.4.19 Optimising Solar Asset Performance through Smart Module Installation using Above's Digital Twin Technology
Imke Meyer[1], Chisanupong Thawanyavitchajit[2], Ricardo Velasco[3], Inaki Perez[4], Will Hitchcock[5], Henrique Balchada[5]
[1] Mott MacDonald, Brighton, United Kingdom; [2] Mott MacDonald, Madrid, Spain; [3] Mott MacDonald, Bogota, Colombia; [4] Mott MacDonald, Bangkok, Thailand; [5] Above Surveying, Colchester, United Kingdom

4DV.4.20 Experimental Comparison of Solar Absorption Characteristics Using Different Colors
Sedong Kim[1]
[1] Korea Institute of Industrial Technology, Chungcheongnam-do, South Korea

4DV.4.21 Development of an Approach to Calculate the Potential of Solar Rooftop PV
Sabrina Krähmer[1], Basem Idlbi[2], Kaouther Belkilani[1], Dietmar Graeber[1]
[1] Ulm University of Applied Sciences, Ulm, Germany; [2] Ulm University of Applied Sciences (Technische Hochschule Ulm), Ulm, Germany

4DV.4.25 Establishment of Local Renewable Management System and Implementation of Inverter Control Tests for Regional Power System Stability
Jihyun Kim[1]
[1] Green Energy Institute, Mokpo, South Korea

4DV.4.26 Direct Driving MW Scale Appliances with PV Power Plants Using Medium Voltage DC Grids
Jens Merten[1], Gregory Guyot[1], Jeremy Martin[1], Matthias Tuma[2], Boris Sucic[3], Holger Borcherding[4], Patrick Spanier[1], Johannes Stierstorfer[5], Rania Fki[5], Zhiyu Cao[6], Peter Wallmeier[6], Stéphane Latrouite[7], Yann Garnier[7], Ghislain Ginot[8], Victor Goncalves[8], Nuno Taveira[9], Geber Villa Fernandez[9], Eddy Lavorel[10], Tarek Lamara[10], Björn Fischer[10]
[1] CEA, Le Bourget du Lac, France; [2] McPhy, Wildau, Germany; [3] JSI, Ljubljana, Slovenia; [4] TH OWL, Lemgo, Germany; [5] WIP Renewable Energies, Munich, Germany; [6] AEG Power Solutions, Warstein-Belecke, Germany; [7] TPE France, Courlaoux, France; [8] ARCEL, Champagne au Mont D'Or, France; [9] ENFASYS, Gijon, Spain; [10] REC Wafer Norway, Porsgrunn, Norway