

## May 28 (Tuesday)

Room A (Room 105) 08:30~10:35

### TuA1: LLC Resonant Converters

Chair(s) **Dehong Xu** (Zhejiang University, China)  
**Jeehoon Jung** (Ulsan National Institute of Science and Technology, Korea)

**[TuA1-1] 08:30~08:55 A Dual Half-Bridge LLC Resonant Converter With Reduced Output Current Ripple for Wide Output Voltage Range Application**

Keon-Woo Kim<sup>1</sup>, Jae-Il Baek<sup>2</sup>, Jae-Sang Kim<sup>1</sup>, Min-Su Lee<sup>1</sup>, and Gun-Woo Moon<sup>1</sup>

<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>Princeton University, USA

**[TuA1-2] 08:55~09:20 Three-Phase Interleaved LLC Converter with Capacitive Current Balancing and Reduced Switch Voltage Stress**

Yoshiya Tada, Yusuke Sato, and Masatoshi Uno  
*Ibaraki University, Japan*

**[TuA1-3] 09:20~09:45 Full-Bridge LLC Resonant Converter with Parallel-Series Transformer Connection and Voltage Doubler Rectifier**

Jiaxuan Zhou and Hao Ma  
*ZheJiang University, China*

**[TuA1-4] 09:45~10:10 Resonance Parameter of Variable Mode LLC Converter for Auxiliary Converter**

XiaoQiong He<sup>2</sup>, Yang Chen<sup>1</sup>, Chen Chen<sup>1</sup>, ZhiQin Zhao<sup>1</sup>, and PengCheng Han<sup>1</sup>

<sup>1</sup>Southwest Jiaotong University, China,  
<sup>2</sup>National Rail Transit Electrification and Automation Engineering Technology Research Center, China

**[TuA1-5] 10:10~10:35 Design of Three Phase Wye-Delta LLC Converter with Time Domain Analysis**

Kuan-Hung Chen, Jing-Yuan Lin, Yi-Feng Lin, Yu-Chen Chang, and Huang-Jen Chiu

*National Taiwan University of Science and Technology, Taiwan*

Room B (Room 110) 08:30~10:10

### TuB1: Converter Topology and Control for Renewable Energy and Distributed Generation Systems

Chair(s) **Huang-Jen Chiu** (National Taiwan University of Science and Technology, Taiwan)  
**Yukihiko Sato** (Chiba University, Japan)

**[TuB1-1] 08:30~08:55 Modified Quasi-Z-Source Inverter with Model Predictive Control for Constant Common-Mode Voltage**

Wenjie Liu, Yongheng Yang, and Tamas Kerekes  
*Aalborg University, Denmark*

**[TuB1-2] 08:55~09:20 Dynamic Transmission Control of Power Converter-Based Renewable Sources and Energy Storage for Temporary Frequency Support**

Jinho Kim and Eduard Muljadi  
*Auburn University, USA*

**[TuB1-3] 09:20~09:45 Multi-winding Boost Multi-input DC-DC Converter Type Distributed Generation System**

Hao He, Daolian Chen, and Yanhui Qiu  
*Qingdao University, China*

**[TuB1-4] 09:45~10:10 A Quasi Single Stage Isolated Buck-Boost Mode Multi-input Inverter**

Jiahui Jiang, Zhaoqin Li, and Daolian Chen  
*Qingdao University, China*

Room C (Room 201) 08:30~10:35

### TuC1: Motor Drives; IM, SRM

Chair(s) **Kan Akatsu** (Shibaura Institute of Technology, Japan)  
**Kyo-Beum Lee** (Ajou University, Korea)

**[TuC1-1] 08:30~08:55 Design of Full-Order Flux Observer for Induction Motor Drive Robust to Rotor Time Constant Variation**

Jiwon Yoo, Joohyun Lee, and Seung-Ki Sul  
*Seoul National University, Korea*

**[TuC1-2] 08:55~09:20 Design of Flux-Axis Angular Speed Estimation using Induced Voltage in Speed Sensor-less Field Oriented Control for Induction Motor**

Jun-ichi Itoh, Kazuya Kawai, Koroku Nishizawa, and Hiroki Watanabe  
*Nagaoka University of Technology, Japan*

**[TuC1-3] 09:20~09:45 Evaluation of DC-link Capacitor RMS Current in Switched Reluctance Motor Drive**

S. S. Ahmad and G. Narayanan  
*Indian Institute of Science, India*

**[TuC1-4] 09:45~10:10 A Novel Frequency Characteristic Model and Noise Shaping Method for Encoder-Based Speed Measurement in Motor Drive**

Yangyang Chen<sup>1</sup>, Ming Yang<sup>1</sup>, Dianguo Xu<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>

<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Aalborg University, Denmark

**[TuC1-5] Power Analysis of 2 MW Brushless Doubly-Fed Induction Generator-Based Wind Energy Generation System**  
 10:10~10:35  
 G. Zhang and C. Zhang  
*Shandong University, China*

Room D (Room 202) 08:30~10:35

**TuD1: Converters for Wireless Power Transfer Systems**

**Chair(s)** **Chung-Chuan Hou** (Chung Hua University, Taiwan)  
**Seung-Hwan Lee** (University of Seoul, Korea)

**[TuD1-1] Double-Sided LCC Compensation Topology with Semi-Bridgeless Rectifier for Wireless Power Transfer System**  
 08:30~08:55  
 Hwa-Rang Cha, Kyung-Ho Park, Yeong-Jun Choi, and Rae-Young Kim  
*Hanyang University, Korea*

**[TuD1-2] Improved Pulse Density Modulation with a Distribution Algorithm for Semi-Bridgeless Rectifier of Inductive Power Transfer System in Electric Vehicles**  
 08:55~09:20  
 Jae Han Lee, Won-Jin Son, Sangjoon Ann, Jongeun Byun, and Byoung Kuk Lee  
*Sungkyunkwan University, Korea*

**[TuD1-3] Design and Implementation of a Constant Current and Constant Voltage Wireless Charger Operating at 6.78 MHz**  
 09:20~09:45  
 Tran Manh Tuan and Woojin Choi  
*Soongsil University, Korea*

**[TuD1-4] Design Challenges for 13.56MHz 10 kW Resonant Inverter for Wireless Power Transfer Systems**  
 09:45~10:10  
 Nguyen Kien Trung<sup>1</sup> and Kan Akatsu<sup>2</sup>  
*<sup>1</sup>Hanoi University of Science and Technology, Vietnam, <sup>2</sup>Shibaura Institute of Technology, Japan*

**[TuD1-5] Switch Design for a High-Speed Switching Semi-Bridgeless Active Rectifier of Inductive Power Transfer Systems Considering Reverse Recovery Phenomenon**  
 10:10~10:35  
 Sangjoon Ann, Won-Jin Son, Jongeun Byun, Jae Han Lee, and Byoung Kuk Lee  
*Sungkyunkwan University, Korea*

Room E (Room 203) 08:30~10:35

**TuE1: Power Electronics Applications with Wide Band-gap Semiconductor**

**Chair(s)** **Xibo Yuan** (University of Bristol, UK)  
**Younghoon Cho** (Konkuk University, Korea)

**[TuE1-1] Design and Research of GaN-Based Motor Drive System with LC Output Filter**  
 08:30~08:55  
 Zekai Lyu, Ming Yang, Donglin Xu, Shuyu Shang, and Dianguo Xu  
*Harbin Institute of Technology, China*

**[TuE1-2] Application of 1.7-kV 700-A SiC LinPak to Optimize LCL Grid-Tied Converters**  
 08:55~09:20  
 Ki-Bum Park<sup>1</sup>, Ralph M. Burkart<sup>1</sup>, Bruno Agostini<sup>1</sup>, and Thiago B. Soeiro<sup>2</sup>  
*<sup>1</sup>ABB Corporate Research, Switzerland, <sup>2</sup>TU Delft, Netherlands*

**[TuE1-3] Evaluation of Extra High Voltage (XHV) Power Module for Gen3 10 kV SiC MOSFETs in a Mobile Utility Support Equipment based Solid State Transformer (MUSE-SST)**  
 09:20~09:45  
 Anup Anurag, Sayan Acharya, and Subhashish Bhattacharya  
*North Carolina State University, USA*

**[TuE1-4] AlGaIn/GaN Metal-Insulator-Semiconductor (MIS)-HFETs Based DC-DC Boost Converters with Integrated Gate Drivers**  
 09:45~10:10  
 Miao Cui<sup>1,2</sup>, Qinglei Bu<sup>1,2</sup>, Yutao Cai<sup>1,2</sup>, Ruize Sun<sup>3</sup>, Wen Liu<sup>2</sup>, Huiqing Wen<sup>2</sup>, Sang Lam<sup>2</sup>, Yung. C. Liang<sup>3</sup>, Ivona Z. Mitrovic<sup>1</sup>, Stephen Taylor<sup>1</sup>, Paul R. Chalker<sup>1</sup>, and Cezhou Zhao<sup>2</sup>  
*<sup>1</sup>University of Liverpool, UK, <sup>2</sup>Xi'an Jiaotong-Liverpool University, China, <sup>3</sup>National University of Singapore, Singapore*

**[TuE1-5] A Novel Gate Driver for Suppressing Overcurrent and Overvoltage of SiC MOSFET**  
 10:10~10:35  
 Jianguai Chen<sup>1</sup>, Yan Li<sup>1</sup>, Mei Liang<sup>2</sup>, R. Kennel<sup>3</sup>, Jiayu Liu<sup>1</sup>, and Haobo Guo<sup>1</sup>  
*<sup>1</sup>Beijing Jiaotong University, China, <sup>2</sup>ABB China, China, <sup>3</sup>Technical University of Munich, Germany*

Room F (Room 204) 08:30~10:35

**TuF1: Multilevel Converters I**

**Chair(s)** **Jose Rodriguez** (Universidad Andres Bello, Chile)  
**Honyong Cha** (Kyungpook National University, Korea)

**[TuF1-1] Study on Modular Multi-Level DC-DC Converter with Cell Voltage Balancing and Fast Output Response using Sub Commutation Circuits**  
 08:30~08:55

H. Obara<sup>1</sup>, M. Katayama<sup>1</sup>, A. Kawamura<sup>1</sup>, J. Xu<sup>2</sup>, N. Shimosato<sup>2</sup>, and S. Inoue<sup>2</sup>

<sup>1</sup>Yokohama National University, Japan, <sup>2</sup>Myway Plus Corporation, Japan

**[TuF1-2] 08:55~09:20 Model Predictive Control with Extrapolation Strategy for the Arm Current Commutation Control of Modular Multilevel Converter Operating in Quasi Two-Level Mode**

Xiaonan Gao<sup>1</sup>, Wei Tian<sup>1</sup>, Zhenbin Zhang<sup>2</sup>, and Ralph Kennel<sup>1</sup>

<sup>1</sup>Technical University of Munich, Germany, <sup>2</sup>Shandong University, China

**[TuF1-3] 09:20~09:45 Dynamic Phasor Modeling of Modular Multi-level Converters for Electromagnetic Transients**

Jingwei Hu<sup>1</sup>, Dewu Shu<sup>1</sup>, Zheng Yan<sup>1</sup>, and Mehrdad Ghandhari<sup>2</sup>

<sup>1</sup>Shanghai Jiaotong University, China, <sup>2</sup>KTH Royal Institute of Technology, Sweden

**[TuF1-4] 09:45~10:10 A Modified Hybrid Modular Multilevel Converter with Reduced Capacitor Voltage Fluctuations and Fault-Tolerant Operation Ability**

Duc Dung Le and Dong-Choon Lee

Yeungnam University, Korea

**[TuF1-5] 10:10~10:35 A Control Scheme to Reduce the Current Load of Integrated Batteries in Cascaded Multilevel Converters**

Christian Korte<sup>1</sup>, Eduard Specht<sup>1</sup>, Stefan M. Goetz<sup>2</sup>, and Marc Hiller<sup>1</sup>

<sup>1</sup>Karlsruhe Institute of Technology, Germany, <sup>2</sup>Technische Universität Kaiserslautern, Germany

Room G (Room 206) 08:30~10:35

## TuG1: Power Electronics for Utility Interface

**Chair(s)** Toshihiko Tanaka (Yamaguchi University, Japan)  
Kui-Jun Lee (Korea National University of Transportation, Korea)

**[TuG1-1] 08:30~08:55 Model Predictive Virtual Flux Control Method for Three-phase AFE Rectifiers Robust Against Supply Harmonics and Unbalance**

Eun-Su Jun, Jae-Chang Kim, and Sangshin Kwak  
Chung-ang University, Korea

**[TuG1-2] 08:55~09:20 Suppression of Harmonics and Instabilities of Single-Phase Inverters Caused by Delay-based Phase-Locked Loop in the Weak Grid**

Jinming Xu<sup>1</sup>, Shenyiyang Bian<sup>1</sup>, Qiang Qian<sup>1</sup>, Jiarong Kan<sup>2</sup>, and Shaojun Xie<sup>1</sup>

<sup>1</sup>Nanjing University of Aeronautics and Astronautics, China, <sup>2</sup>Yancheng Institute of Technology, China

**[TuG1-3] 09:20~09:45 Number of Levels, Arm Inductance and Modulation Trade-offs for High Power Medium Voltage Grid-Connected Modular Multilevel Converters**

Aditya Shekhar, Lucia Beloqui Larumbe, Thiago Batista Soeiro, Yang Wu, and Pavol Bauer

Delft University of Technology, Netherlands

**[TuG1-4] 09:45~10:10 Sinusoidal Charging-Discharging Method of LiBs for Reducing Capacitances of DC-Capacitors in Smart Charger for EVs in Single-Phase Three-Wire Distribution Feeders**

Fuka Ikeda<sup>1</sup>, Yuki Okamoto<sup>2</sup>, Kei Nishikawa<sup>2</sup>, Hiroaki Yamada<sup>2</sup>, Masayuki Okamoto<sup>1</sup>, and Toshihiko Tanaka<sup>2</sup>

<sup>1</sup>National Institute of Technology, Ube College, Japan, <sup>2</sup>Yamaguchi University, Japan

**[TuG1-5] 10:10~10:35 A Fully Distributed Architecture for the Hybrid Cascaded Converter Based Utility Interface**

Yu-chen Su, Ping-heng Wu, and Po-tai Cheng

National Tsing Hua University, Taiwan

Room H (Room 207)

08:30~10:10

## TuH1: Smart/Micro Grid

**Chair(s)** Sung Yeul Park (University of Connecticut, USA)  
Kenji Natori (Chiba University, Japan)

**[TuH1-1] 08:30~08:55 Consensus-Based Distributed Optimization Control Method in DC Microgrid with Generation Constraints**

Xinlu Zhang<sup>1</sup>, Mi Dong<sup>1</sup>, Dongran Song<sup>1</sup>, Jing Ou<sup>1</sup>, Jian Yan<sup>1</sup>, and Guoxun Xiao<sup>2</sup>

<sup>1</sup>Central South University, China, <sup>2</sup>Changsha Best Electric Technology Co., Ltd., China

**[TuH1-2] 08:55~09:20 A Distributed Proportional Load Sharing Controller for DC Microgrids**

Juwon Lee, Bumsu Kim, and Juhoon Back

Kwangwoon University, Korea

**[TuH1-3] 09:20~09:45 A Distributed Harmonic Power Sharing Strategy for Islanded Microgrids**

Tuan V. Hoang and Hong-Hee Lee

University of Ulsan, Korea

**[TuH1-4] 09:45~10:10 Energy Management of Household Microgrid with Multiple Energy Resources for Rural Area**

Hui Yan, Nian Lv, Fang Zhuo, Hao Yi, and Zhenxiong Wang

Xi'an Jiaotong University, China

Room A (Room 105) 13:30~15:35

**TuA2: Designs of Magnetic Components**

**Chair(s)** **Mor Mordechai Peretz** (Ben-Gurion University, Israel)  
**Duy-Dinh Nguyen** (Aichi Institute of Technology, Japan)

**[TuA2-1]** **Design of Optimized Coupling Factor for Minimum Inductor Current Ripple in DC-DC Converter using Multi-winding Coupled Inductor**  
13:30~13:55  
Taewon Kang<sup>1</sup>, Jaeho Lee<sup>1</sup>, and Yongsug Suh<sup>2</sup>  
<sup>1</sup>CORE Electric Co., Ltd., Korea, <sup>2</sup>Chonbuk National University, Korea

**[TuA2-2]** **Magnetic Design Method for Multi-Material Powder Core Inductor to Improve Efficiency of Bidirectional DC/DC Converter within Wide Load Range**  
13:55~14:20  
J. Imaoka, Y. Ishikura, K. Ito, T. Aoki, M. Noah, and M. Yamamoto  
Nagoya University, Japan

**[TuA2-3]** **Modular DC Solid State Transformer with Fault-Tolerant Function**  
14:20~14:45  
Xiangqi Meng, Yanbing Jia, Chunguang Ren, Xiaoqiang Lin, and Baifu Zhang  
Taiyuan University of Technology, China

**[TuA2-4]** **Characteristic Analysis of Integrated Magnetic Component for Forward Converter**  
14:45~15:10  
T. Shiraiishi<sup>1</sup>, F. Hattori<sup>2</sup>, M. Ishitobi<sup>1</sup>, and E. Hiraki<sup>3</sup>  
<sup>1</sup>National Institute of Technology, Nara College, Japan, <sup>2</sup>Powerle Academy Co., Ltd., Japan, <sup>3</sup>Okayama University, Japan

**[TuA2-5]** **A Modular Stacked Transformer Structure for LLC Resonant Converters and Analysis of Current Sharing Behavior in Parallel PCB Windings**  
15:10~15:35  
Jahangir Afsharian<sup>1</sup>, Dewei (David) Xu<sup>1</sup>, Ning Zhu<sup>2</sup>, Bing Gong<sup>2</sup>, and Zhihua Yang<sup>2</sup>  
<sup>1</sup>Ryerson University, Canada, <sup>2</sup>Murata Power Solutions, Canada

Room B (Room 110) 13:30~15:35

**TuB2: Grid-connected Inverter for Renewable Energy and Distributed Generation Systems**

**Chair(s)** **Chang-Hua Lin** (National Taiwan University of Science & Technology, Taiwan)  
**Babak Parkhideh** (University of North Carolina at Charlotte, USA)

**[TuB2-1]** **Parameters Design Strategy of PBC Controller for LCL-Filtered Grid-Tied Inverter Based on Limited Steady-State Error**  
13:30~13:55  
Jinpin Zhao<sup>1</sup>, Weimin Wu<sup>1</sup>, Zhikang Shuai<sup>2</sup>, An Luo<sup>2</sup>, Henry Chung<sup>3</sup>, and Frede Blaabjerg<sup>4</sup>  
<sup>1</sup>Shanghai Maritime University, China, <sup>2</sup>Hunan University, China, <sup>3</sup>City University of Hong Kong, Hong Kong, <sup>4</sup>Aalborg University, Denmark

**[TuB2-2]** **A Frequency Deadband-Based Virtual Inertia Control for Grid-Connected Power Converters**  
13:55~14:20  
Nanjun Lu<sup>1</sup>, Jingyang Fang<sup>1</sup>, Yi Tang<sup>1</sup>, and Branislav. Hredzak<sup>2</sup>  
<sup>1</sup>Nanyang Technological University, Singapore, <sup>2</sup>University of New South Wales, Australia

**[TuB2-3]** **A Robust Harmonic Compensation Technique for the Single Phase Grid Connected Inverters under the Distorted Grid Voltage Conditions**  
14:20~14:45  
Reyyan Ahmad Khan, Muhammad Noman Ashraf, and Woojin Choi  
Soongsil University, Korea

**[TuB2-4]** **A Study on Autonomous Distributed Control and Grid Accident Robust Control Technique for Energy Router in Distributed Generation Linked Clusters**  
14:45~15:10  
Bonghoon Jung and Kyungsoo Lee  
Korea Polytechnic University, Korea

**[TuB2-5]** **A Design of Volt/VAr Control Parameters of Distributed Generation for Loss Reduction and Voltage Rise Mitigation**  
15:10~15:35  
Soo-Bin Kim and Seung-Ho Song  
Kwangwoon University, Korea

Room C (Room 201) 13:30~15:35

**TuC2: Modulation Techniques for Motor Drives**

**Chair(s)** **Jian Sun** (Rensselaer Polytechnic Institute, USA)  
**Jang-Mok Kim** (Pusan National University, Korea)

**[TuC2-1]** **Using Voltage-Morphing to Achieve Smooth Transitions Between Different Switching-Schemes on a Three-Level Inverter**  
13:30~13:55  
Rebin Jaber, Markus Koller, and Bernd Plassnegger  
Austrian Institute of Technology, Austria

**[TuC2-2]** **A Common-Mode Voltage Reduction Method of FCS-MPC in H8 Inverter for SPMSM Drive System Considering Dead-Time Effect**  
13:55~14:20  
Won-Sang Jeong, Kyoung-Min Choo, Jae-Hyung Lee, and Chung-Yuen Won  
Sungkyunkwan University, Korea

[TuC2-3] **A Shared-bridge Converter with Reversed Current Direction for Active Magnetic Bearing Drive**  
14:20~14:45

Zaidong Hu, Dong Jiang, Hongbo Sun, and Ronghai Qu

*Huazhong University of Science and Technology, China*

[TuC2-4] **Phase to Phase Interleaved Method to Reduce the Common Mode Voltage for Seven Phase BLDCM Drive**  
14:45~15:10

Dong-Youn Kim, Jae-Sung Ma, and Jang-Mok Kim  
*Pusan National University, Korea*

[TuC2-5] **A Method to Reduce Common-mode Voltage of Dual Three-Phase Motor Based on TSPWM**  
15:10~15:35

Lu Fangke, Lu Haifeng, Li Yongdong, and Chai Jianyun

*Tsinghua University, China*

Room D (Room 202) 13:30~15:10

## TuD2: Control of Wireless Power Transfer Systems

**Chair(s)** **Chris Mi** (San Diego State University, USA)  
**Sung-Jin Choi** (University of Ulsan, Korea)

[TuD2-1] **Rotary Inductive Power Transfer for LED Lighting Systems**  
13:30~13:55

Chung-Chuan Hou, Chia-Ming Chang, Wei-Hsiang Cheng, and Hsien-Ching Huang

*Chung Hua University, Taiwan*

[TuD2-2] **Power Control in the Dynamic Wireless Charging of Electric Vehicles**  
13:55~14:20

Nguyen Thi Diep<sup>1,2</sup>, Nguyen Kien Trung<sup>1</sup>, and Tran Trong Minh<sup>1</sup>

<sup>1</sup>*Hanoi University of Science & Technology, Vietnam*,  
<sup>2</sup>*Electric Power University, Vietnam*

[TuD2-3] **Current Sensorless ZPA Frequency Tracking Control of IPT System with LCCL-S Topology**  
14:20~14:45

Jongeun Byun, Won-Jin Son, Jae Han Lee, Sangjoon Ann, and Byoung Kuk Lee

*Sungkyunkwan University, Korea*

[TuD2-4] **Maximum Efficiency in the Dynamic Wireless Charging Systems of Electric Vehicles**  
14:45~15:10

Nguyen Thi Diep<sup>1,2</sup>, Nguyen Kien Trung<sup>1</sup>, and Tran Trong Minh<sup>1</sup>

<sup>1</sup>*Hanoi University of Science & Technology, Vietnam*, <sup>2</sup>*Electric Power University, Vietnam*

Room E (Room 203) 13:30~15:35

## TuE2: Measuring and Protection for Wide Band-gap Semiconductor

**Chair(s)** **Subhashish Bhattacharya** (North Carolina State University, USA)  
**Paul Jang** (Korea Polytechnic University, Korea)

[TuE2-1] **Fast Wide-bandgap Device Overcurrent Protection with Direct Current Measurement**  
13:30~13:55

Wen Zhang<sup>1</sup>, Fred Wang<sup>1,2</sup>, Zheyu Zhang<sup>3</sup>, and Bernhard Holzinger<sup>4</sup>

<sup>1</sup>*The University of Tennessee, USA*, <sup>2</sup>*Oak Ridge National Laboratory, USA*, <sup>3</sup>*GE Global Research, USA*, <sup>4</sup>*Keysight Technologies, Germany*

[TuE2-2] **Application of the Rogowski Coil Current Sensor for Overcurrent Detection and Blocking in Power Conversion Systems**  
13:55~14:20

Hanjong Yoon and Younghoon Cho

*Konkuk University, Korea*

[TuE2-3] **Elimination of Overshoot and Oscillation in the Auxiliary Branch of a SiC Auxiliary Resonant Commutated Pole Inverter (ARCPI)**  
14:20~14:45

Wenzhi Zhou, Xibo Yuan, and Ian Laird

*University of Bristol, UK*

[TuE2-4] **Research of Gap Filler Material in the GaN Transistor Thermal Management**  
14:45~15:10

Bainan Sun, Niels Elkjær Iversen, Zhe Zhang, and Michael A.E. Andersen

*Technical University of Denmark, Denmark*

[TuE2-5] **Analyzing EMI Issues in a DC/DC Converter using GaN Instead of Si Power Transistors**  
15:10~15:35

Lars Middelstaedt, Bastian Strauss, and Andreas Lindemann

*Otto-von-Guericke University Magdeburg, Germany*

Room F (Room 204) 13:30~15:35

## TuF2: Multilevel Converters II

**Chair(s)** **Dewu Shu** (Shanghai Jiaotong University, China)  
**Nho-Van Nguyen** (Ho Chi Minh City University of Technology, Vietnam)

[TuF2-1] **Cascaded Single-Stage NPC Boost Multilevel Inverter for Distributed Generation Systems**  
13:30~13:55

Ki-Mok Kim, Moo-Hyun Park, Dong-Kwan Kim, Seung-Hyun Choi, and Gun-Woo Moon

*Korea Advanced Institute of Science and Technology, Korea*

[TuF2-2] **A Hybrid Medium Voltage Multilevel Converter with Parallel Voltage-Source Active Filter**  
13:55~14:20

Daniel Bernet, Lukas Stefanski, and Marc Hiller

*Karlsruhe Institute of Technology, Germany*

**[TuF2-3] Hybrid Switched-Capacitor Multi-Level Inverter for Renewable Energy Systems**  
 14:20~14:45  
 Ki-Mok Kim, Young-Dal Lee, Yu-Jin Jang, Jung-Kyu Han, and Gun-Woo Moon  
*Korea Advanced Institute of Science and Technology, Korea*

**[TuF2-4] The Current-Shaping Modular Multi-Level DC/DC Converter**  
 14:45~15:10  
 P. A. Gray, and P. W. Lehn  
*University of Toronto, Canada*

**[TuF2-5] Modified Decentralized Control for Multiphase Converters**  
 15:10~15:35  
 Quoc-Dung Phan<sup>1</sup>, An-Nhuan Le<sup>1</sup>, Dinh-Tuyen Nguyen<sup>1</sup>, Minh-Thien Nguyen<sup>1</sup>, and Guillaume Gateau<sup>2</sup>  
<sup>1</sup>*Ho Chi Minh City University of Technology, Vietnam National University, Vietnam,*  
<sup>2</sup>*LAPLACE-INPT, France*

Room G (Room 206) 13:30~15:35

**TuG2: PFC Circuit for AC/DC Converter**

**Chair(s)** **Minh-Khai Nguyen** (Queensland University of Technology, Australia)  
**Sekyo Chung** (Gyeongsang National University, Korea)

**[TuG2-1] A New Bridgeless PFC Converter having Low Common-Mode Noise and High Efficiency for Server Power Application**  
 13:30~13:55  
 Young-Dal Lee<sup>1</sup>, Chong-Eun Kim<sup>2</sup>, Dong-Min Kim<sup>1</sup>, Seung-Hyun Choi<sup>1</sup>, and Gun-Woo Moon<sup>1</sup>  
<sup>1</sup>*Korea Advanced Institute of Science and Technology, Korea,* <sup>2</sup>*SOLUM Corp., Korea*

**[TuG2-2] Novel Single-Phase Buck+Boost PFC Rectifier with Integrated Series Power Pulsation Buffer**  
 13:55~14:20  
 M. Haider<sup>1</sup>, D. Bortis<sup>1</sup>, J. W. Kolar<sup>1</sup>, and Y. Ono<sup>2</sup>  
<sup>1</sup>*ETH Zürich, Switzerland,* <sup>2</sup>*Nabtesco Corporation, Japan*

**[TuG2-3] A Novel AC/DC Converter Based on Stacked Boost Circuit and Dual-Mode LLC Circuit**  
 14:20~14:45  
 Tingting Yao, Yueshi Guan, Fang Li, Yijie Wang, Wei Wang, and Dianguo Xu  
*Harbin Institute of Technology, China*

**[TuG2-4] One-Phase Modulation without DC Link Control for Three-Phase Rectifier with LCL Filter**  
 14:45~15:10  
 Ki-Bum Park  
*ABB Corporate Research, Switzerland*

**[TuG2-5] A High Performance Soft-Switching AC/DC Converter**  
 15:10~15:35  
 Chien-Ming Wang<sup>1</sup>, Chang-Hua Lin<sup>2</sup>, Chi-Hsiang Cheng<sup>1</sup>, and Bo-Han Wu<sup>1</sup>  
<sup>1</sup>*National Ilan University, Taiwan,* <sup>2</sup>*National Taiwan University of Science & Technology, Taiwan*

Room H (Room 207) 13:30~15:10

**TuH2: Microgrid Technologies**

**Chair(s)** **Meiqin Mao** (Hefei University of Technology, China)  
**Yongho Chung** (LSIS Co., Ltd, Korea)

**[TuH2-1] Single-phase UPFC Topology with Autotransformer Structure for Smart Grid**  
 13:30~13:55  
 Hyun-Jun Lee and Young-Doo Yoon  
*Hanyang University, Korea*

**[TuH2-2] A Universal Control Method to Realize Plug-and-Play Converters for Microgrids**  
 13:55~14:20  
 Hazuki Esashika, Kenji Natori, and Yukihiko Sato  
*Chiba University, Japan*

**[TuH2-3] A Feeder Impedance Identification Based Droop Control Method for Accurate Reactive Power Sharing in Islanded Microgrids**  
 14:20~14:45  
 Jianyong Zhao<sup>1</sup>, Jian Li<sup>3</sup>, Heng Nian<sup>1</sup>, Lei Yang<sup>1</sup>, Bao Gai<sup>2</sup>, Zaiping Pan<sup>1</sup>, and Yourui Xu<sup>3</sup>  
<sup>1</sup>*Zhejiang University, China,* <sup>2</sup>*Bureau of Development and Reform of Pingdu City, China,*  
<sup>3</sup>*State Grid Qinghai Electric Power Company, China*

**[TuH2-4] Smart Motor Drive Providing Inertia Support for the Grid by Applying Virtual Synchronous Generator Control**  
 14:45~15:10  
 Daisuke Terazono<sup>1</sup>, Jia Liu<sup>1</sup>, Yushi Miura<sup>2</sup>, and Toshifumi Ise<sup>1</sup>  
<sup>1</sup>*Osaka University, Japan,* <sup>2</sup>*Nagaoka University of Technology, Japan*

Room A (Room 105) 15:50~17:55

**TuA3: Dual Active Bridge Converters**

**Chair(s)** **Zhe Zhang** (Technical University of Denmark, Denmark)  
**Honyong Cha** (Kyungpook National University, Korea)

**[TuA3-1] A Simple DC Bias Elimination Technique for Dual-Active-Bridge DC/DC Converters**  
 15:50~16:15  
 Duy-Dinh Nguyen<sup>1,3</sup>, Kazuto Yukita<sup>1</sup>, Goro Fujita<sup>2</sup>, and Minh Cao Ta<sup>3</sup>  
<sup>1</sup>*Aichi Institute of Technology, Japan,* <sup>2</sup>*Shibaura Institute of Technology, Japan,* <sup>3</sup>*Hanoi University of Science and Technology, Vietnam*

**[TuA3-2] Switching Modulation Method for Current-Fed Dual-Active-Bridge Converter to Improve Power Conversion Efficiency**  
 16:15~16:40  
 Hyun-Jun Choi<sup>1</sup>, Jun-Young Lee<sup>1</sup>, Ju-Young Sim<sup>1</sup>, Sang-Gyu Cheon<sup>2</sup>, Chang-Ui Lee<sup>2</sup>, and Jee-Hoon Jung<sup>1</sup>  
<sup>1</sup>*Ulsan Nation Institute of Science and Technology, Korea,* <sup>2</sup>*PANASIA Co., Ltd., Busan, Korea*

**[TuA3-3] 16:40~17:05 Dual-Side Circulating Currents Free TPS Control for Dual Active Bridge DC-DC Converter and Its Implementation**

Fengjiang Wu<sup>1</sup>, Guizhong Wang<sup>2</sup>, and Xiaoguang Li<sup>1</sup>

<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Industrial and Technological Research Institute of HIT, China

**[TuA3-4] 17:05~17:30 An Interleaved Single-Stage Bridgeless CCM AC-DC Converter with Wide Output Voltage Range**

Adhistira M. Naradhipa, Suhan Kang, and Sewan Choi  
*Seoul National University of Science and Technology, Korea*

**[TuA3-5] 17:30~17:55 Design of a Medium Frequency Transformer with High Insulation Level for Dual Active Bridge DC-DC Converter**

Tianzhu Tang<sup>1</sup>, J. A. Ferreira<sup>2</sup>, Saijun Mao<sup>3</sup>, Wenbo Wang<sup>1</sup>, and M. Ghaffarian Niasar<sup>2</sup>

<sup>1</sup>Beijing Delft Institute of Intelligent Science and Technology, China, <sup>2</sup>Delft University of Technology, Netherlands, <sup>3</sup>Leadrive Technology Co., Ltd., China

Room B (Room 110)

15:50~17:55

### TuB3: PV System for Renewable Energy and Distributed Generation Systems I

**Chair(s)** Jinjun Liu (Xi'an Jiaotong University, China)  
Katherine A. Kim (National Taiwan University, Taiwan)

**[TuB3-1] 15:50~16:15 Analysis and Verification of the Stability for PV Series-Connected Power Optimizer System**

Yutai Fu, Jizhi Qi, Yonghao Li, Xinghua Zhang, and Min Chen

*Zhejiang University, China*

**[TuB3-2] 16:15~16:40 An Adaptive Constant Power Generation Control Scheme with Simple MPP Estimation for Photovoltaic Systems**

Yinxiao Zhu, Huiqing Wen, Guanying Chu, and Xingshuo Li

*Xi'an Jiaotong-Liverpool University, China*

**[TuB3-3] 16:40~17:05 Comparison of Swarm Intelligence Based Global Maximum Power Point Tracking Methods for Photovoltaic Generation System**

Kun-Che Ho<sup>1</sup>, Cheng-Chung Lin<sup>1</sup>, F. Selin Bagci<sup>1</sup>, Shun-Chung Wang<sup>2</sup>, Yi-Hua Liu<sup>1</sup>, and Yu-Shan Cheng<sup>3</sup>

<sup>1</sup>National Taiwan University of Science and Technology, Taiwan, <sup>2</sup>Lunghwa University of Science and Technology, Taiwan, <sup>3</sup>Tokyo Metropolitan University, Japan

**[TuB3-4] 17:05~17:30 PV Fed Hybrid Power Converter for Rural Home Applications**

Karthikeyan A, Praneeth C.V.S, and Prabhakaran K. K.  
*National Institute of Technology Karnataka, India*

Room C (Room 201)

15:50~17:55

### TuC3: Topics for Electric Drives; Estimation, Capless Topology

**Chair(s)** Faz Rahman (University of New South Wales, Australia)  
Hitoshi Haga (Nagaoka University of Technology, Japan)

**[TuC3-1] 15:50~16:15 Stator Temperature Estimation Considering Model Mismatching for AC Speed Servo System Without Temperature Sensor**

Hiroki Iwata, Yuji Okada, Kiyoshi Ohishi, and Yuki Yokokura

*Nagaoka University of Technology, Japan*

**[TuC3-2] 16:15~16:40 Resonance Analysis and Suppression Strategy for Electrolytic Capacitor-less Permanent Magnet Synchronous Motor Drives**

Junya Huo<sup>1,2</sup>, Hanlin Zhan<sup>2</sup>, Gaolin Wang<sup>1</sup>, Nannan Zhao<sup>1</sup>, Dawei Ding<sup>1</sup>, Lianghong Zhu<sup>1,2</sup>, and Dianguo Xu<sup>1</sup>

<sup>1</sup>Harbin Institute of Technology, China,

<sup>2</sup>Guangdong Midea Air-Conditioning Equipment Co., Ltd., China

**[TuC3-3] 16:40~17:05 A New On-line Parameters Identification Method for IPMSMs using Current Derivative Measurement**

M. X. Bui<sup>1</sup>, D. Xiao<sup>2</sup>, and M. F. Rahman<sup>2</sup>

<sup>1</sup>Le Quy Don Technical University, Vietnam, <sup>2</sup>University of New South Wales, Australia

**[TuC3-4] 17:05~17:30 An Anti-Overvoltage Strategy for Electrolytic Capacitorless IPMSM Drives using Power Controller**

Dawei Ding<sup>1</sup>, Haiming Hu<sup>1</sup>, Gaolin Wang<sup>1</sup>, Guoqiang Zhang<sup>1</sup>, Dianguo Xu<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>

<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Aalborg University, Denmark

**[TuC3-5] 17:30~17:55 Magnet Temperature Estimation of IPMSM by Using Reactive Energy**

Hyun-Sam Jung<sup>1</sup>, Hwigin Kim<sup>1</sup>, Seung-Ki Sul<sup>1</sup>, and Daniel J. Berry<sup>2</sup>

<sup>1</sup>Seoul National University, Korea, <sup>2</sup>General Motors Global Propulsion Systems, USA

Room D (Room 202)

15:50~17:55

### TuD3: Design of Wireless Power Transfer Systems

**Chair(s)** Xin Dai (Chongqing University, China)  
Byoung-Hee Lee (Hanbat National University, Korea)

**[TuD3-1] 15:50~16:15 Development of Long Rail Dynamic Wireless Power Transfer for Battery-Free Mobile Robot**

Chan Anyapo

*Pathumwan Institute of Technology, Thailand*

[TuD3-2] 16:15~16:40	<b>Improvement of Capacitively Isolated Outlet and Plug for Practical Use</b> Junnosuke Haruna, Hirohito Funato, Takuya Hatsumi, Toshiki Uemura, and Yusuke Kose <i>Utsunomiya University, Japan</i>
[TuD3-3] 16:40~17:05	<b>Development of a Wireless Power Supply System for an E-Bike</b> Jaehong Lee, Sangmin Lee, Myeongseok Kwak, Gyeonghoon Yeom, and Seung-Hwan Lee <i>University of Seoul, Korea</i>
[TuD3-4] 17:05~17:30	<b>Comparison of Optimized Chargepads for Wireless EV Charging Application</b> Soumya Bandyopadhyay, Jianning Dong, Zian Qin, and Pavol Bauer <i>TU Delft, Netherlands</i>
[TuD3-5] 17:30~17:55	<b>An Optimized Multi-load Wireless Power Transfer System with Constant Load Currents</b> Zhe Zhou <sup>1</sup> , Weiguo Li <sup>1</sup> , Chenwen Cheng <sup>2</sup> , Zhanfeng Deng <sup>1</sup> , Fangyi Li <sup>1</sup> , Qiuyu Shi <sup>1</sup> , and Chris Mi <sup>2</sup> <i><sup>1</sup>Global Energy Interconnection Research Institute, China, <sup>2</sup>San Diego State University, USA</i>

Room E (Room 203) 15:50~17:55

**TuE3: [IS] WBG Devices**

<b>Chair(s)</b>	<b>Myungho Kim</b> (Korea Electrotechnology Research Institute, Korea) <b>Younghoon Cho</b> (Konkuk University, Korea)
[TuE3-1] 15:50~16:15	<b>Recent SiC Module Progress and Their Applications</b> Kazuhiro Kurachi and Gourab Majumdar <i>Mitsubishi Electric Corp., Japan</i>
[TuE3-2] 16:15~16:40	<b>Advanced GaN Power HEMT Technology and Applications</b> Simon Li <i>GaNpower, Canada</i>
[TuE3-3] 16:40~17:05	<b>Short Circuit Characteristics of 1700V SiC MOSFET Module for Bi-directional Applications</b> Dong-Keun Jang <i>Semi-Powerex Corp., Korea</i>
[TuE3-4] 17:05~17:30	<b>Recent R&amp;D Status In SiC Power Devices of YES POWERTECHNIX</b> Chang Heon Yang <i>YES POWERTECHNIX, Korea</i>
[TuE3-5] 17:30~17:55	<b>Status of SiC Development in Trinno Technology</b> Su Seong Kim <i>Trinno Technology, Korea</i>

Room F (Room 204) 15:50~17:55

**TuF3: [IS] High Power Applications**

<b>Chair(s)</b>	<b>Hak-Jun Lee</b> (LSIS Co., Ltd., Korea) <b>Byung Geuk Cho</b> (LSIS Co., Ltd., Korea)
[TuF3-1] 15:50~16:15	<b>Current Status of DC Distribution System by KEPCO</b> Jintae Cho <i>Korea Electric Power Research Institute, Korea</i>
[TuF3-2] 16:15~16:40	<b>SAT (Site Acceptance Test) Evaluation Equipment for EESS</b> Misung Kim <i>Korea Testing &amp; Research Institute, Korea</i>
[TuF3-3] 16:40~17:05	<b>27 kVDC, 3 MW Dual Output High Voltage Power Supply for RF Amplifiers</b> Amitkumar M. Patel <i>Institute for Plasma Research, India</i>
[TuF3-4] 17:05~17:30	<b>SAT (Site Acceptance Test) Testing Items for EESS</b> Misung Kim <i>Korea Testing &amp; Research Institute, Korea</i>
[TuF3-5] 17:30~17:55	<b>The Development of Components and the Design of System for 200MW HVDC System</b> Jihun Kim <i>Hyosung Corporation, Korea</i>

Room G (Room 206) 15:50~17:55

**TuG3: Control of AC/DC Converter**

<b>Chair(s)</b>	<b>Po-Tai Cheng</b> (National Tsing Hua University, Taiwan) <b>Ki-Bum Park</b> (ABB Corporate Research, Switzerland)
[TuG3-1] 15:50~16:15	<b>Suppression Control of Lower-Order Harmonics of Input Current in Bidirectional Isolated Three-Phase AC/DC Dual-Active-Bridge Converter Based on Matrix Converter</b> K. Sumiya <sup>1</sup> , K. Sakuma <sup>1</sup> , J. Xu <sup>2</sup> , N. Shimosato <sup>2</sup> , and Y. Sato <sup>1</sup> <i><sup>1</sup>Chiba University, Japan, <sup>2</sup>Myway Plus Corporation, Japan</i>
[TuG3-2] 16:15~16:40	<b>A Multiplexing Modulation Strategy Based on Single-phase AC/DC Converter with Optimized E-Capless Function</b> Xiaoqing Wang, Lei Jing, Bodong Li, Ning Chen, Maohang Qiu, and Min Chen <i>Zhejiang University, China</i>
[TuG3-3] 16:40~17:05	<b>Virtual Inductance based Power Factor Adjustment Technique for Current Source Rectifiers in High-Power Applications</b> Jae-Chang Kim and Sangshin Kwak <i>Chung-Ang University, Korea</i>



**[TuG3-4] Simplified Model Predictive Control for AC/DC Matrix Converters with Fixed Switching Frequency**

17:05~17:30

Thanh-Luan Nguyen<sup>1</sup>, Huu-Nhan Nguyen<sup>2</sup>, Tuyen D. Nguyen<sup>3</sup>, and Hong-Hee Lee<sup>1</sup>

<sup>1</sup>University of Ulsan, Korea, <sup>2</sup>Duy Tan University, Vietnam, <sup>3</sup>Ho Chi Minh City University of Technology, Vietnam

**[TuG3-5] Small-Signal Modeling of Three-Level Boost Rectifier and System Design for Medium-Voltage Solid-State Transformer**

17:30~17:55

Moonhyun Lee, Jong-Woo Kim, and Jih-Sheng Lai

Virginia Tech, USA

Room H (Room 207)

15:50~17:55

**TuH3: [IS] Hardware-in-the-Loop (HIL) Simulation**

**Chair(s)** Benoit Marcoux (Opal-RT Technologies, Inc., Canada)

**[TuH3-1] World's First Travelling Wave Protection HIL Testing**

15:50~16:15

Benoit Marcoux

Opal-RT Technologies, Inc., Canada

**[TuH3-2] The Concept and Case Study of P-HIL**

16:15~16:40

Hyounglok Oh

REALTIMEWAVE Co., Ltd., Korea

**[TuH3-3] Model-Based Design for Power Electronics Control - Part 1 of 2, Modeling & Simulation**

16:40~17:05

Takumi Tohyama

MathWorks, Japan

**[TuH3-4] Model-Based Design for Power Electronics Control - Part 2 of 2, Code Generation & Real-Time Testing**

17:05~17:30

Takumi Tohyama

MathWorks, Japan

**[TuH3-5] HIL Testing for Power Electronics Made Easy with Speedgoat Real-Time Solution**

17:30~17:55

Carlos Villegas

Speedgoat GmbH, Germany

## May 29 (Wednesday)

Room A (Room 105) 08:30~10:10

### WeA1: Applications of DC/DC Converters

**Chair(s)** **Tsorng-Juu Liang** (National Cheng-Kung University, Taiwan)  
**Babak Parkhideh** (University of North Carolina at Charlotte, USA)

**[WeA1-1] 08:30~08:55 Boost-Forward Integrated Converter for High Power Density Spacecraft Applications**  
 Dong-Kwan Kim<sup>1</sup>, Yeonho Jeong<sup>2</sup>, Jeong-Eon Park<sup>1,3</sup>, Nayoung Lee<sup>1,3</sup>, and Gun-Woo Moon<sup>1</sup>  
<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>University of Colorado Denver, USA, <sup>3</sup>Korea Aerospace Research institute, Korea

**[WeA1-2] 08:55~09:20 Switched Capacitor Converter-Based PWM Plus Phase-Shift Control Multiport Converter with Differential Power Processing Capability for Photovoltaic Systems**  
 Masatoshi Uno, Ryuichi Igarashi, and Yusuke Sato  
*Ibaraki University, Japan*

**[WeA1-3] 09:20~09:45 A Novel Two-Stage Power Conversion Method Suitable for LDCs of the Electric Vehicles**  
 Tran Manh Tuan and Woojin Choi  
*Soongsil University, Korea*

**[WeA1-4] 09:45~10:10 Bendable Differential Power Processing Converter for Curved Photovoltaic Panels**  
 K. Aikawa, H. Sato, and M. Uno  
*Ibaraki University, Japan*

Room B (Room 110) 08:30~10:35

### WeB1: Modern Battery Management System Technologies

**Chair(s)** **Woojin Choi** (Soongsil University, Korea)  
**Jonghoon Kim** (Chungnam National University, Korea)

**[WeB1-1] 08:30~08:55 Voltage Clamping Balance for Charging/Discharging Battery Module**  
 Yi-Yuan Chung, Tsorng-Juu Liang, Wei-Jing Tseng, and Jwo-Hann Liu  
*National Cheng-Kung University, Taiwan*

**[WeB1-2] 08:55~09:20 Online Learning ANN Model for SoC Estimation of the Lithium-Ion Battery in Case of Small Amount of Data for Practical Applications**  
 M. Bezha and N. Nagaoka  
*Doshisha University, Japan*

**[WeB1-3] 09:20~09:45 An Online State-of-Health Estimation Algorithm for Electric Vehicles through Aging Tendency of Open Circuit Voltage**  
 Tae-Won Noh, Hae-Chan Han, and Byoung Kuk Lee  
*Sungkyunkwan University, Korea*

**[WeB1-4] 09:45~10:10 Battery Cell Balancer with Active Power Decoupling Function**  
 Turmandakh Bat-Orgil<sup>1,2</sup>, Bayasgalan Dugarjav<sup>2</sup>, and Toshihisa Shimizu<sup>1</sup>  
<sup>1</sup>Tokyo Metropolitan University, Japan, <sup>2</sup>National University of Mongolia, Mongolia

**[WeB1-5] 10:10~10:35 A Comparative Analysis of Online Update Techniques for Battery Model Parameters Considering Complexity and Estimation Accuracy**  
 Hae-Chan Han, Tae-Won Noh, and Byoung Kuk Lee  
*Sungkyunkwan University, Korea*

Room C (Room 201) 08:30~10:35

### WeC1: Sensorless Motor Drives and Control Strategies

**Chair(s)** **Zhuang Xu** (The University of Nottingham Ningbo, China)  
**Young-Doo Yoon** (Hanyang University, Korea)

**[WeC1-1] 08:30~08:55 12-step Position Sensorless Control of High-Speed Brushless DC Motor using Enhanced Back-EMF in Discontinuous Conduction Mode**  
 Hyung-Seok Park and Jang-Mok Kim  
*Pusan National University, Korea*

**[WeC1-2] 08:55~09:20 Self-adjusting Strategy Based on Rotating Injection for Sensorless Control of High-power PMSM Drives**  
 Xiaofan Wang<sup>1</sup>, Xiaochun Fang<sup>1</sup>, Zhi Wang<sup>2</sup>, Zhihong Zhong<sup>1</sup>, Yizhi Wang<sup>1</sup>, Fei Lin<sup>1</sup>, and Zhongping Yang<sup>1</sup>  
<sup>1</sup>Beijing Jiaotong University, China, <sup>2</sup>CRRC Qingdao Sifang Rolling Stock Research Institute Co., Ltd., China

**[WeC1-3] 09:20~09:45 Position and Speed Estimation Algorithm for Permanent Magnet Synchronous Machines Considering Nonlinear Magnetic Effects**  
 Matthias Brodatzki<sup>1</sup>, Jan Richter<sup>1</sup>, Johannes Kolb<sup>2</sup>, and Michael Braun<sup>1</sup>  
<sup>1</sup>Karlsruhe Institute of Technology, Germany, <sup>2</sup>SHARE at KIT, Schaeffler Technologies AG & Co., Germany

**[WeC1-4] 09:45~10:10 An Optimized Nonlinear Extended State Observer for Sensorless IPM Synchronous Motor Drives**  
 Zhuang Xu<sup>1</sup>, Tianru Zhang<sup>1</sup>, and Chris Gerada<sup>2</sup>  
<sup>1</sup>The University of Nottingham Ningbo, China, <sup>2</sup>The University of Nottingham, UK

**[WeC1-5] The Study on Position Sensor Fault Detection and Algorithm Transition from Sensored to Sensorless Control for IPMSM**  
10:10~10:35  
Dongwoo Lee and Kan Akatsu  
*Shibaura Institute of Technology, Japan*

Room D (Room 202) 08:30~10:10

### WeD1: Single Phase Inverters

**Chair(s)** Weimin Wu (Shanghai Maritime University, China)  
Jun-Keun Ji (Soonchunhyang University, Korea)

**[WeD1-1] FRT Operation for Single-Phase Grid-Tied Inverter with Active Power Decoupling Capability**  
08:30~08:55  
Jun-ichi Itoh, Satoshi Nakamura, Satoshi Nagai, and Hiroki Watanabe  
*Nagaoka University of Technology, Japan*

**[WeD1-2] A Hill-Climbing Optimization Approach for Closed-Loop Auto-Tuning of the Grid-Connected Ripple-Port Inverters**  
08:55~09:20  
Morcos Metry, Minjeong Kim, and Robert S. Balog  
*Texas A&M University, USA*

**[WeD1-3] Split-Capacitor Self-Balancing of Single-Phase Half-Bridge Inverters**  
09:20~09:45  
Che-Wei Chang, Terng-Wei Tsai, and Yaow-Ming Chen  
*National Taiwan University, Taiwan*

**[WeD1-4] Power Decoupling Control of the Two-Stage Single-Phase DC-AC Power Conversion System to Eliminate the Double Line Frequency Ripple**  
09:45~10:10  
A. Saghir Amin and Woojin Choi  
*Soongsil University, Korea*

Room E (Room 203) 08:30~10:35

### WeE1: [OS] IGCT Applications I

**Chair(s)** Eric Carroll (EIC Consultancy, France)  
Yongsug Suh (Chonbuk National University, Korea)

**[WeE1-1] Use of IGCTs in Modular Multilevel Converters for HVDC Link: Influence of the Modulation Method on the Efficiency**  
08:30~08:55  
Davin Guédon<sup>1,2</sup>, Philippe Ladoux<sup>1</sup>, Mehdi Kanoun<sup>2</sup>, and Sébastien Sanchez<sup>1,3</sup>  
<sup>1</sup>LAPLACE, Université de Toulouse, France,  
<sup>2</sup>Electricité de France, France, <sup>3</sup>ICAM, France

**[WeE1-2] Soft-Switching Resonant Conversion with IGCT**  
08:55~09:20  
Dragan Stamenkovic and Drazen Dujic  
*École Polytechnique Fédérale de Lausanne, Switzerland*

**[WeE1-3] An RC-IGCT for Application at Up to 5.3kV**  
09:20~09:45  
Umamaheswara Reddy Vemulapati, Tobias Wikström, and Matthias Lüscher  
*ABB Switzerland Ltd., Switzerland*

**[WeE1-4] IGCT Self-Protection Strategy for IGCT Converters**  
09:45~10:10  
Hong Zeng, Xiulin Chen, Yongmin Chen, Xuejun Pan, Shunbiao Zhang, Fanglin Chen, and Wenbin Zeng  
*CRRC ZhuZhou Insitute Co., Ltd., China*

**[WeE1-5] NPC-IGCT Phase Module Clamp Circuit LRC Parameters Design Considering FRD Snappy Recovery**  
10:10~10:35  
Yang Ju Zou, Jia Xi Hu, Zhen Yu Ma, Jian Ping Liu, Run Qing Guo, and Zhi Xue Zhang  
*CRRC ZhuZhou Insitute Co., Ltd., China*

Room F (Room 204) 08:30~10:35

### WeF1: [OS] Large Power Conversion Systems and Grid Applications

**Chair(s)** Takaharu Takeshita (Nagoya Institute of Technology Gokiso, Japan)  
Yasuyuki Nishida (Chiba Institute of Technology, Japan)

**[WeF1-1] Optimal Operation of Soft-Open Points for High Penetrated Distributed Generations on Distribution Networks**  
08:30~08:55  
Changhee Han<sup>1</sup>, Sungyoon Song<sup>1</sup>, Yeuntae Yoo<sup>1</sup>, Jaehyeong Lee<sup>1</sup>, Gilsoo Jang<sup>1</sup>, and Minhan Yoon<sup>2</sup>  
<sup>1</sup> Korea University, Korea, <sup>2</sup> Tongmyong University, Korea

**[WeF1-2] New 40kV / 300kVA Quasi-2-Level Operated 5-Level Flying Capacitor SiC "Super-Switch" IPM**  
08:55~09:20  
Piotr Czyn, Panteleimon Papamanolis, Thomas Guillod, Florian Krismer, and Johann W. Kolar  
*ETH Zurich, Switzerland*

**[WeF1-3] Design and Performance Evaluation of 1.2 kV, 325 A SiC-MOSFET High Performance Module based 100 kVA Three-phase Two-level Power Block**  
09:20~09:45  
Sayan Acharya, Anup Anurag, Nithin Kolli, and Subhashish Bhattacharya  
*North Carolina State University, USA*

**[WeF1-4] Three-Phase PFC Rectifier by Means of Three Single-Phase Passive PFC Units**

09:45~10:10 Shin-ich Motegi<sup>1</sup> and Yasuyuki Nishida<sup>2</sup>  
<sup>1</sup>Kobe City College of Technology, Japan, <sup>2</sup>Chiba Institute of Technology, Japan

**[WeF1-5] Study of Generator Control with H-Infinity Considering Distributed Generator**

10:10~10:35 K. Yukita, G. Fukuyama, T. Hosoe, T. Matsumura, and Y. Goto  
*Aichi Institute of Technology, Japan*

Room G (Room 206) 08:30~10:35

**WeG1: [IS] High Power Dynamic Wireless Charging of Electric Vehicles 1**

**Chair(s)** **Chris Mi** (San Diego State University, USA)  
**Jae Lee** (Toyota Research Institute of North America, USA)

**[WeG1-1] Dynamic Wireless Charging Technology and its Economic Feasibility Study**

08:30~08:55 Jae Lee  
*Toyota Research Institute of North America, USA*

**[WeG1-2] The Demonstration of a 30kW, 0.3km Wireless Power Enabled Autonomous Driving Bus in Suzhou**

08:55~09:20 Baohua Xu  
*ZoneCharge, China*

**[WeG1-3] Grid Integration Solutions for Stationary and Dynamic Wirelessly Charged Evs**

09:20~09:45 Udaya Madawala  
*The University of Auckland, New Zealand*

**[WeG1-4] WPT Standards and Committee Update from China**

09:45~10:10 Xin Dai  
*Chongqing University, China*

**[WeG1-5] Autonomous Coil Alignment to Minimize Lateral Misalignment of Dynamic Wireless Charging Electric Vehicle**

10:10~10:35 Seungyoung Ahn  
*Korea Advanced Institute of Science and Technology, Korea*

Room H (Room 207) 08:30~10:35

**WeH1: DC Distribution**

**Chair(s)** **Manoj Datta** (RMIT University, Australia)  
**Younghoon Cho** (Konkuk University, Korea)

**[WeH1-1] Zero Sequence Currents Externally Circulating between the Back to Back Modular Multilevel Converters in Parallel AC-DC Distribution Links**

08:30~08:55 Aditya Shekhar, Thiago Batista Soeiro, Laura Ramirez-Elizondo, and Pavol Bauer  
*Delft University of Technology, Netherlands*

**[WeH1-2] High Power Density Bidirectional Three-port DC-DC Converter for Battery Applications in DC microgrids**

08:55~09:20 Juyoung Sim, Junyoung Lee, Hyunjun Choi, and Jee-Hoon Jung  
*Ulsan National Institute of Science and Technology, Korea*

**[WeH1-3] Output Impedance Analysis of PWM DC-to-DC Converters**

09:20~09:45 Syam Kumar Pidaparthy and Byungcho Choi  
*Kyungpook National University, Korea*

**[WeH1-4] State-Space Modeling of DC Distribution Systems: Experimental Validation**

09:45~10:10 Nils H. van der Blij<sup>1</sup>, Laura M. Ramirez-Elizondo<sup>1</sup>, Matthijs T.J. Spaan<sup>1</sup>, Wuhua Li<sup>2</sup>, and Pavol Bauer<sup>1</sup>  
<sup>1</sup>Delft University of Technology, Netherlands, <sup>2</sup>Zhejiang University, China

**[WeH1-5] On the Applicability of Kuramoto Model to Microgrid Technologies**

10:10~10:35 Kevin Prasetio, Manoj Datta, and Papan Dey  
*RMIT University, Australia*

Room 101~104 and 106~109

12:10~14:10

## Poster Session I

**Chair(s)**    **Kai Sun** (Tsinghua University, China)  
**Hag-Wone Kim** (Korea National University of Transportation, Korea)

- [P1-1] **Design and Implementation of Ozone Generators with Area-graph Method to Model DBD Chamber**  
 Tsai-Fu Wu, Ling-Chia Yu, and Jou-Wen Chen  
*National Tsing Hua University, Taiwan*
- [P1-2] **Experimental Verification of Robot Arm Operation Using Power Packet Dispatching System**  
 T. Ando and T. Yokoyama  
*Tokyo Denki University, Japan*
- [P1-3] **Minimization of Dead Time Effect on Bridge Converter Output Voltage Quality by Use of Advanced Gate Drivers**  
 Håvard Lefdal Hove<sup>1</sup>, Ole Christian Spro<sup>1</sup>, Giuseppe Guidi<sup>2</sup>, Kjell Ljøkelsøy<sup>1</sup>, and Dimosthenis Pefitsis<sup>2</sup>  
<sup>1</sup>Norwegian University of Science and Technology, Norway, <sup>2</sup>SINTEF Energy Research, Norway
- [P1-4] **Challenges of Junction Temperature Sensing in SiC Power MOSFETs**  
 J. Ortiz Gonzalez and O. Alatise  
*University of Warwick, UK*
- [P1-5] **Investigation on Non-invasive Current Mismatch Measurement in Paralleled GaN HEMTs**  
 A. Lauer<sup>2</sup>, H. Niakan<sup>1</sup>, M. Hiller<sup>2</sup>, and B. Parkhideh<sup>1</sup>  
<sup>1</sup>University of North Carolina at Charlotte, USA, <sup>2</sup>Karlsruhe Institute of Technology, Germany
- [P1-6] **Analysis and Suppression of Mutual Inductive Couplings of the CM EMI Filter in Motor Drive**  
 Zhihao Fang, Dong Jiang, and Zaidong Hu  
*Huazhong University of Science and Technology, China*
- [P1-7] **A Novel Method for Thermal Analysis of MF Transformers with Hollow Windings**  
 Bo Zhang<sup>1</sup>, Ning Yan<sup>1</sup>, and Naisheng Liu<sup>2</sup>  
<sup>1</sup>Shenyang University of Technology, China, <sup>2</sup>State Grid Corporation of China, China
- [P1-8] **Magnetic Integration of EMI Filter for Grid-Connected Voltage-Source Inverters**  
 Shiqi Jiang, Yitao Liu, Jianchun Peng, and Hui Jiang  
*Shenzhen University, China*
- [P1-9] **Model-Based Design and DSP Code Generation using Simulink® for Power Electronics Applications**  
 Jung-Muk (Michael) Choe<sup>1</sup>, Luis Arnedo<sup>1</sup>, Yongduk Lee<sup>1</sup>, Zakdy Sorchini<sup>1</sup>, Alessandro Mignogna<sup>2</sup>, Ismail Agirman<sup>3</sup>, and Hanjong Kim<sup>3</sup>

<sup>1</sup>United Technologies Research Center, USA,<sup>2</sup>United Technologies Research Center, Italy,<sup>3</sup>Carrier, USA

- [P1-10] **Modeling for Conducted Noise Simulation Considering Switching Characteristics on AC/DC Converter**  
 Kazuki Kuwana, Yuki Kawamura, Wataru Kitagawa, and Takaharu Takeshita  
*Nagoya Institute of Technology Gokiso, Japan*
- [P1-11] **A New Active Zero State PWM for Six-Phase Inverter**  
 Jae-Hyuk Baik<sup>1</sup>, Sang-Won Yun<sup>2</sup>, and Ji-Yoon Yoo<sup>1</sup>  
<sup>1</sup>Korea University, Korea, <sup>2</sup>Mando Co., Korea
- [P1-12] **Experimental Consideration of Radiated EMI Caused by Air-conditioner Piping - Modal Analysis Based on Measured Current Distribution -**  
 Kanako Tsushima<sup>1</sup>, Satoshi Ogasawara<sup>1</sup>, Koji Orikawa<sup>1</sup>, Masatsugu Takemoto<sup>1</sup>, and Kenji Koyama<sup>2</sup>  
<sup>1</sup>Hokkaido University, Japan, <sup>2</sup>DAIKIN Industries, Ltd., Japan
- [P1-13] **Active Compensation of Unbalanced Load Currents in Grid Connected Voltage Source Converters**  
 Raghendra Tiwari and Roy Nilsen  
*Norwegian University of Science and Technology, Norway*
- [P1-14] **DC-DC Converter with Self-Regulated Output Voltage Control Scheme for Multiple-String Dimmable LED Driver Control**  
 Pang-Jung Liu, Yu-Chi Hsu, Ting-Yu Wei, and Zhi-Yuan Hong  
*National Taipei University of Technology, Taiwan*
- [P1-15] **A Single Stage AC-DC Converter for Wireless Power Transfer System**  
 MinJi Kim, KyungJong Yoo, SangJae Yoo, JungWon Woo, EunSoo Kim, and InGab Hwang  
*Jeonju University, Korea*
- [P1-16] **Bio-Inspired Joint for a Movable Wireless Power Transfer**  
 Mohamad Abou Houran, Xu Yang, Wenjie Chen, Mehdi Samizadeh, and Bagher Karami  
*Xi'an Jiaotong University, China*
- [P1-17] **Discrete Time Modeling of Wireless Power Transfer System Using LCC Compensation Topology**  
 Xiufang Hu<sup>1</sup>, Yue Wang<sup>1</sup>, Shuangqing Lv<sup>1</sup>, Xiaoshuai Dong<sup>2</sup>, Tianjin Chen<sup>3</sup>, Yongbin Jiang<sup>1</sup>, and Pengfan Xu<sup>1</sup>  
<sup>1</sup>Xi'an Jiaotong University, China, <sup>2</sup>Xi'an XJ Power Electronics Technology Co., Ltd., China, <sup>3</sup>Xuji Power Co., Ltd., China
- [P1-18] **A Novel Synchronization Technique for High Frequency Rectifier in Wireless Power Transfer**  
 Yongbin Jiang, Min Wu, Zexian Zeng, Yonghui Liu, Xiufang Hu, Laili Wang, and Yue Wang  
*Xi'an Jiaotong University, China*

- [P1-19] **Soft-Switching and Efficient Power Transfer in Capacitive Wireless Systems with LCLC Compensation Networks**  
Eli Abramov<sup>1</sup>, Ilya Zeltser<sup>2</sup>, and Mor Mordechai Peretz<sup>1</sup>  
<sup>1</sup>Ben-Gurion University, Israel, <sup>2</sup>Rafael Advanced Defense Systems Ltd., Israel
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- [P1-20] **Design of Current Sensorless Control for Totem-Pole Boost PFC Converter**  
Che-Yu Lu, Yi-Wen Hsu, and Hung-Chi Chen  
National Chiao Tung University, Taiwan
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- [P1-21] **Multi-phase Interleaved AC to DC Buck-boost Converter with Active Power Decoupling Function and Sliding-mode Control Strategy**  
Soonhwan Hwang, Satoshi Ogasawara, Koji Orikawa, and Masatsugu Takemoto  
Hokkaido University, Japan
- 
- [P1-22] **Single-Phase Boost Type Power Factor Corrector with Embedded Active Buffer Achieving Power Decoupling**  
Kaicheng Ding, Yan Zhang, Jinjun Liu, Rui Cao, Yuetao Hou, and Xin Meng  
Xi'an Jiaotong University, China
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- [P1-23] **Comprehensive Loss Analysis of Isolated Bidirectional Matrix Based AC-DC Converter**  
Prathamesh Pravin Deshpande, Amit Kumar Singh, Hau Chong Aih, Merlin Chai, and Sanjib Kumar Panda  
National University of Singapore, Singapore
- 
- [P1-24] **Novel and Simple Current-Ripple Calculation of LCL Filter for Parallel-Connected Three-Phase PWM Rectifiers**  
Masaya Akase<sup>1</sup>, Hiroaki Yamada<sup>1</sup>, Toshihiko Tanaka<sup>1</sup>, Ryo Okawachi<sup>2</sup>, and Kiyoshi Ochi<sup>2</sup>  
<sup>1</sup>Yamaguchi University, Japan, <sup>2</sup>The Japan Steel Works Ltd., Japan
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- [P1-25] **A New Modulation Approach for Matrix Converter**  
S. Pipolo<sup>1</sup>, A. Formentini<sup>1</sup>, A. Trentin<sup>1</sup>, P. Zanchetta<sup>1</sup>, M. Calvini<sup>2</sup>, and M. Venturini<sup>2</sup>  
<sup>1</sup>University of Nottingham, UK, <sup>2</sup>Phase Motion Control s.p.a., Italy
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- [P1-26] **DPWM-Controlled Indirect Matrix Converter to Suppress Common-Mode Voltage**  
Tzung-Lin Lee and Wen-Mei Huang  
National Sun Yat-sen University, Kaohsiung
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- [P1-27] **Analysis and Research on Space Vector Overmodulation Strategy of Indirect Matrix Converter**  
Wenshen Wang<sup>1</sup>, Shanhu Li<sup>1</sup>, Xu Liu<sup>1</sup>, Yongjian Li<sup>1</sup>, and Yiping Liu<sup>3</sup>  
<sup>1</sup>Hebei University of Technology, China, <sup>2</sup>Tianjin Power Street Light Management Department, China
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- [P1-28] **Analysis and Modeling for Stray Inductance of Commutation Circuit in Indirect Matrix Converter**  
Yang Mei, Ziyu Liu, Shiheng Niu, and Weichao Huang  
North China University of Technology, China
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- [P1-29] **An Optimized Third Harmonic Injection Method for Three-Phase Cascaded H-Bridge Photovoltaic Inverter**  
Wang Mao<sup>1</sup>, Xing Zhang<sup>1</sup>, Tao Zhao<sup>1</sup>, Yuhua Hu<sup>1</sup>, Fusheng Wang<sup>1</sup>, Zhiqiang Dai<sup>1</sup>, and Renxian Cao<sup>2</sup>  
<sup>1</sup>Hefei University of Technology, China, <sup>2</sup>Sungrow Power Supply Co., Ltd., China
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- [P1-30] **Frequency Characteristic and Impedance Analysis on Three-Phase Grid-Connected Inverters Based on DDSRF-PLL**  
Xiangqiang Wu<sup>1</sup>, Tong Huang<sup>1</sup>, Xin Chen<sup>1</sup>, Haibing Hu<sup>1</sup>, and Guoqing He<sup>2</sup>  
<sup>1</sup>Nanjing University of Aeronautics and Astronautics, China, <sup>2</sup>Chine Electric Power Research Institute, China
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- [P1-31] **A High-Robust Grid-Side Current Feedback Active Damping Design Method for Gridconnected Inverter**  
Ke Xu<sup>1</sup>, Li Peng<sup>1</sup>, Weibiao Wu<sup>1</sup>, Bowei Lin<sup>1</sup>, and Shirong Yang<sup>2</sup>  
<sup>1</sup>Huazhong University of Science and Technology, China, <sup>2</sup>China Ship Development and Design Center, China
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- [P1-32] **A Novel Single-Phase Flying-Inductor Buck-Boost Inverter**  
Javad Sadeghi Chevinly<sup>1</sup>, Yam P. Siwakoti<sup>2</sup>, Mojtaba Forouzesh<sup>3</sup>, and Frede Blaabjerg<sup>4</sup>  
<sup>1</sup>University of Guilan, Iran, <sup>2</sup>University of Technology Sydney, Australia, <sup>3</sup>Queen's University, Canada, <sup>4</sup>Aalborg University, Denmark
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- [P1-33] **A Single-Phase Transformerless Buck-Boost Inverter for Standalone and Grid-Tied Applications with Reduced Magnetic Volume**  
Fazal Akbar, Honnyong Cha, Seunghoon Lee, and Tien-The Nguyen  
Kyungpook National University, Korea
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- [P1-34] **Improved Feedforward to Enhance Harmonic Suppression for Grid-Connected Inverter**  
Boyang Liu, Hua Lin, and Jianjie Xiao  
Huazhong University of Science and Technology, China
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- [P1-35] **A Novel Space Vector Modulation Strategy for Three-Phase Quasi Switched Boost Inverter**  
Tan-Tai Tran<sup>1</sup>, Minh-Khai Nguyen<sup>2</sup>, Young-Cheol Lim<sup>1</sup>, and Joon-Ho Choi<sup>1</sup>  
<sup>1</sup>Chonnam National University, Korea, <sup>2</sup>Queensland University of Technology, Australia

- [P1-36] **Model Predictive Control of Neutral Point Clamped Inverter with Reduced Switching Frequency**  
Mu Li, Shu Zhan, Bing Chu, and Xingda Yan  
*University of Southampton, UK*
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- [P1-37] **Disturbance Observer Based Internal Model Control for Three Phase LCL-type Inverter**  
Jinmu Lai<sup>1</sup>, Xianggen Yin<sup>1</sup>, Zhen Wang<sup>1</sup>, Langzi Li<sup>1</sup>, Zhenyu Qi<sup>1</sup>, and Xin Yin<sup>2</sup>  
<sup>1</sup>*Huazhong University of Science & Technology, China*, <sup>2</sup>*The University of Liverpool, UK*
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- [P1-38] **Applying Multi-Oversampling to One-Comparator Counter-Based Sampling to Enhance System Stability**  
Y. T. Yau<sup>1</sup>, K. I. Hwu<sup>2</sup>, C. W. Wang<sup>2</sup>, and Jenn-Jong Shieh<sup>3</sup>  
<sup>1</sup>*Asian Power Devices Inc., Taiwan*, <sup>2</sup>*National Taipei University of Technology, Taiwan*, <sup>3</sup>*Ta Hwa University of Science and Technology, Taiwan*
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- [P1-39] **Influence of the Rectifier's Output Capacitance on the ZVS Transition in Asymmetrical Half-Bridge PWM Converters**  
B. Kohlhepp, M. Barwig, and T. Duerbaum  
*Friedrich-Alexander University Erlangen-Nürnberg, Germany*
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- [P1-40] **3-Bridge LLC Resonant Converter with Auxiliary Switches Operating Over Wide Output Voltage Control Range**  
JaeSung Oh<sup>1</sup>, SangJae Yoo<sup>1</sup>, KyungJong Yoo<sup>1</sup>, MinJi Kim<sup>1</sup>, JunHwan Lee<sup>1</sup>, EunSoo Kim<sup>1</sup>, and YoonSang Cook<sup>2</sup>  
<sup>1</sup>*Jeonju University, Korea*, <sup>2</sup>*PACTECH Co., Ltd., Korea*
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- [P1-41] **Fault Analysis and Fault-Tolerant Method of Dual Active Bridge Converter under Triple Phase Shift Control**  
Haochen Shi, Huiqing Wen, and Jinglin Li  
*Xi'an Jiaotong-Liverpool University, China*
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- [P1-42] **Impedance Modeling and Stability Analysis of Triple-Phase-Shift-Based Dual Active Bridge Converter with LC Filter**  
Fan Feng, Xin Zhang, Peiyi Gao, Fanfan Lin, Bohui Zhao, and Hoay Beng Gooi  
*Nanyang Technological University, Singapore*
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- [P1-43] **Integrated Current Balancing Transformer Based Input-Parallel Output-Parallel LLC Resonant Converter Modules**  
Ubaid Ahmad, Honnyong Cha, Nabeel Naseem, and Duc-Tuan Do  
*Kyungpook National University, Korea*
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- [P1-44] **A Secondary Partial Energy Phase Shift Regulation LLC Resonant Converter with Current Sharing Ability**  
Hui Chen<sup>1</sup>, Shuai Shao<sup>2</sup>, Hao Jiang<sup>1</sup>, Guohai Ren<sup>1</sup>, and Pengying Du<sup>1</sup>  
<sup>1</sup>*Zhejiang University City College, China*, <sup>2</sup>*Zhejiang University, China*
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- [P1-45] **Interlink Three-Level Bidirectional DC-DC Converter with Asymmetrical Load Condition**  
Jun-young Lee, Hyun-jun Choi, Ju-young Sim, and Jee-hoon Jung  
*Ulsan National Institute of Science and Technology, Korea*
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- [P1-46] **A Novel Voltage Balancing Strategy using LC for Dual Output Dual-Active-Bridge Converter**  
Kisu Kim, Jeonghun Kim, Viet C. Nguyen, and Honnyong Cha  
*Kyungpook National University, Korea*
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- [P1-47] **The Effects of Maglev Chopper's Control Cycle on Suspension Performance in EMS System**  
Da Liang, Kunlun Zhang, Qilong Jiang, and Hongyun He  
*Southwest Jiaotong University, China*
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- [P1-48] **A Nine-level ANPC/H-Bridge Inverter for Open-Winding Motor Drive System**  
Xiaohui Xu<sup>1</sup>, Kui Wang<sup>2</sup>, Nianzhou Liu<sup>1</sup>, Zedong Zheng<sup>2</sup>, and Yongdong Li<sup>2</sup>  
<sup>1</sup>*National Key Laboratory of Science and Technology on Vessel Integrated Power System, China*, <sup>2</sup>*Tsinghua University, China*
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- [P1-49] **SHE-PWM Control for A Four-level Hybrid-Clamped Inverter**  
Mingzhe Wu<sup>1</sup>, Kui Wang<sup>2</sup>, Kehu Yang<sup>1</sup>, Chengran Ma<sup>1</sup>, and Yongdong Li<sup>2</sup>  
<sup>1</sup>*China University of Mining and Technology, China*, <sup>2</sup>*Tsinghua University, China*
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- [P1-50] **Natural Balancing Modulation Strategy for a Hybrid H-Bridge Five-Level Neutral Point Clamped Converter with Capacitor Cells**  
N. Ornov<sup>1</sup>, M. Zygmantowski<sup>2</sup>, J. Michalak<sup>2</sup>, and A. Ruderman<sup>1</sup>  
<sup>1</sup>*Nazarbayev University, Kazakhstan*, <sup>2</sup>*Silesian University of Technology, Poland*
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- [P1-51] **An Analysis Method of Harmonic Transfer Characteristics From AC-side to DC-side of Modular Multilevel Converter**  
Pengfan Xu, Yue Wang, Taiyuan Yin, Shiyuan Yin, Zhang Wang, and Kai Li  
*Xi'an Jiaotong University, China*
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- [P1-52] **A Simplified Capacitor Voltage Balancing Method for Modular Multilevel Converter with Carrier-Phase-Shift Pulse Width Modulation**  
Weiyao Wang, Ke Ma, Yunxiao Yang, and Xu Cai  
*Shanghai Jiao Tong University, China*
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- [P1-53] **A Cascaded Control Concept for Modular Multilevel Converters with Capacitor Voltage Estimation using a Kalman Filter**  
B. Ruccius<sup>1</sup>, T. Kraus<sup>1</sup>, R. Westermann<sup>1</sup>, T. Heckel<sup>1</sup>, M. März<sup>1</sup>, and B. Wagner<sup>2</sup>  
<sup>1</sup>*Fraunhofer IISB, Germany*, <sup>2</sup>*Technische Hochschule Nürnberg, Germany*

- [P1-54] **Comparative Study on the Operating Area of M<sup>3</sup>C and B2B MMC for Soft Open Point Application**  
Mengfei Li<sup>1</sup>, Huan Yang<sup>1</sup>, Rongxiang Zhao<sup>1</sup>, Taiying Zheng<sup>1</sup>, Yi Lu<sup>2</sup>, Yong Yang<sup>2</sup>, and Caomingzhe Si<sup>1</sup>  
<sup>1</sup>Zhejiang University, China, <sup>2</sup>State Grid Zhejiang Electric Power Co., Ltd. Research Institute, China
- [P1-55] **Carrier Based PWM Control of 3-Level NPC Inverter with DC Neutral Point Balancing and Common Mode Voltage Reduction**  
Nho-Van Nguyen and Mon-Van Doi  
Vietnam National University Ho Chi Minh City, Vietnam
- [P1-56] **Experiment on Nearest Level Modulation Algorithm for FPGA based Modular Multilevel Converters**  
Tran Hung Cuong<sup>1,2</sup>, Pham Viet Phuong<sup>1</sup>, Tran Van Phuong<sup>1</sup>, and Tran Trong Minh<sup>1</sup>  
<sup>1</sup>Hanoi University of Science and Technology, Vietnam, <sup>2</sup>Hong Duc University, Vietnam
- [P1-57] **A Self-Excitation Scheme for a Brushless Synchronous Generator**  
Ghulam Jawad Sirewal, Muhammad Ayub, and Byung-il Kwon  
Hanyang University, Korea
- [P1-58] **Wide Speed-range Operation of a Dual-mode Wound Field Synchronous Machine**  
Muhammad Ayub<sup>1</sup>, Qasim Ali<sup>2</sup>, Ghulam Jawad Sirewal<sup>1</sup>, and Byung-il Kwon<sup>1</sup>  
<sup>1</sup>Hanyang University, Korea, <sup>2</sup>COMSATS University, Pakistan
- [P1-59] **Measurement of Inverter Caused Losses in Permanent Magnet Synchronous Machines Using a Modular Multiphase Multilevel Converter**  
C. Rollbühler<sup>1</sup>, L. Stefanski<sup>1</sup>, S. Gretzinger<sup>1</sup>, J. Kolb<sup>2</sup>, M. Hiller<sup>1</sup>, and M. Doppelbauer<sup>1</sup>  
<sup>1</sup>Karlsruhe Institute of Technology, Germany, <sup>2</sup>SHARE at KIT, Schaeffler Technologies AG & Co., Germany
- [P1-60] **Series-connected PV MVDC Converter for Large Scale PV System**  
Huan Wang<sup>1,2</sup>, Xinke Huang<sup>1,2</sup>, Yibo Wang<sup>1</sup>, and Honghua Xu<sup>2,3</sup>  
<sup>1</sup>Institute of Electrical Engineering, Chinese Academy of Sciences, China, <sup>2</sup>University of Chinese Academy of Sciences, China, <sup>3</sup>Beijing Corona Science & Technology Co., Ltd., China
- [P1-61] **Study on the Protection and Energy Transmission Modes of One Phase Short Circuit to Ground in Inverters**  
Dezhi Chen<sup>1,2</sup>, Zhiyu Feng<sup>1</sup>, Byung-il Kwon<sup>2</sup>, Wenliang Zhao<sup>3</sup>, and Baodong Bai<sup>1</sup>  
<sup>1</sup>Shenyang University of Technology, China, <sup>2</sup>Hanyang University, Korea, <sup>3</sup>Shandong University, China
- [P1-62] **Experimental Verification of Weighted Moving Average 1MHz Multisampling Deadbeat Control for PMSM**  
Arata Takahashi and Tomoki Yokoyama  
Tokyo Denki University, Japan
- [P1-63] **Synthetic Voltage Vector Selection Criteria in Predictive Torque Control for Performance Improvement of Three Phase Induction Motor Drive**  
Apekshit Bhowate, Mohan Aware, and Sohith Sharma  
Visvesvaraya National Institute of Technology, India
- [P1-64] **A Simple and Robust Model-Based Loss Minimization Method for Direct Torque Control of Induction Motor**  
S. Rasul Eftekhari<sup>1</sup>, S. Alireza Davari<sup>1</sup>, Peyman Naderi<sup>1</sup>, Cristian Garcia<sup>2</sup>, and Jose Rodriguez<sup>2</sup>  
<sup>1</sup>Shahid Rajaei Teacher Training University, Iran, <sup>2</sup>Universidad Andres Bello, Chile
- [P1-65] **A Thyristor-based Seamless Winding Changeover Circuit for High Efficiency of Electric Vehicle Drive System**  
Yangjin Shin<sup>1</sup>, Sungyoul Park<sup>2</sup>, Sewan Choi<sup>2</sup>, Suyeon Cho<sup>1</sup>, Hochang Jung<sup>1</sup>, Junsung Park<sup>1</sup>, Waegyeong Shin<sup>1</sup>, and Deokjin Kim<sup>1</sup>  
<sup>1</sup>Korea Automotive Technology Institute, Korea, <sup>2</sup>Seoul National University of Science and Technology, Korea
- [P1-66] **The Influence of the LC with Clamping Diodes dv/dt Filter on Current Control of PMSM Drives in Case of Inverter Output Current Sensing and Its Compensation**  
Heonyoung Kim, Byeong-Heon Kim, and Subhashish Bhattacharya  
North Carolina State University, USA
- [P1-67] **Restart Strategy for Scalar Controlled Synchronous Reluctance Machine Driving a High-Inertia Load with a Single DC-link Current Sensor**  
Kibok Lee<sup>1</sup> and Srdjan M. Lukic<sup>2</sup>  
<sup>1</sup>Incheon National University, Korea, <sup>2</sup>North Carolina State University, USA
- [P1-68] **Novel Current Control Assisted V/F Control Method for High Speed Induction Motor Drives**  
Jin-Woo Lee  
Doowon Technical University College, Korea
- [P1-69] **A Simple MTPA Operation Scheme for V/f Control of PMSMs**  
Won-Jae Kim and Sang-Hoon Kim  
Kangwon National University, Korea
- [P1-70] **Type-3 PLL Based Speed Estimation Scheme for Sensorless Linear Induction Motor Drives**  
Huimin Wang and Xinglai Ge  
Southwest Jiaotong University, China



- [P1-71] **Development of an Inductorless Step-Down Converter**  
Wei-Yu Wang, Jia-Hao Kuo, and Kuo-Yuan Lo  
*National Kaohsiung University of Science and Technology, Taiwan*
- [P1-72] **Evaluation of MPPT and APC Performance Connected with Different DC Load Types**  
Xingshuo Li and Huiqing Wen  
*Xian Jiaotong-Liverpool University, China*
- [P1-73] **Characteristics of Floating Photovoltaic Power Generation Based on Probability Statistics**  
Hansang Jeong<sup>1,2</sup>, Jaeho Choi<sup>2</sup>, Hohyun Lee<sup>1</sup>, and Yeonho Ok<sup>3</sup>  
<sup>1</sup>K-water Co., Korea, <sup>2</sup>Chungbuk National University, Korea, <sup>3</sup>Power 21 Co., Korea
- [P1-74] **High-Frequency Isolated Medium-Voltage AC Grid-connected PV Power Generation System Structure based on DC Bus Collection**  
Lin Lin<sup>2</sup>, Qi Chen<sup>2</sup>, Xingang Wu<sup>2</sup>, Chuang Liu<sup>1</sup>, Haoran Zhang<sup>1</sup>, and Dongfeng Yang<sup>1</sup>  
<sup>1</sup>Northeast Electric Power University, China, <sup>2</sup>Zhe Jiang Huayun Clean Energy Co., Ltd, China
- [P1-75] **Voltage Compensation Scheme for DFIG Wind Turbine System to Enhance Low-Voltage Ride-Through Capability**  
Tan Luong Van<sup>1</sup>, Trong Huan Nguyen<sup>2</sup>, Nhut Minh Ho<sup>2</sup>, Xuan Nam Doan<sup>1</sup>, and Thanh Hai Nguyen<sup>3</sup>  
<sup>1</sup>HCM City University of Food Industry, Vietnam, <sup>2</sup>Posts and Telecommunications Institute of Technology, Vietnam, <sup>3</sup>Higher College of Technology, UAE
- [P1-76] **A Micro-grid Smooth Transfer Control Strategy based on a Special Slave Distributed Generation Unit**  
Xin Meng, Jinjun Liu, and Zeng Liu  
*Xi'an Jiaotong University, China*
- [P1-77] **Power Balance for Voltage-controlled PV Generator without Robust Voltage Source**  
Wang Zhenxiong, Zhuo Fang, Lv Nian, Yi Hao, Wu Jiaqi, Yan Hui, and Ma Zekun  
*Xi'an Jiaotong University, China*
- [P1-78] **A Closed-loop GSPWM Method for Attenuating Circulating Leakage Current in PV Station**  
Tao Xu, Feng Gao, Tianqu Hao, and Kangjia Zhou  
*Shandong University, China*
- [P1-79] **Lyapunov Based Controller for 3 $\phi$  VSI Stage of a UPS and a Distributed Generation Units**  
Yusuf Gupta, Neelima Parganiha, and Suryanarayana Doolla  
*Indian Institute of Technology Bombay, India*
- [P1-80] **Inertia Emulation through Supercapacitor Energy Storage Systems**  
Ruiqi Zhang, Jingyang Fang, and Yi Tang  
*Nanyang Technological University, Singapore*
- [P1-81] **DC Output Wind Generator with Modified Trapezoidal Modulated Converter and Solid-State Transformer**  
Noriyuki Kimura<sup>1,2</sup>, Naoki Kawabata<sup>1</sup>, Toshimitsu Morizane<sup>1</sup>, and Hideki Omori<sup>1</sup>  
<sup>1</sup>Osaka Institute of Technology, Japan, <sup>2</sup>Fukui University of Technology, Japan
- [P1-82] **Small Signal Stability and V-P Control of Islanded AC Microgrid at Constant Frequency**  
Xiuhui Tang and Daming Zhang  
*The University of New South Wales, Australia*
- [P1-83] **Unbalanced Load Compensation by Power-Based Control in the Synchronous Reference Frame**  
F. Göthner<sup>1</sup>, D. I. Brandao<sup>2</sup>, and E. Tedeschi<sup>1</sup>  
<sup>1</sup>Norwegian University of Science and Technology, Norway, <sup>2</sup>Federal University of Minas Gerais, Brazil
- [P1-84] **Dynamic Stiffness Improvement of a Grid-tied Voltage Source Inverter**  
Seonghyeon Kim, Horyung Jeong, and Jae Suk Lee  
*Chonbuk National University, Korea*
- [P1-85] **Research on Multiphase Topology of F2F DC Transformer and the Control Method**  
Shuhuai Shi<sup>1</sup>, Zhuan Zhao<sup>2</sup>, Fang Zhuo<sup>1</sup>, Sheng Cheng<sup>1</sup>, and Runchu Ding<sup>1</sup>  
<sup>1</sup>Xi'an Jiaotong University, China, <sup>2</sup>Zhengzhou Electric Power College, China
- [P1-86] **A DC Transformer Based on MMC and Full-Bridge Structure with Control Method**  
Sheng Cheng, Shuhuai Shi, Fang Zhuo, Feng Wang, Yanlin Zhu, and Nan Zhang  
*Xi'an Jiao tong University, China*
- [P1-87] **Commutation Strategy of Reconfigurable Grid-Connected Inverter to Improve Power Quality**  
W. Choi and B. Sarlioglu  
*University of Wisconsin-Madison, USA*
- [P1-88] **FPGA-based Development of Finite State-MPC for Three-Phase Grid-Connected VSI System**  
Vijay Kumar Singh, Ravi Nath Tripathi, and Tsuyoshi Hanamoto  
*Kyushu Institute of Technology, Japan*
- [P1-89] **A Bridgeless Buck-flyback PFC Converter with High PF and Dead Angles Eliminated**  
Zhengge Chen, Pooya Davari, and Huai Wang  
*Aalborg University, Denmark*
- [P1-90] **Investigation of an STATCOM-based Energy Stored Quasi-Z Source Cascaded H-bridge Inverter Photovoltaic Power System**  
Weihua Liang, Yitao Liu, Shiqi Jiang, Jianchun Peng, and Hui Jiang  
*Shenzhen University, China*

- [P1-91] **Energy Management System Applied in DC Electric Springs**  
 Daojun Zha, Qingsong Wang, Ming Cheng, and Fujin Deng  
*Southeast University, China*
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- [P1-92] **Simple Modular Equalization System with Reduced Switch Count and Constant Current Characteristics for Series-Connected EDLC Modules**  
 M. Uno and K. Hasegawa  
*Ibaraki University, Japan*
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- [P1-93] **Coupled Inductor Design Methodology to Improve Energy Transfer Efficiency in Active Cell Balancing Circuit using Multi-Winding Coupled Inductor**  
 Sang-Jung Lee<sup>1,2</sup>, Myoung-ho Kim<sup>1</sup>, and Jee-Hoon Jung<sup>2</sup>  
<sup>1</sup>*Korea Electrotechnology Research Institute, Korea*, <sup>2</sup>*Ulsan National Institute of Science and Technology, Korea*
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- [P1-94] **Synthesis of Balancing Topologies for Parallel-connected Battery Cells by Principle of Duality**  
 Phuong-Ha La and Sung-Jin Choi  
*University of Ulsan, Korea*
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- [P1-95] **Optimal Sizing of BESS for Hybrid Electric Ship Using Multi-Objective Particle Swarm Optimization**  
 Rudy Tjandra<sup>1</sup>, Shuli Wen<sup>1</sup>, Dehong Zhou<sup>2</sup>, and Yi Tang<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, Singapore*, <sup>2</sup>*University of Alberta, Canada*
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- [P1-96] **Nonlinear Observer and Simplified Equivalent Circuit Model-based EKF-SOC Estimator of a Rechargeable LiFePo<sub>4</sub> cell**  
 Jinhyeong Park<sup>1</sup>, Gunwoo Kim<sup>1</sup>, Woonki Na<sup>2</sup>, Cheolwoo Lim<sup>3</sup>, and Jonghoon Kim<sup>1</sup>  
<sup>1</sup>*Chungnam National University, Korea*, <sup>2</sup>*California State University, USA*, <sup>3</sup>*Korea Advanced Institute of Science and Technology, Korea*
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- [P1-97] **Loss Analysis of Hybrid Electric Vehicle Inverters**  
 Fumio Asakura, Norihito Kimura, and Yuji Hayashi  
*SOKEN, Inc., Japan*
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- [P1-98] **A LFO Suppression Approach for PET-TNCS Based on the Cascaded Nonlinear PI Controller**  
 Yulan Su and Xinglai Ge  
*Southwest Jiaotong University, China*
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- [P1-99] **Analysis on Surge Voltage in Inverter-fed Motor using Frequency Response Analysis**  
 M. Fujieda<sup>1</sup>, Y. Takahashi<sup>1</sup>, N. Kimura<sup>1</sup>, T. Wakimoto<sup>1</sup>, S. Nagai<sup>2</sup>, N. Koshino<sup>2</sup>, and K. Takizawa<sup>2</sup>  
<sup>1</sup>*SOKEN INC., Japan*, <sup>2</sup>*TOYOTA Motor Corporation, Japan*
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- [P1-100] **Use of the Stationary Wavelet Transform to Characterize Transient Events in DC Power Distribution Systems**  
 D. G. Oslebo<sup>1</sup>, K. Corzine<sup>2</sup>, T. Weatherford<sup>1</sup>, R. Cristi<sup>1</sup>, and A. Maqsood<sup>2</sup>  
<sup>1</sup>*Naval Postgraduate School, USA*, <sup>2</sup>*University of California-Santa Cruz, USA*
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- [P1-101] **A Genetic Algorithm Based Motor Controller System Automatic Layout Method**  
 Han Cao<sup>1,2,3</sup>, Puqi Ning<sup>1,2,3</sup>, Xuhui Wen<sup>1,2,3</sup>, and Tianshu Yuan<sup>1,2,3</sup>  
<sup>1</sup>*University of Chinese Academy of Sciences, China*, <sup>2</sup>*Institute of Electrical Engineering, Chinese Academy of Sciences, China*, <sup>3</sup>*Collaborative Innovation Center of Electrical Vehicles in Beijing, China*
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- [P1-102] **On-Line Switch-Open Fault Detection of PMSM using Artificial Neural Network**  
 Jun Lee and Jung-Ik Ha  
*Seoul National University, Korea*
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- [P1-103] **A Lifetime Estimation Method of MMC Submodules Based on the Combination of FEA and Physical Lifetime Model**  
 Binyu Wang, Jianpeng Wang, Dingkun Ma, Laili Wang, Fengtao Yang, Xinying Li, and Youbo Tan  
*Xi'an Jiaotong University, China*
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- [P1-104] **A New Kind of Hybrid UHVDC System Dedicated for Long-Distance Power Delivery and Regional Power Grids Back-to-Back Hierarchical Interconnection**  
 Yongxin Chen, Xianggen Yin, Xingzhu Wang, Xiangyuan Yin, Wenbin Cao, and Yuanlin Pan  
*Huazhong University of Science and Technology, China*
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- [P1-105] **Active Current-limiting Control to Handle DC Line Fault of Overhead DC Grid**  
 Meng Zhou<sup>1</sup>, Wang Xiang<sup>1</sup>, Wenping Zuo<sup>1</sup>, Weixing Lin<sup>2</sup>, Jinyu Wen<sup>1</sup>, Ruizhang Yang<sup>1</sup>, Binye Ni<sup>1</sup>, and Xiaojun Lu<sup>1</sup>  
<sup>1</sup>*Huazhong University of Science and Technology, China*, <sup>2</sup>*TBEA China Xinjiang Sunoasis Co., Ltd., China*
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- [P1-106] **Sequence Impedance Modeling and Frequency Characteristic Analysis of MMC-based HVDC**  
 Tong Huang<sup>1</sup>, Xin Chen<sup>1</sup>, Guanghui Li<sup>2</sup>, and Guoqing He<sup>2</sup>  
<sup>1</sup>*Nanjing University of Aeronautics and Astronautics, China*, <sup>2</sup>*China Electric Power Research Institute, China*
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- [P1-107] **A Bypass LCC-Based DC Fault Isolation Scheme for Bipolar MMC-HVDC**  
 Jianquan Liao, Yuhao Wen, Niancheng Zhou, and Qia nggang Wang  
*Chongqing University, China*

**[P1-108] A Three-Terminal Hybrid HVDC System Based on LCC and Hybrid MMC with DC Fault Clearance Capability**

Wei Han<sup>1</sup>, Ruizhang Yang<sup>2</sup>, Wang Xiang<sup>2</sup>, Chao Liu<sup>1</sup>, Weidong Ma<sup>1</sup>, and Jinyu Wen<sup>2</sup>

<sup>1</sup>Electrical Power Research Institute of Henan Electric Power Corporation, China, <sup>2</sup>Huazhong University of Science and Technology, China

**[P1-109] AC Fault Clearing within an MMC-based DC Hub**

M. Poikilidis<sup>1</sup>, E. Kontos<sup>2</sup>, and P. Bauer<sup>2</sup>

<sup>1</sup>DNV GL, Netherlands, <sup>2</sup>Delft University of Technology, Netherlands

**[P1-110] Power Electronic Transformer Based on Mixed-frequency Modulation Strategy**

Liangcai Shu<sup>1</sup>, Wu Chen<sup>1</sup>, and Chenyu Zhang<sup>2</sup>

<sup>1</sup>Southeast University, China, <sup>2</sup>State Grid Jiangsu Electric Power Co., Ltd. Research Institute, China

**[P1-111] A Novel Experimental Measurement Method of Transformer Parasitic Capacitances**

Naizeng Wang, Xu Yang, Angyang Zhou, and Yiting Xie

*Xi'an Jiaotong University, China*

**[P1-112] A Soft-Switching Three-Phase DVR Equipped With a High-Frequency Isolated Converter**

Maoh-Chin Jiang, Bing-Jyun Shih, and Yu-Kai Lin

*National Ilan University, Taiwan*

**[P1-113] Control of Load Interfacing Power Electronics Converter in Multifrequency Systems**

M. Gagic, I. Pecelj, Z. Qin, and J. A. Ferreira

*Delft University of Technology, Netherlands*

**[P1-114] Core-Type Transformer Design Method with Integrated Series Inductance for DC-DC Converters**

Murat Kaymak, Mustafa Enes Fincan, and Rik W. De Doncker

*RWTH Aachen University, Germany*

**[WeA2-3] Case Study Report Electrochemical Capacitor Latest Application**

Toshihiko Furukawa

*United Chemi-Con, Japan*

**[WeA2-4] Model-based Development Technology of ICT Power Supply and Future Application for Intelligent Energy Management**

Yonezawa Yu

*Fujitsu Laboratories Ltd., Japan*

Room B (Room 110)

14:10~16:15

**WeB2: Control Strategies for Battery Based Power Systems**

**Chair(s)** **Judith Apsley** (The University of Manchester, UK)  
**Byoung Kuk Lee** (Sungkyunkwan University, Korea)

**[WeB2-1] Battery Energy Storage System with Energy Spring Based on VS G Control Strategy**

Yuting Shao, Ranchen Yang, Xin Li, and Guozhu Chen  
*Zhejiang University, China*

**[WeB2-2] An On-line Strategy based on Rolling State Prediction for Hybrid Energy Storage System of Tram**

Yu Wang, Zhongping Yang, Fei Lin, Xiaochun Fang, Xingkun An, and Hongda Zhou  
*Beijing Jiaotong University, China*

**[WeB2-3] Maximum Power Flow Management for Stand-alone PV Based Battery Charging System**

Utpal Kumar Das, Kok Soon Tey, Mohd Yamani Idna Idris, and Saad Mekhilef  
*University of Malaya, Malaysia*

**[WeB2-4] Energy Strategy of Fuel Cell Powered Railcars for a Reduction of Fuel Cell Power Capacity and Lithium-Ion Battery Capacity**

K. Ogawa<sup>1</sup> and K. Kondo<sup>2</sup>

<sup>1</sup>Chiba University, Japan, <sup>2</sup>Waseda University, Japan

**[WeB2-5] Optimal Operation of Co-phase Traction Power System with Hybrid Energy Storage and PV Integrated**

Yuanli Liu, Minwu Chen, and Yinyu Chen  
*Southwest Jiaotong University, China*

Room A (Room 105)

14:10~15:50

**WeA2: [IS] Server Systems & Data Center**

**Chair(s)** **Yonezawa Yu** (Fujitsu Laboratories Ltd., Japan)

**[WeA2-1] A Study of the Failure Prediction with Estimated Humidity Data**

14:10~14:35

Kaisei Kanetani

*NTT Facilities, Japan*

**[WeA2-2] Design Considerations of Server Power Supply for Data Center Application**

14:35~15:00

Chong-Eun Kim

*SoluM, Korea*

Room C (Room 201) 14:10~16:15

**WeC2: [OS] Advanced Power Conversion Systems for Battery and Motor Drive**

**Chair(s)** **Yasuyuki Nishida** (Chiba Institute of Technology, Japan)  
**Takaharu Takeshita** (Nagoya Institute of Technology Gokiso, Japan)

**[WeC2-1] 14:10~14:35 Modeling and Simulation for Conducted Noise on AC/DC Converter using SiC-Device**

Wataru Kitagawa, Kohei Mitani, Yuki Kawamura, and Takaharu Takeshita  
*Nagoya Institute of Technology, Japan*

**[WeC2-2] 14:35~15:00 AC/DC Converter Using Modular Matrix Converter for Quick Battery Charger**

Kazuma Suzuki and Takaharu Takeshita  
*Nagoya Institute of Technology, Japan*

**[WeC2-3] 15:00~15:25 22kW EV Battery Charger Allowing Full Power Delivery in 3-Phase as Well as 1-Phase Operation**

Panteleimon Papamanolis, Florian Krismer, and Johann W. Kolar  
*ETH Zurich, Switzerland*

**[WeC2-4] 15:25~15:50 Restarting Method for Hydraulic Turbine Generation Systems Applied PMSG Sensorless Control**

Yeongsu Bak and Kyo-Beum Lee  
*Ajou University, Korea*

Room D (Room 202) 14:10~16:15

**WeD2: [OS] Solid-State Transformer**

**Chair(s)** **Sanjib Kumar Panda** (National University of Singapore, Singapore)  
**Florian Krismer** (ETH Zurich, Switzerland)

**[WeD2-1] 14:10~14:35 Multi-objective Optimization and Modeling of High Frequency Transformers for DC-DC Stage in Solid State Transformer**

Haonan Tian, Sriram Vaisambhayana, and Anshuman Tripathi  
*Nanyang Technological University, Singapore*

**[WeD2-2] 14:35~15:00 New Series-Resonant Solid-State DC Transformer Providing Three Self-Stabilized Isolated Medium-Voltage Input Ports**

F. Krismer, J. Böhrer, J. W. Kolar, and G. Pammer  
*ETH Zurich, Switzerland*

**[WeD2-3] 15:00~15:25 A New Control Scheme to Process Ripple Power Through Isolation stage of the Three-stage Solid State Transformer**

Naga Brahmendra Yadav Gorla, Sandeep Kolluri, Merlin Chai, and Sanjib Kumar Panda  
*National University of Singapore, Singapore*

**[WeD2-4] 15:25~15:50 Control of Smart Transformer in Different Electric Grid Configurations**

Rongwu Zhu, Giovanni De Carne, Markus Andresen, and Marco Liserre  
*Christian-Albrechts-Universität zu Kiel, Germany*

**[WeD2-5] 15:50~16:15 Medium Voltage Asynchronous Micro-grid Power Conditioning System Enabled by HV SiC Devices**

Sanket Parashar and Subhashish Bhattacharya  
*North Carolina State University, USA*

Room E (Room 203) 14:10~16:15

**WeE2: [OS] IGCT Applications II**

**Chair(s)** **Eric Carroll** (EIC Consultancy, France)  
**Yongsug Suh** (Chonbuk National University, Korea)

**[WeE2-1] 14:10~14:35 Investigation of a Novel IGCT Module for DC Circuit Breaker**

Qiang Yi, Yifei Wu, Yi Wu, Fei Yang, Zhihui Zhang, and Chong Gao  
*Xi'an Jiaotong University, China*

**[WeE2-2] 14:35~15:00 Cascaded Snubber Scheme using Flyback Type Transformer for 10kV IGCT Applications**

Siamak Shirmohammadi and Yongsug Suh  
*Chonbuk National University, Korea*

**[WeE2-3] 15:00~15:25 Converter Switching Based Generic Loss Evaluation in Semiconductor and Clamp Circuit of IGCT Based MMC Converter Cells for HVDC Applications**

Madhan Mohan<sup>1</sup>, Evgeny Tsyplakov<sup>2</sup>, Christian Winter<sup>2</sup>, and Harshavardhan Marabathina<sup>1</sup>  
<sup>1</sup>ABB GISPL, India, <sup>2</sup>ABB Semiconductors, Switzerland

**[WeE2-4] 15:25~15:50 Robust, Low-loss RCIGCT Technology and MV Applications**

Peter K. Steimer, David Weiss, and Bjørn Ødegård  
<sup>1</sup>ABB Switzerland Ltd., Switzerland

**[WeE2-5] 15:50~16:15 Thermal Performance Analysis of 10kV IGCT based Three Level ANPC Converter in 7MW PMSG MV Wind Turbines**

Amreena Lama Lyngdoh<sup>1</sup>, Yongsug Suh<sup>1</sup>, Byoung-Gun Park<sup>2</sup>, and Jiwon Kim<sup>2</sup>  
<sup>1</sup>Chonbuk National University, Korea, <sup>2</sup>Korea Electrotechnology Institute, Korea

Room F (Room 204) 14:10~15:50

**WeF2: [IS] Renewable Energy Systems****Chair(s)** **Joo-Won Baek** (Korea Electrotechnology Research Institute, Korea)**[WeF2-1] 14:10~14:35** **A Hybrid Active Neutral-Point Clamped Inverter for Battery Energy Storage Systems**Seok-Min Kim  
*LSIS, Korea***[WeF2-2] 14:35~15:00** **Introduction of Smart AC Module as a Part of 'Home Energy Solution'**Sangin Lee  
*LG Electronics, Korea***[WeF2-3] 15:00~15:25** **Solid State Transformer**Myoungho Kim  
*Korea Electrotechnology Research Institute, Korea***[WeF2-4] 15:25~15:50** **Power Electronics Probing**Changhun Oh  
*Teledyne LeCroy, Korea*

Room G (Room 206) 14:10~16:15

**WeG2: [IS] High Power Dynamic Wireless Charging of Electric Vehicles 2****Chair(s)** **Chris Mi** (San Diego State University, USA)  
**Xin Dai** (Chongqing University, China)**[WeG2-1] 14:10~14:35** **Evaluation of Power Transmission Efficiency with 'Area Inside the Established Threshold' (AET)**Tomohide Tsukasaki  
*HIOKI E.E. Corporation, Japan***[WeG2-2] 14:35~15:00** **1MW Dynamic Wireless Charging System for Light Rail Train**David Cho  
*Green Power Co., Ltd., Korea***[WeG2-3] 15:00~15:25** **Electric Vehicle Wireless Charging Systems for Both a Stationary and Dynamic Future**Grant Covic  
*The University of Auckland, New Zealand***[WeG2-4] 15:25~15:50** **Wireless In-Wheel Motor with Dynamic Wireless Power Transfer in Motion**Hiroshi Fujimoto  
*The University of Tokyo, Japan***[WeG2-5] 15:50~16:15** **MOBIS Activities on 48V PSS and Chassis Components**Sang Min Kim  
*HYUNDAI MOBIS, Korea*

Room H (Room 207) 14:10~16:15

**WeH2: [IS] Power Semiconductor and Module Solutions from ON Semiconductor****Chair(s)** **Kevin (KyuHyun) Lee** (ON Semiconductor, Korea)  
**Taesung Kwon** (ON Semiconductor, Korea)**[WeH2-1] 14:10~14:35** **Short Circuit Rate 750V FS4 IGBT with High Performance for Automotive Applications**Jeong Min Son  
*ON Semiconductor, Korea***[WeH2-2] 14:35~15:00** **ON's New Super Junction MOSFET Solution for DC EV Charging Station**Wonsuk Choi  
*ON Semiconductor, Korea***[WeH2-3] 15:00~15:25** **Pros and Cons of Discrete, IPM and PIM Solutions Based on the Application**Arnold Lee  
*ON Semiconductor, Korea***[WeH2-4] 15:25~15:50** **2000V IGBT Modules for 1500V PV Application**Justin Jegal  
*ON Semiconductor, Korea***[WeH2-5] 15:50~16:15** **Innovative Performance Improvement for Fast Switching Frequency Applications by State of the Art Technology from ON's Latest SiC Diode and FS4 IGBT**Joshua Jeong  
*ON Semiconductor, Korea*

Room A (Room 105) 16:30~18:35

**WeA3: [OS] Advanced Bidirectional Isolated DC/DC Converters for DC Microgrids****Chair(s)** **Kai Sun** (Tsinghua University, China)  
**Hongfei Wu** (Nanjing University of Aeronautics and Astronautics, China)**[WeA3-1] 16:30~16:55** **A Phase-Shift Modulation Strategy for a Bidirectional CLLC Resonant Converter**Wenmin Hua<sup>1</sup>, Hongfei Wu<sup>1</sup>, Zhiyuan Yu<sup>1</sup>, Yan Xing<sup>1</sup>, and Kai Sun<sup>2</sup>  
<sup>1</sup>Nanjing University of Aeronautics and Astronautics, China, <sup>2</sup>Tsinghua University, China**[WeA3-2] 16:55~17:20** **Analysis and Design of LLC Resonant Converters Operating in Reverse Mode**Angyang Zhou, Xu Yang, Mofan Tian, Naizeng Wang, and Laili Wang  
*Xi'an Jiaotong University, China*

**[WeA3-3] Analysis and Design of a Bidirectional High Step-up Active Clamp Flyback Converter for Dielectric Elastomer Actuator**  
 17:20~17:45  
 Yang Chen, Yaqi Sun, Mofan Tian, Laili Wang, and Haoyuan Jin  
*Xi'an Jiaotong University, China*

**[WeA3-4] Analysis and Mitigation of Oscillations in Bi-directional CLLC Resonant Converters**  
 17:45~18:10  
 Zheyuan Yi<sup>1</sup>, Huan Chen<sup>1</sup>, Kai Sun<sup>1</sup>, John Fletcher<sup>2</sup>, Georgios Konstantinou<sup>2</sup>, and Branislav Hredzak<sup>2</sup>  
<sup>1</sup>Tsinghua University, China, <sup>2</sup>University of New South Wales, Australia

**[WeA3-5] Voltage Control Method in Non-linear Dead-time Effect Region for Dual Active Bridge DC-DC Converter**  
 18:10~18:35  
 Jun-ichi Itoh, Kengo Kawauchi, Hayato Higa, Hiroki Watanabe, and Keisuke Kusaka  
*Nagaoka University of Technology, Japan*

Room B (Room 110) 16:30~18:10

**WeB3: [OS] Power Conversion and Control of Distributed Energy Resources**

**Chair(s)** Liuchen Chang (University of New Brunswick, Canada)  
 Grahame Holmes (RMIT University, Australia)

**[WeB3-1] Novel Nonlinear DC-Link Voltage Control for Small-Scale Grid-Connected Wind Power Converters**  
 16:30~16:55  
 Guan hong Song, Bo Cao, Liuchen Chang, and Riming Shao  
*University of New Brunswick, Canada*

**[WeB3-2] Design Methodology of Bidirectional Flyback Converter for Differential Power Processing Modules in PV Applications**  
 16:55~17:20  
 Seungbin Park<sup>1</sup>, Mina Kim<sup>1</sup>, Hoejeong Jeong<sup>2</sup>, Katherine A. Kim<sup>3</sup>, Taewon Kim<sup>4</sup>, A-Rong Kim<sup>4</sup>, and Jee-Hoon Jung<sup>1</sup>  
<sup>1</sup>Ulsan National Institute of Science and Technology, Korea, <sup>2</sup>LG Electronics, Korea, <sup>3</sup>National Taiwan University, Taiwan, <sup>4</sup>Research Institute of Science and Technology, Korea

**[WeB3-3] A New Isolated AC-DC Power Converter Topology with Reduced Number of Switches for High-Input Voltage and High-Output Current Applications**  
 17:20~17:45  
 Obaid Aldosari<sup>1</sup>, Luciano A. Garcia Rodriguez<sup>2</sup>, David Carballo Rojas<sup>3</sup>, and Juan Carlos Balda<sup>4</sup>  
*University of Arkansas, USA*

**[WeB3-4] Single Phase Converter with Power Decoupling and Reactive Power Control for Bi-directional EV Charger**  
 17:45~18:10  
 Peiji Zhu<sup>1</sup>, Meiqin Mao<sup>1</sup>, and Shuang Xu<sup>2</sup>  
<sup>1</sup>Hefei University of Technology, China, <sup>2</sup>University of New Brunswick, Canada

Room C (Room 201) 16:30~18:10

**WeC3: [OS] SiC Inverters for Electric Drives and Grid Applications**

**Chair(s)** Keiji Wada (Tokyo Metropolitan University, Japan)  
 Zhang Xueguang (Harbin Institute of Technology, China)

**[WeC3-1] EMI Modeling of Three-Level Active Neutral-Point-Clamped SiC Inverter Under Different Modulation Schemes**  
 16:30~16:55  
 Donghua Pan<sup>1</sup>, Mengxing Chen<sup>1</sup>, Xiongfei Wang<sup>1</sup>, Huai Wang<sup>1</sup>, Frede Blaabjerg<sup>1</sup>, and Wei Wang<sup>2</sup>  
<sup>1</sup>Aalborg University, Denmark, <sup>2</sup>Harbin Institute of Technology, China

**[WeC3-2] Peak Temperature Reduction Method of SiC-MOSFETs Employed in the Initial Charge for the DC Capacitor using Leg Short-Circuits**  
 16:55~17:20  
 Tomoyuki Mannen<sup>1,2</sup>, Hidetaka Mishima<sup>1</sup>, and Keiji Wada<sup>2</sup>  
<sup>1</sup>Tokyo University of Science, Japan, <sup>2</sup>Tokyo Metropolitan University, Japan

**[WeC3-3] Switching Characterization of SiC MOSFETs in Three-Level Active Neutral-Point-Clamped In-verter Application**  
 17:20~17:45  
 Mengxing Chen<sup>1</sup>, Donghua Pan<sup>1</sup>, Huai Wang<sup>1</sup>, Xiongfei Wang<sup>1</sup>, Frede Blaabjerg<sup>1</sup>, and Wei Wang<sup>2</sup>  
<sup>1</sup>Aalborg University, Denmark, <sup>2</sup>Harbin Institute of Technology, China

**[WeC3-4] Performance Evaluation Between SMPTC and PTC for PMSM Drives**  
 17:45~18:10  
 Cristian Garcia<sup>1</sup>, Jose Rodriguez<sup>1</sup>, Margarita Norambuena<sup>2</sup>, S. Alireza Davari<sup>3</sup>, Fengxiang Wang<sup>4</sup>, and Yongchang Zhang<sup>5</sup>  
<sup>1</sup>Universidad Andres Bello, Chile, <sup>2</sup>Universidad Tecnica Federico Santa Maria, Chile, <sup>3</sup>Shahid Rajaei Teacher Training University, Iran, <sup>4</sup>Quanzhou Institute of Equipment Manufacturing, Haixi Institutes, Chinese Academy of Sciences, China, <sup>5</sup>North China University of Technology, China

Room D (Room 202) 16:30~18:10

### WeD3: [OS] DC Transformer for DC Distribution and Microgrids: Topology, Design and Control

**Chair(s)** **Zhe Zhang** (Technical University of Denmark, Denmark)  
**Xin Zhang** (Nanyang Technological University, Singapore)

**[WeD3-1] 16:30~16:55 Resonant Parameter Design of Asymmetrical CLLC-Type DC Transformer with Robust Voltage Gain**  
 Jingjing Huang and Xin Zhang  
*Nanyang Technological University, Singapore*

**[WeD3-2] 16:55~17:20 An Integrated Three-phase Transformer for Partial Parallel Dual Active Bridge Converter**  
 Jiasheng Huang<sup>1</sup>, Zhe Zhang<sup>2</sup>, Yudi Xiao<sup>2</sup>, Bainan Sun<sup>2</sup>, and Michael A.E. Andersen<sup>2</sup>  
<sup>1</sup>*Xi'an Jiaotong University, China*, <sup>2</sup>*Technical University of Denmark, Denmark*

**[WeD3-3] 17:20~17:45 Modeling and Stability Analysis of the Cascaded Dual Active Bridge Converter System with Considerations of the Controller Parameters**  
 Fanfan Lin, Xin Zhang, and Fan Feng  
*Nanyang Technological University, Singapore*

**[WeD3-4] 17:45~18:10 Analysis of MHz 380V-12V DCX with Low FoM Device**  
 Hongbo Shi<sup>1</sup>, Xinke Wu<sup>1</sup>, and Mingchao Xia<sup>2</sup>  
<sup>1</sup>*Zhejiang University, China*, <sup>2</sup>*Beijing Jiaotong University, China*

Room E (Room 203) 16:30~18:35

### WeE3: [OS] Reliability and Fault-Tolerant Operation of Modular Multilevel Converter

**Chair(s)** **Ke Ma** (Shanghai Jiao Tong University, China)  
**Georgios Konstantinou** (University of New South Wales, Australia)

**[WeE3-1] 16:30~16:55 Similarity-Based Fast Open-Circuit Fault Diagnosis Method for Modular Multilevel Converters**  
 Dehong Zhou<sup>1</sup>, Huan Qiu<sup>1</sup>, Shunfeng Yang<sup>2</sup>, and Yi Tang<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, Singapore*,  
<sup>2</sup>*Southwest Jiaotong University, China*

**[WeE3-2] 16:55~17:20 Mission Profile Emulator for Sub-modules of Modular Multilevel Converter with Carrier Phase-Shift Modulation**  
 Yunxiao Yang, Ke Ma, and Weiyao Wang  
*Shanghai Jiao Tong University, China*

**[WeE3-3] 17:20~17:45 Thermal Performance of Modular Multilevel Converters in HVDC Applications Under Offset PWM**  
 Harith R. Wickramasinghe<sup>1</sup>, Weiyao Wang<sup>2</sup>, Ke Ma<sup>2</sup>, and Georgios Konstantinou<sup>1</sup>  
<sup>1</sup>*UNSW Sydney, Australia*, <sup>2</sup>*Shanghai Jiao Tong University, China*

**[WeE3-4] 17:45~18:10 Mission Profile Based Adaptive Carrier Frequency Control for Modular Multilevel Converters for Medium Voltage Applications**  
 Zhongxu Wang, Huai Wang, Yi Zhang, and Frede Blaabjerg  
*Aalborg University, Denmark*

**[WeE3-5] 18:10~18:35 Reliability Modeling and Analysis on Metallized Film Capacitors for MMC**  
 Yao Ran, Zheng Meimei, Li Hui, Lai Wei, Wang Xiao, and Long Haiyang  
*Chongqing University, China*

Room F (Room 204) 16:30~18:35

### WeF3: [OS] High-Performance Grid-Friendly Photovoltaic Power Conversion Systems

**Chair(s)** **Yongheng Yang** (Aalborg University, Denmark)  
**Yu-Chen Liu** (National Taiwan University of Science and Technology, Taiwan)

**[WeF3-1] 16:30~16:55 A Switched Quasi-Z-Source Inverter with Continuous Input Currents**  
 Jing Yuan, Yongheng Yang, and Frede Blaabjerg  
*Aalborg University, Denmark*

**[WeF3-2] 16:55~17:20 Reliability of DC-link Capacitors in Two-Stage Micro-Inverters under different PV Module Sizes**  
 Ariya Sangwongwanich<sup>1</sup>, Yanfeng Shen<sup>2</sup>, Andrii Chub<sup>3</sup>, Elizaveta Liivik<sup>1,3</sup>, Dmitri Vinnikov<sup>3</sup>, Huai Wang<sup>1</sup>, and Frede Blaabjerg<sup>1</sup>  
<sup>1</sup>*Aalborg University, Denmark*, <sup>2</sup>*University of Cambridge, UK*, <sup>3</sup>*TalTech University, Estonia*

**[WeF3-3] 17:20~17:45 A Low-Computational High-Performance Model Predictive Control of Single Phase Battery Assisted Quasi Z-Source PV Inverters**  
 Abderezak Lashab, Dezso Sera, and Josep M. Guerrero  
*Aalborg University, Denmark*

**[WeF3-4] Dynamic Process Elimination Control Strategy based on Super-Twisting Algorithm for Droop-Controlled Grid-Connected Inverter**

Wei Zhang<sup>1</sup>, Hongpeng Liu<sup>1</sup>, Wei Wang<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>

<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Aalborg University, Denmark

**[WeF3-5] DC component Mitigation Utilizing BP-PI and Repetitive Control in Transformless Grid-Connected Inverters**

Bo Long, Yong Liao, Yu Fei Dai, Li Jun Huang, Xin Lu, Yong Chen, and Fu Sheng Li

University of Electronic Science and Technology of China, China

Room G (Room 206) 16:30~18:35

**WeG3: [OS] Multi-Function Converters for Microgrids**

**Chair(s)** Tsai-Fu Wu (National Tsing Hua University, Taiwan)  
Liang-Rui Chen (National Changhua University of Education, Taiwan)

**[WeG3-1] Verification and Implementation of Two 350 kVA 3Φ4W Multi-Function Converters with Circulating Power Tests**

T.-F. Wu, Y.-T. Liu, Y.-H. Huang, and A. Kumari  
National Tsing Hua University, Taiwan

**[WeG3-2] Design and Implementation of a Diagnostic System for Lithium Battery Module Based on Sinusoidal Loading Technique**

Chang-Hua Lin, Kuan-Chung Chen, and Yu-Lin Lee  
National Taiwan University of Science & Technology, Taiwan

**[WeG3-3] Three-Level Bi-Directional Half-Bridge CLLC Resonant Converter for DC Micro-Grid**

Hsuan-Yu Yueh, Jing-Yuan Lin, Haung-Jen Chiu, Chen-Yen Chu, Yu-Chen Chang, and Sih-Yi Lee

National Taiwan University of Science and Technology, Taiwan

**[WeG3-4] Design of a Bidirectional DC/AC Converter with Battery Charging/Discharging/Standing Balance Control**

Liang-Rui Chen<sup>1</sup>, Bo-Rui Xu<sup>1</sup>, Chuan-Sheng Liu<sup>2</sup>, Shao-wei Peng<sup>1</sup>, and Chia-Hsuan Wu<sup>1</sup>

<sup>1</sup>National Changhua University of Education, Taiwan, <sup>2</sup>National Formosa University, Taiwan

**[WeG3-5] A High Step-up Modular Isolated DC-DC Converter for Large Capacity Photovoltaic Generation System Integrated into MVDC Grids**

Shilei Lu<sup>1</sup>, Kai Sun<sup>1</sup>, Guoen Cao<sup>2</sup>, Yongdong Li<sup>1</sup>, Jung-Ik Ha<sup>3</sup>, and Geon-Hong Min<sup>3</sup>

<sup>1</sup>Tsinghua University, China, <sup>2</sup>Institute of Electrical Engineering, Chinese Academy of Sciences, China, <sup>3</sup>Seoul National University, Korea

Room H (Room 207) 16:30~18:35

**WeH3: [IS] Recent Advances in Power Semiconductor Technologies of Infineon**

**Chair(s)** Kwok-wai Ma (Infineon Technologies, Hong Kong)  
Martin Cheung (Infineon Technologies, Hong Kong)

**[WeH3-1] The Value of CoolGaN™ for Selected Applications in the Low Power and High Power Segment**

Martin Cheung  
Infineon Technologies, Hong Kong

**[WeH3-2] IPM Technologies for Air Conditioner Applications**

Sungmo Young  
Infineon Technologies, Korea

**[WeH3-3] SiC and CoolMos for LDC and OBC**

Li Zhe  
Infineon Technologies, Korea

**[WeH3-4] Impact of Load Profiles and IGBT Thermal Specification on Inverter Performance**

Kwok-wai Ma  
Infineon Technologies, Hong Kong

**[WeH3-5] CoolSiCTM SiC MOSFET - Technology, Device and Application**

Chang Ho Kim  
Infineon Technologies, Korea



## May 30(Thursday)

Room A (Room 105) 08:30~10:10

### ThA1: Topologies for DC/DC Converters I

**Chair(s)** Junming Zhang (Zhejiang University, China)  
Jae-Kuk Kim (Inha University, Korea)

**[ThA1-1]** 08:30~08:55 **Hybrid DC-DC Converter using Center-Tapped Clamp Circuit in Wide Range of High Output Voltage**

Cheon-yong Lim, Ki-Mok Kim, Dongmin Kim, Tae-Woo Kim, and Gun-Woo Moon  
*Korea Advanced Institute of Science and Technology, Korea*

**[ThA1-2]** 08:55~09:20 **Pre-regulating Boost Converter with Asymmetric Half-bridge LLC Converter for DC Server Power Supply**

Moo-Hyun Park<sup>1</sup>, Yeonho Jeong<sup>2</sup>, Dong-Kwan Kim<sup>1</sup>, Ki-Mok Kim<sup>1</sup>, and Gun-Woo Moon<sup>1</sup>  
*<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>University of Colorado Denver, USA*

**[ThA1-3]** 09:20~09:45 **A New APWM Half-Bridge Converter With Enhanced Zero-Voltage-Switching Range in Wide Input Voltage Range**

Seung-Hyun Choi<sup>1</sup>, Jung-Kyu Han<sup>1</sup>, Min-Su Lee<sup>1</sup>, Sang-Hyun Ha<sup>1,2</sup>, and Gun-Woo Moon<sup>1</sup>  
*<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>Agency for Defense Development, Korea*

**[ThA1-4]** 09:45~10:10 **A New ZVS Switched-Capacitor DC-DC Converter with Low Boost Inductance**

Jaehoon Kim, Sunju Kim, Nur Banu Sagpazar, and Sewan Choi  
*Seoul National University of Science and Technology, Korea*

Room B (Room 110) 08:30~10:35

### ThB1: PV System for Renewable Energy and Distributed Generation Systems II

**Chair(s)** Robert Balog (Texas A&M University at Qatar, Qatar)  
Rae-Young Kim (Hanyang University, Korea)

**[ThB1-1]** 08:30~08:55 **Study on Single-phase Photovoltaic Power Generation System with Power Decoupling and Generation Control Functions**

Takaya Sekiguchi and Toshihisa Shimizu  
*Tokyo Metropolitan University, Japan*

**[ThB1-2]** 08:55~09:20 **Precise Inductor Current Ripple Distribution of Three-Level Active Neutral-Point-Clamped Inverter**

Donghua Pan<sup>1</sup>, Mengxing Chen<sup>1</sup>, Xiongfei Wang<sup>1</sup>, Huai Wang<sup>1</sup>, Frede Blaabjerg<sup>1</sup>, and Wei Wang<sup>2</sup>

*<sup>1</sup>Aalborg University, Denmark, <sup>2</sup>Harbin Institute of Technology, China*

**[ThB1-3]** 09:20~09:45 **Maximum Voltage Point Tracking for Partially-Shaded PV Modules**

Woei-Luen Chen, Zih-Shan Lai, and Wen-Hsuan Huang

*University of Taipei, Taiwan*

**[ThB1-4]** 09:45~10:10 **Design and Implementation of Multi-Level LLC Maximum Power Tracking PV System under Partial Shading Condition**

Yu-Kai Chen<sup>1</sup>, Yi-Chen Lai<sup>1</sup>, Hong-Wen Hsu<sup>1</sup>, and Jui-Yang Chiu<sup>2</sup>

*<sup>1</sup>National Formosa University, Taiwan, <sup>2</sup>AcBel Polytech Inc., Taiwan*

**[ThB1-5]** 10:10~10:35 **PV-to-Bus DPP Architecture Based on Unidirectional DC-DC Converter for Photovoltaic Application**

Guanying Chu and Huiqing Wen

*Xi'an Jiaotong-Liverpool University, China*

Room C (Room 201) 08:30~10:35

### ThC1: Electric Machines, Actuators, and Sensors

**Chair(s)** Tomoyuki Shimono (Yokohama National University, Japan)

Dong-Hee Lee (Kyungshung University, Korea)

**[ThC1-1]** 08:30~08:55 **Development of DC Linear Permanent Magnet Machine based on Multi-Layered Core-less Structure**

Tomoyuki Shimono<sup>1,2</sup>, Shunya Takano<sup>1,2</sup>, and Hiroshi Asai<sup>1,2</sup>

*<sup>1</sup>Yokohama National University, Japan, <sup>2</sup>Kanagawa Institute of Industrial Science and Technology, Japan*

**[ThC1-2]** 08:55~09:20 **Modeling of Single-Pulse Operated Switched Reluctance Generator and its Verification**

S. S. Ahmad and G. Narayanan

*Indian Institute of Science, India*

**[ThC1-3]** 09:20~09:45 **Investigation of Current Measurement Method of Bonding Wire by Using GMR Sensor**

Tatsuru Tamori and Kan Akatsu

*Shibaura Institute of Technology, Japan*

**[ThC1-4] Discrete Implementation Aspects for Online Current- and Voltage-Sensor Offset Calibration based on Inverter Voltage Distortion**  
 Michael Schubert and Rik W. De Doncker  
*RWTH Aachen University, Germany*

**[ThC1-5] DSP-Based Switched Reluctance Motor Incremental Inductance Measurement through Current Loop**  
 Jongwan Kim and Jih-Sheng Lai  
*Virginia Polytechnic Institute and State University, USA*

Room D (Room 202) 08:30~10:35

**ThD1: Controls of Grid-Connected Inverter I**

**Chair(s)** Tomoki Yokoyama (Tokyo Denki University, Japan)  
 Dinh-Tuyen Nguyen (Ho Chi Minh City University of Technology, Vietnam)

**[ThD1-1] Integrated Anti-Windup Architecture using a Disturbance Observer Framework for High Performance LCL Current Regulators**  
 Luke McNabb, Brendan McGrath, Liuping Wang, and Grahame Holmes  
*RMIT University, Australia*

**[ThD1-2] Individual Channel Design-based Modeling and Analysis of Three Phase Grid-tied Inverter with Unbalanced Grid Impedance**  
 Weimin Wu<sup>1</sup>, Yun Li<sup>1</sup>, Jiahao Liu<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>  
<sup>1</sup>Shanghai Maritime University, China, <sup>2</sup>Aalborg University, Denmark

**[ThD1-3] Current Harmonic Suppression for Gridconnected VSG Based on Virtual Harmonic Impedance**  
 Yaowei Hu, Yuting Shao, Ranchen Yang, and Guozhu Chen  
*Zhejiang University, China*

**[ThD1-4] A Simplified Digital Closed-loop Current Control of Three-phase PV Inverter Operating in Triangular Conduction Mode**  
 Sungjae Ohn, Nidhi Haryani, Rolando Burgos, and Dushan Boroyevich  
*Virginia Tech, USA*

**[ThD1-5] A Seamless and Autonomous Mode Transfer Method of Grid-connected Inverter with Critical Load**  
 Sungyoul Park<sup>1</sup>, Minho Kwon<sup>2</sup>, and Sewan Choi<sup>1</sup>  
<sup>1</sup>Seoul National University of Science and Technology, Korea, <sup>2</sup>Korea Electrotechnology Research Institute, Korea

Room E (Room 203) 08:30~10:35

**ThE1: [IS] Medium Voltage (MV) Drivers**

**Chair(s)** Yongsug Suh (Chonbuk National University, Korea)  
 Peter Steimer (ABB Ltd, Switzerland)

**[ThE1-1] Model Predictive Control for Medium Voltage Drives**  
 Vedrana Spudic, Tobias Geyer, and Wim van der Merwe  
*ABB, Switzerland*

**[ThE1-2] Medium Voltage Applications in a Connected Enterprise**  
 John Qiang Yin  
*Rockwell Automation, Inc., China*

**[ThE1-3] State-of-the-Art Industrial Medium Voltage Drives and Technology Trends**  
 Peter Barbosa  
*Delta Electronics, Inc., Taiwan*

**[ThE1-4] Medium-Voltage Converter Technologies and Their Applications**  
 Toshiaki Oka and Tamai Shinzo  
*TMEIC, Japan*

**[ThE1-5] Energy Savings and Application Case Examples Through LSIS MV Drives**  
 Jong-Je Park  
*LSIS, Korea*

Room F (Room 204) 08:30~10:35

**ThF1: Power Electronics for Transportation Electrification**

**Chair(s)** Jun-ichi Itoh (Nagaoka University of Technology, Japan)  
 Chuang Liu (Northeast Electric Power University, China)

**[ThF1-1] A Phase-Shift Full-Bridge Converter with Novel Voltage Oscillation Clamping Circuit for Electric Vehicle On-Board Charger**  
 Min-Su Lee, Cheon-Yong Lim, Keon-Woo Kim, Moo-Hyun Park, and Gun-Woo Moon  
*Korea Advanced Institute of Science and Technology, Korea*

**[ThF1-2] Development of Train Regenerative Braking Ground Absorbing Device Based on Super Capacitor Energy Storage**  
 Li Kunpeng<sup>1,2</sup>, Liu Wei<sup>1</sup>, Li Qunzhan<sup>1</sup>, Zhao Yunyun<sup>2</sup>, He Zhixin<sup>2</sup>, Shi Haiou<sup>2</sup>, Jin Shoujie<sup>3</sup>, and Chen Guangzan<sup>4</sup>  
<sup>1</sup>Southwest Jiaotong University, China, <sup>2</sup>Guangzhou Metro Design&Research Institute Co., Ltd., China, <sup>3</sup>Guangzhou Metro Group Co., Ltd., China, <sup>4</sup>Zhuzhou CRRC Times Electric Co., Ltd., China

**[ThF1-3] Control Algorithm Design and Implementation of Solid State Transformer**  
 09:20~09:45 Gedeon Niyitegeka<sup>1</sup>, Juyoung Park<sup>1,2</sup>, GyeongSig Cho<sup>1</sup>, Gawoo Park<sup>1</sup>, and Jaeho Choi<sup>2</sup>  
<sup>1</sup>G-Philos Co., Ltd., Korea, <sup>2</sup>Chungbuk National University, Korea

**[ThF1-4] A Modular Multilevel Interface for Transformerless Grid Integration of Large-Scale Infrastructure for Wireless Electric Vehicle Charging**  
 09:45~10:10 Giuseppe Guidi<sup>1</sup>, Salvatore D'Arco<sup>1</sup>, Jon Are Suul<sup>1,2</sup>, Ryosuke Iso<sup>3</sup>, and Jun-Ichi Itoh<sup>3</sup>  
<sup>1</sup>SINTEF Energy Research, Norway, <sup>2</sup>Norwegian University of Science and Technology, Norway, <sup>3</sup>Nagaoka University of Technology, Japan

**[ThF1-5] High Efficient Hybrid Converter using Center-tapped Clamp Circuit**  
 10:10~10:35 Cheon-yong Lim<sup>1</sup>, Yeonho Jeong<sup>2</sup>, Min-Su Lee<sup>1</sup>, Young-Dal Lee<sup>1</sup>, and Gun-Woo Moon<sup>1</sup>  
<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>University of Colorado, USA

Room G (Room 206) 08:30~10:35

### ThG1: EM Noise Reduction Techniques in Power Converters

**Chair(s)** Toshihisa Shimizu (Tokyo Metropolitan University, Japan)  
 Jinguok Kim (Ulsan National Institute of Science and Technology, Korea)

**[ThG1-1] Active Noise Canceller for the Reduction of Differential-Mode Noise in Low-Frequency Band of DC/DC Converter**  
 08:30~08:55 Hiroki Masuko and Toshihisa Shimizu  
 Tokyo Metropolitan University, Japan

**[ThG1-2] Novel EMI-Suppression Method for Galvanically Isolated Converters**  
 08:55~09:20 F. Hubert, P. Dorsch, T. Duerbaum, and S. J. Rupitsch  
 University of Erlangen-Nuremberg, Germany

**[ThG1-3] A Transformer-Isolated Common-Mode Active EMI Filter Using a Low-cost BJT Amplifier with Feedforward Structure**  
 09:20~09:45 Sangyeong Jeong<sup>1,2</sup>, Dongil Shin<sup>3</sup>, and Jinguok Kim<sup>1,2</sup>  
<sup>1</sup>Ulsan National Institute of Science and Technology, Korea, <sup>2</sup>EM coretech Inc., Korea, <sup>3</sup>LG Electronics, Korea

**[ThG1-4] Common-Mode Noise Reduction Technique for Back-to-back Bridgeless PFC**  
 09:45~10:10 Dong-Kwan Kim<sup>1</sup>, Jae-Sang Kim<sup>1</sup>, Dong-Min Choi<sup>1</sup>, Jaein Lee<sup>1,2</sup>, and Gun-Woo Moon<sup>1</sup>  
<sup>1</sup>Korea Advanced Institute of Science and Technology, Korea, <sup>2</sup>Agency for Defense Development, Korea

**[ThG1-5] A Study on Stray Capacitance of Ferrite Common Mode Chokes for EMI Filters**  
 10:10~10:35 Guangdong Dong and Fanghua Zhang  
 Nanjing University of Aeronautics and Astronautics, China

Room H (Room 207) 08:30~10:35

### ThH1: Other Selected Topics in Power Electronics

**Chair(s)** Hirohito Funato (Utsunomiya University, Japan)  
 Hanju Cha (Chungnam National University, Korea)

**[ThH1-1] Realistic Circuit Modeling Using Derating Factors for Triboelectric Nanogenerators in Energy Harvesting Applications**  
 08:30~08:55 Bo-Kyung Yoon<sup>1</sup>, Jee-Hoon Jung<sup>1</sup>, Jeong Min Baik<sup>1</sup>, and Katherine A. Kim<sup>2</sup>  
<sup>1</sup>Ulsan National Institute of Science and Technology, Korea, <sup>2</sup>National Taiwan University, Taiwan

**[ThH1-2] Electrical Variable Capacitor Using Symmetrical Switch Configuration in RF Plasma System**  
 08:55~09:20 Juhwa Min<sup>1</sup>, Beomseok Chae<sup>1</sup>, Jinho Kim<sup>2</sup>, Hyunbae Kim<sup>2</sup>, and Yongsug Suh<sup>1</sup>  
<sup>1</sup>Chonbuk National University, Korea, <sup>2</sup>Samsung Electronics, Korea

**[ThH1-3] Pulse Electric Field by Half bridge Modular Multilevel Inverter for Liquid Food Sterilization**  
 09:20~09:45 Prakasit Sritakaew and Rardchawadee Silapunt  
 King Mongkut's University of Technology Thonburi, Thailand

**[ThH1-4] Design of Transformer with Impedance Matching Circuit for High Power Transmitter of Active Sonar**  
 09:45~10:10 Seung-Min Song<sup>1</sup>, In-Dong Kim<sup>1</sup>, Byung-Hwa Lee<sup>2</sup>, and Jeong-Min Lee<sup>2</sup>  
<sup>1</sup>Pukyong National University, Korea, <sup>2</sup>Agency for Defense Development, Korea

**[ThH1-5] Volume Reduction Effect of Thinly Extended Core Structure for Transformer in Isolated DC-DC Converter**  
 10:10~10:35 R. Murata, T. Shirakawa, K. Umetani, and E. Hiraki  
 Okayama University, Japan

## Poster Session II

**Chair(s)** Kan Akatsu (Shibaura Institute of Technology, Japan)  
Rae-Young Kim (Hanyang University, Korea)

**[P2-1] Inaccuracy and Instability: Challenges of SiC MOSFET Transient Measurement Intruded by Probes**

Zheng Zeng<sup>1,2</sup>, Xin Zhang<sup>1</sup>, and Linjing Miao<sup>1</sup>

<sup>1</sup>Nanyang Technological University, Singapore, <sup>2</sup>Chongqing University, China

**[P2-2] Slew Rate Control of High-Voltage SiC MOSFETs using Gate Resistance vs. Intermediate Voltage Level**

Audrey Dearien, Shuang Zhao, Chris Farnell, and H. Alan Mantooth

University of Arkansas, USA

**[P2-3] Evaluation of Frequency-Dependent On-Resistance of GaN Devices at High Frequency**

Kangping Wang, Bingyang Li, Zhiyuan Qi, Laili Wang, Xu Yang, and Aici Qiu

Xi'an Jiaotong University, China

**[P2-4] GCT Technologies and Their Applications**

Kazuhiro Kurachi, Kazunori Taguchi, and Gourab Majumdar

Mitsubishi Electric Corporation, Japan

**[P2-5] A Busbar Integrated SiC-based Converter with Embedded Heat-pipes**

Yao Chang<sup>1</sup>, Amir Sajjad Bahman<sup>2</sup>, Haoze Luo<sup>1</sup>, Wuhua Li<sup>1</sup>, Xiangning He<sup>1</sup>, Francesco Iannuzzo<sup>2</sup>, and Frede Blaabjerg<sup>2</sup>

<sup>1</sup>Zhejiang University, China, <sup>2</sup>Aalborg University, Denmark

**[P2-6] Thermal Management Solutions for a Lightweight 3L GaN Inverter**

Roberto Trani<sup>1</sup>, Antonio Pio Catalano<sup>2</sup>, Alberto Castellazzi<sup>1</sup>, and Vincenzo d'Alessandro<sup>2</sup>

<sup>1</sup>University of Nottingham, UK, <sup>2</sup>University of Naples "Federico II", Italy

**[P2-7] Common Mode Noise Cancellation by Two Opposite-Phase-Operating Inverters for Motor Drive**

Yuto Watase, Shuichi Nakamuta, Baihua Zhang, and Masahito Shoyama

Kyushu University, Japan

**[P2-8] Wireless Power Transmission Equipment Used for Implantable Cardiac Pacemakers**

Shuangqing Lv, Wenjie Chen, Xiufang Hu, and Yang Yang

Xi'an Jiaotong University, China

**[P2-9] Modeling and Design of Common Mode and Differential Mode Filter for PWM Converters**

Gopal Mondal, Jonathan Robinson, and Michael Finkenzeller

Siemens AG, Germany

**[P2-10] Modeling and Electromagnetic Transient (EMT) Simulation of a Dual Active Bridge DC-DC Converter**

W. M. Gong<sup>1</sup>, C. Wang<sup>2</sup>, Z. Zhu<sup>1</sup>, and S. K. Xu<sup>1</sup>

<sup>1</sup>China Southern Grid, China, <sup>2</sup>Harbin Institute of Technology, China

**[P2-11] Characteristic Analysis of Hybrid CM Choke Coil with Reduced Parasitic Capacitance Suitable for LED-TV SMPS**

J. Lee<sup>1</sup>, J. Oh<sup>1</sup>, K. Kim<sup>1</sup>, D. Park<sup>2</sup>, H. Kim<sup>3</sup>, J. Won<sup>4</sup>, and J. Kim<sup>1</sup>

<sup>1</sup>Daegu Catholic University, Korea, <sup>2</sup>Yeungnam University, Korea, <sup>3</sup>SL Corporation, Korea, <sup>4</sup>Samsung Electro-Mechanics, Korea

**[P2-12] Modeling and Prediction of Common-Mode Conducted Noise in Boost Converter with Terminal Port Theory**

Shuaitao Zhang, Baihua Zhang, and Masahito Shoyama

Kyushu University, Japan

**[P2-13] Reduction of the Leakage Currents by Switching Transition Synchronization for a Four-Switch Buck-Boost Converter**

M. Zehelein, J. Portik, M. Nitzsche, P. Marx, and J. Roth-Stielow

University of Stuttgart, Germany

**[P2-14] Design and Implementation of 1GW MMCHVDC Based on Real-Time Digital Simulator and Physical Control System**

Jun-Min Lee, Dae-Wook Kang, Jong-Pil Lee, and Dong-Wook Yoo

Korea Electrotechnology Research Institute, Korea

**[P2-15] Start-up Current Overshoot Moderation for a Headlight Driver with a Microcontroller Unit**

Kai-Jun Pai and Po-Hsun Chen

Ming Chi University of Technology, Taiwan

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- [P2-102] **Accelerated Life Test Study on Thyristors of HVDC Converter Valve**  
Cuicui Liu<sup>1</sup>, Ning Liang<sup>2</sup>, Yating Gou<sup>1</sup>, Jiachen Tian<sup>1</sup>, Fang Zhuo<sup>1</sup>, and Feng Wang<sup>1</sup>  
<sup>1</sup>Xi'an Jiaotong University, China, <sup>2</sup>Maintenance & Test(M&T) Center of EHV Power Transmission Company, China
- [P2-103] **Impedance Characteristics Analysis of Modular Multilevel Converter with Direct Modulation and Compensated Modulation**  
Jing Lyu<sup>1</sup>, Jinshui Dai<sup>1</sup>, Chen Zhang<sup>2</sup>, Jianwen Zhang<sup>1</sup>, and Xu Cai<sup>1</sup>  
<sup>1</sup>Shanghai Jiao Tong University, China, <sup>2</sup>Norwegian University of Science and Technology, Norway
- [P2-104] **Redundant Star Topology based Control Network Architecture for Guaranteeing Reliable Operation of HVDC-MMC Systems**  
Ryangsoo Kim<sup>1</sup>, Byunghee Son<sup>1</sup>, Hyoung-Jun Park<sup>1</sup>, Dongwook Yoo<sup>2</sup>, and Hark Yoo<sup>1</sup>  
<sup>1</sup>Electronics and Telecommunications Research Institute, Korea, <sup>2</sup>Korea Electrotechnology Research Institute, Korea
- [P2-105] **Analysis of Submodule Capacitor Overvoltage During DC-side Fault in Hybrid MMC-based HVDC System**  
Yunbeom Gim, Zhengxuan Li, Jingwei Meng, Zexi Deng, and Qiang Song  
*Tsinghua University, China*
- [P2-106] **Design and Verification of Naju 200MW VSC-HVDC System**  
J. Kim, H. Yoo, and H. Jung  
*Hyosung Corporation, Korea*
- [P2-107] **A Plug and Play Power Electronics Education Board for Hands-on Learning of Power Converters Incorporating WBG Semiconductor**  
Namwon Kim, Chondon Roy, Robert Cox, and Babak Parkhideh  
*University of North Carolina at Charlotte, USA*
- [P2-108] **Design of Coupled Inductor Considering Saturation of Core by Leakage Inductance for a 100kW Interleaved Inverter**  
Dongmin Choi<sup>1</sup>, Seunghoon Baek<sup>1</sup>, Younghoon Cho<sup>1</sup>, Si-Jun Yeo<sup>2</sup>, and Hangoo Kim<sup>2</sup>  
<sup>1</sup>Konkuk University, Korea, <sup>2</sup>Sungshin Electric Co., Ltd., Korea

- [P2-109] Current Controlled with Valley Voltage Detection Three-port Converter with Current-Pulsed Load**  
 Zeyu Zhu<sup>1</sup>, Ping Yang<sup>1</sup>, Chaorui Liu<sup>1</sup>, Songrong Wu<sup>1</sup>, Wensheng Song<sup>1</sup>, Jianping Xu<sup>1</sup>, and Xiaohui Qu<sup>2</sup>  
<sup>1</sup>Southwest Jiaotong University, China, <sup>2</sup>Southeast University, China
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- [P2-110] Motor Drive Dc Arc Detection Using Autocorrelation Algorithm**  
 Lei Xing, Xin Wu, and Charles Lents  
 United Technologies Research Center, USA
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- [P2-111] IoT Sensor Solution using a PoF Module for the Environmental Monitoring of HVDC-MMC Systems**  
 Hyoung-Jun Park<sup>1</sup>, Siwoong Park<sup>1</sup>, Ryangsoo Kim<sup>1</sup>, Hark Yoo<sup>1</sup>, Hwi-il Sun<sup>2</sup>, and Dongwook Yoo<sup>2</sup>  
<sup>1</sup>Electronics and Telecommunications Research Institute, Korea, <sup>2</sup>Korea Electrotechnology Research Institute, Korea
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- [P2-112] A Robust Composite Control Method for LCL Grid-connected Inverter Based on SiC MOSFETs under Weak Grid**  
 Guihua Liu<sup>1</sup>, Lei Guo<sup>1</sup>, Wei Wang<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>  
<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Aalborg University, Denmark
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- [P2-113] Current Sharing Behavior of Parallel Connected Silicon Carbide MOSFETs Influenced by Parasitic Inductance**  
 Sibao Ding<sup>1</sup>, Panbao Wang<sup>1</sup>, Wei Wang<sup>1</sup>, Dianguo Xu<sup>1</sup>, and Frede Blaabjerg<sup>2</sup>  
<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>Aalborg University, Denmark
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- [P2-114] Speed Sensorless Control of a Surface-mounted Permanent Magnet Drive**  
 X. Zhang<sup>1</sup>, A. Semjonovs<sup>2</sup>, Y. Zbede<sup>2</sup>, A. Bodrov<sup>1</sup>, and J. Apsley<sup>1</sup>  
<sup>1</sup>The University of Manchester, UK, <sup>2</sup>Previously at the University of Manchester, UK

Room A (Room 105) 14:10~16:15

**ThA2: Topologies for DC/DC Converters II**

**Chair(s)** **Hongfei Wu** (Nanjing University of Aeronautics and Astronautics, China)  
**Honyong Cha** (Kyungpook National University, Korea)

**[ThA2-1] Unidirectional High-Power DC-DC Converter Utilizing Scott Transformer Connection**  
 14:10~14:35 Stefan Milovanovic and Drazen Dujic  
*École Polytechnique Fédérale de Lausanne, Switzerland*

**[ThA2-2] Three-level Resonant Switched Capacitor Boost Converter**  
 14:35~15:00 Nur Banu Sagpazar, Woosik Cho, Kyuyeong Kim, and Sewan Choi  
*Seoul National University of Science and Technology, Korea*

**[ThA2-3] A New Full-Bridge Converter With Phase-Shifted Coupled Inductor Rectifier**  
 15:00~15:25 Jung-Kyu Han, Keon-Woo Kim, Cheon-Yong Lim, Dongmin Kim, and Gun-Woo Moon  
*Korea Advanced Institute of Science and Technology, Korea*

**[ThA2-4] Analysis, Design and Implementation of a Bidirectional Three-Phase Push-Pull Converter for Wide Voltage Range Application**  
 15:25~15:50 Tat-Thang Le, Hyeonju Jeong, Sunju Kim, and Sewan Choi  
*Seoul National University of Science and Technology, Korea*

**[ThA2-5] APWM Resonant Converter with SST for EMI Filter Size Reduction**  
 15:50~16:15 Hwa-Pyeong Park, Sangyeong Jeong, Mina Kim, Jinguok Kim, and Jee-Hoon Jung  
*Ulsan National Institute of Science and Technology, Korea*

Room B (Room 110) 14:10~16:15

**ThB2: Grid-connected Inverter Under Fault Condition for Renewable Energy and Distributed Generation Systems**

**Chair(s)** **Jinming Xu** (Nanjing University of Aeronautics and Astronautics, China)  
**Hag-Wone Kim** (Korea National University of Transportation, Korea)

**[ThB2-1] Hybrid-Mode Cuk Inverter with Low-Voltage Ride-Through Capability under Grid-Faults**  
 14:10~14:35 Byeongcheol Han<sup>1</sup>, Minsung Kim<sup>2</sup>, and Jih-Sheng Lai<sup>1</sup>  
<sup>1</sup>Virginia Tech, USA, <sup>2</sup>Dongguk University, Korea

**[ThB2-2] Fault Current Analysis of Type-3 Wind Turbine Considering Dynamic Influence of Phase Locked Loop**  
 14:35~15:00 Xiaomeng Yu, Yuanzhu Chang, Jiabing Hu, and Lei Shang  
*Huazhong University of Science and Technology, China*

**[ThB2-3] Time-Varying Amplitude-Frequency Characteristics Analysis of VSC Internal Voltage under Grid Fault**  
 15:00~15:25 Jingyi Liu, Yuanzhu Chang, Jiabing Hu, and Lei Shang  
*Huazhong University of Science and Technology, China*

**[ThB2-4] Performance of Reactive Power Variation using Positive Feedback for Detecting Unintentional Islanding Operation**  
 15:25~15:50 Jongmin Jo, Woosik Sim, and Hanju Cha  
*Chungnam National University, Korea*

**[ThB2-5] Flicker Mitigation for a Grid-Connected Tidal and River Power Generator using the BESS**  
 15:50~16:15 S. Seo<sup>1</sup>, J. Kim<sup>1</sup>, E. Muljadi<sup>1</sup>, S. Meor-Danial<sup>2</sup>, M. Worthington<sup>3</sup>, and R. Wills<sup>4</sup>  
<sup>1</sup>Auburn University, USA, <sup>2</sup>National Renewable Energy Laboratory, USA, <sup>3</sup>Ocean Renewable Power Company, USA, <sup>4</sup>Intergrid, USA

Room C (Room 201) 14:10~15:50

**ThC2: Synchronous Motor Drives**

**Chair(s)** **Nobukazu Hoshi** (Tokyo University of Science, Japan)  
**Jung-Ik Ha** (Seoul National University, Korea)

**[ThC2-1] Current Loop Bandwidth Extension for AC Servo System Based on GaN-HEMT and FPGA**  
 14:10~14:35 Zekai Lyu, Ming Yang, Jiang Long, Shuyu Shang, and Dianguo Xu  
*Harbin Institute of Technology, China*

**[ThC2-2] Reduction of the 6<sup>th</sup> and 12<sup>th</sup> Harmonic in the Torque Ripple of a Salient Pole Synchronous Reluctance Machine**  
 14:35~15:00 Mario Nikowitz, Matthias Hofer, and Manfred Schrödl  
*Technische Universitaet Wien, Austria*

**[ThC2-3] Online MTPA Operation of IPMSM Based on Dual-Loop Control in Polar Coordinates**  
 15:00~15:25 Hyeon-Sik Kim and Seung-Ki Sul  
*Seoul National University, Korea*

**[ThC2-4] A Hardware-in-the-Loop Simulation Approach for Analysis of Permanent Magnet Synchronous Motor Drive**  
 15:25~15:50 Ipsita Mishra, Ravi Nath Tripathi, Vijay Kumar Singh, and Tsuyoshi Hanamoto  
*Kyushu Institute of Technology, Japan*

Room D (Room 202) 14:10~16:15

**ThD2: Controls of Grid-Connected Inverter II**

**Chair(s)** Alex Ruderman (Nazarbayev University, Kazakhstan)  
Yongheng Yang (Aalborg University, Denmark)

**[ThD2-1] 14:10~14:35 A Gray-Box Parameters Identification Method of Voltage Source Converter Using Vector Fitting Algorithm**

Weihua Zhou, Yanbo Wang, and Zhe Chen  
*Aalborg University, Denmark*

**[ThD2-2] 14:35~15:00 Analysis and Optimizing Method of Transient Performance for LCL-Based Grid-connected Inverter with Passive Damping**

Minghan Dong, Hao Ma, and Zhihong Bai  
*Zhejiang University, China*

**[ThD2-3] 15:00~15:25 High Quality Grid Current Control For LCL Inverters using Self-Synchronising Inverter Side Current Regulation**

A. A Nazib, D. G Holmes, and B. P McGrath  
*RMIT University, Australia*

**[ThD2-4] 15:25~15:50 A Self-Tuning Notch Filter Based Hybrid Active Damper for LCL Type Grid-Tied Inverters with Adaptability to Weak Grids**

Zheyu Miao<sup>1</sup>, Sun Long<sup>2</sup>, Wenxi Yao<sup>1</sup>, and Zhengyu Lu<sup>1</sup>  
*<sup>1</sup>Zhejiang University, China, <sup>2</sup>State Grid Ningbo Power Supply Company, China*

**[ThD2-5] 15:50~16:15 Real-time Estimation Control of Inductance Parameters with 1MHz multi-sampling Method using Dust Core Materials for PWM Inverter**

S. Kurita<sup>1</sup>, K. Imai<sup>1</sup>, T. Yokoyama<sup>1</sup>, and S. Ohasi<sup>2</sup>  
*<sup>1</sup>Tokyo Denki University, Japan, <sup>2</sup>Fuji Electric Co., Japan*

Room E (Room 203) 14:10~16:15

**ThE2: HVDC-MMC Application Issues**

**Chair(s)** Giovanni De Carne (Christian-Albrechts-Universität zu Kiel, Germany)  
Chan-Ki Kim (Korea Electric Power Research Institute, Korea)

**[ThE2-1] 14:10~14:35 Pole-to-Ground Fault Analysis for MMC-HVDC Grid**

Zhen He<sup>1</sup>, Jiabing Hu<sup>1</sup>, Lei Lin<sup>1</sup>, and Zhiyuan He<sup>2</sup>  
*<sup>1</sup>Huazhong University of Science and Technology, China, <sup>2</sup>Global Energy Interconnection Research Institute, China*

**[ThE2-2] 14:35~15:00 Startup Scheme and Modulation Strategy for a New Modular Multilevel Converter**

Guanlong Jia<sup>1</sup>, Min Chen<sup>1</sup>, Song Tang<sup>1</sup>, Yi Lu<sup>2</sup>, and Yong Yang<sup>3</sup>

*<sup>1</sup>Zhejiang University, China, <sup>2</sup>State Grid Zhejiang Electric Power Co., Ltd. Research Institute Hangzhou, China, <sup>3</sup>State Grid Zhejiang Electric Power Co., Ltd., China*

**[ThE2-3] 15:00~15:25 New Instability Phenomenon Due to AC/DC Interaction in VSC HVDC System**

Chan-Ki Kim<sup>1</sup>, Soo-Yeon Sim<sup>1</sup>, and Gyu-Seop Lee<sup>2</sup>  
*<sup>1</sup>Korea Electric Power Research Institute, Korea, <sup>2</sup>Seoul National University, Korea*

**[ThE2-4] 15:25~15:50 A Hybrid Flying Cascaded DC/DC Converter Topology for HVDC Interconnections**

Xiaodong Zhao, Binbin Li, Shuxin Zhang, Qintian Fu, and Dianguo Xu  
*Harbin Institute of Technology, China*

**[ThE2-5] 15:50~16:15 Voltage Unbalance Compensation Method with Zero Voltage Switching for Series Connected Switching Devices**

Jun-ichi Itoh, Ryosuke Iso, and Hiroki Watanabe  
*Nagaoka University of Technology, Japan*

Room F (Room 204) 14:10~15:50

**ThF2: [OS] Power Electronics System in Automotive Applications**

**Chair(s)** Jun-ichi Itoh (Nagaoka University of Technology, Japan)  
Zhenbin Zhang (Shandong University, China)

**[ThF2-1] 14:10~14:35 An Improved LLC Resonant Converter with Variable-Rectifier for Electric-Vehicle Charger Application**

Jian Zhao<sup>1</sup>, Xinxi Tang<sup>1</sup>, Hongfei Wu<sup>1</sup>, Yan Xing<sup>1</sup>, and Kai Sun<sup>2</sup>  
*<sup>1</sup>Nanjing University of Aeronautics and Astronautics, China, <sup>2</sup>Tsinghua University, China*

**[ThF2-2] 14:35~15:00 Circuit Design and Control Method of Electric Vehicle Battery Charger Using Traction Motor and Inverter**

Seok-Min Kim and Kyo-Beum Lee  
*Ajou University, Korea*

**[ThF2-3] 15:00~15:25 Design of Series Inductances in Triple Active Bridge Converter Using Normalization Procedure for Integrated EV and PV System**

Van-Long Pham and Keiji Wada  
*Tokyo Metropolitan University, Japan*

**[ThF2-4] 15:25~15:50 Three-phase AC-DC Converter for EV Rapid Charging with Wireless Communication for Decentralized Controller**

Keita Ohata, Masakazu Adachi, Keisuke Kusaka, and Jun-ichi Itoh  
*Nagaoka University of Technology, Japan*

Room G (Room 206) 14:10~16:15

## ThG2: Modeling Techniques in Power Converters

**Chair(s)** Keiji Wada (Tokyo Metropolitan University, Japan)  
Jong-Hae Kim (Daegu Catholic University, Korea)

- [ThG2-1] **Modeling And Experimental Verification of Geometry Effects on Core Losses**  
14:10~14:35  
Marko Mogorovic and Drazen Dujic  
*PEL/EPFL, Switzerland*
- [ThG2-2] **State-Space Modeling of Grid-Connected Power Converters Considering Power-Internal Voltage Characteristics**  
14:35~15:00  
Qiao Peng, Yongheng Yang, and Frede Blaabjerg  
*Aalborg University, Denmark*
- [ThG2-3] **Physical Analysis of Gate-Source Voltage Dependencies of Parasitic Capacitors, and Their Impacts on Switching Behavior of a Discrete Silicon-Carbide MOSFET**  
15:00~15:25  
Yasushige Mukunoki<sup>1</sup>, Takeshi Horiguchi<sup>1</sup>, Hiroshi Nakatake<sup>1</sup>, Masaki Kuzumoto<sup>1,2</sup>, Makoto Hagiwara<sup>2</sup>, and Hirofumi Akagi<sup>2</sup>  
<sup>1</sup>Mitsubishi Electric Corporation, Japan, <sup>2</sup>Tokyo Institute of Technology, Japan
- [ThG2-4] **Design of Bus Bar Structures in Power Converter Circuit Considering Both Parasitic Inductance and AC Resistance**  
15:25~15:50  
Koji Mitsui and Keiji Wada  
*Tokyo Metropolitan University, Japan*
- [ThG2-5] **Analysis of the Sideband Effect on the Stability of the Voltage-Mode-Controlled Boost Converter**  
15:50~16:15  
Na Yan, Xinbo Ruan, Yazhou Wang, and Xinze Huang  
*Nanjing University of Aeronautics and Astronautics, China*

Room H (Room 207) 14:10~16:15

## ThH2: Reliability, Diagnosis, Prognosis, and Protection I

**Chair(s)** Huai Wang (Aalborg University, Denmark)  
Kyo-Beum Lee (Ajou University, Korea)

- [ThH2-1] **Parameters Identification of Buck Converter Based on Dynamic Characteristics**  
14:10~14:35  
Yingzhou Peng and Huai Wang  
*Aalborg University, Denmark*
- [ThH2-2] **Reliability Assessment of Single-phase PV Inverters**  
14:35~15:00  
Saeed Peyghami<sup>1</sup>, Ahmed Abdelhakim<sup>2</sup>, Pooya Davari<sup>1</sup>, and Frede Blaabjerg<sup>1</sup>  
<sup>1</sup>Aalborg University, Denmark, <sup>2</sup>ABB Corporate Research Center, Sweden

- [ThH2-3] **Investigation of an Integrated Sensor to Determine Junction Temperature of SiC MOSFETs During Power Cycling Tests**  
15:00~15:25  
Carsten Kempiak<sup>1</sup>, Andreas Lindemann<sup>1</sup>, Shiori Idaka<sup>2</sup>, and Eckhard Thal<sup>2</sup>  
<sup>1</sup>Otto-von-Guericke-University Magdeburg, Germany, <sup>2</sup>Mitsubishi Electric Europe B.V., Germany

- [ThH2-4] **Unified SVPWM Strategy for Post-fault Threelevel NPC Voltage Source Inverters**  
15:25~15:50  
Qingli Deng and Xinglai Ge  
*Southwest Jiaotong University, China*

- [ThH2-5] **Thermal Stress Model of Transversal Forced Air-Cooled Capacitor Banks for MWPower Converters**  
15:50~16:15  
Zhijian Yin<sup>1</sup>, Rui Wu<sup>2</sup>, Morten Hygum<sup>2</sup>, Yongheng Yang<sup>1</sup>, and Huai Wang<sup>1</sup>  
<sup>1</sup>Aalborg University, Denmark, <sup>2</sup>Vestas Wind Systems A/S, Denmark

Room A (Room 105)

16:30~18:35

## ThA3: Controls for DC/DC Converters

**Chair(s)** Jim Ching-Jan Chen (National Taiwan University)  
Jae-Kuk Kim (Inha University, Korea)

- [ThA3-1] **Optimized Transient Modulation Control of Bidirectional Full-Bridge DC-DC Converter**  
16:30~16:55  
Qinglei Bu, Huiqing Wen, and Jiacheng Wen  
*Xi'an Jiaotong-Liverpool University, China*
- [ThA3-2] **Primary-Side Control for Flyback Converter with Wide Range Operation**  
16:55~17:20  
Bin-Kun Huang, Tsorng-Juu Liang, Wei-Jing Tseng, Kai-Hui Chen, and Qing-Mu Chen  
*National Cheng Kung University Taiwan, Taiwan*
- [ThA3-3] **Analysis and Design of a Control Strategy for Wide-Range ZVS of Isolated Bidirectional Dual-bridge Series Resonant DC/DC Converters**  
17:20~17:45  
Yihan Gao and Hao Ma  
*Zhejiang University, China*
- [ThA3-4] **An Independently Controlled Single-Input-Dual-Output Buck Converter with Coupled Inductor having 1:1 Turns Ratio**  
17:45~18:10  
Yuwei Liu, Guipeng Chen, Liping Mo, and Xinlin Qing  
*Xiamen University, China*
- [ThA3-5] **Analysis and Design of Four-Level Flying-Capacitor Converter in Burst Mode Operation**  
18:10~18:35  
Gwangyol Noh<sup>1,2</sup>, and Jung-Ik Ha<sup>1</sup>  
<sup>1</sup>Seoul National University, Korea, <sup>2</sup>Samsung Electronics, Korea

Room B (Room 110) 16:30~18:35

**ThB3: Other Renewable Energy and Distributed Generation Systems**

**Chair(s)** Zhenbin Zhang (Shandong University, China)  
Seung-Ho Song (Kwangwoon University, Korea)

**[ThB3-1]** Analysis of Wind Turbine Fatigue Load Data Model  
16:30~16:55

Jian Yang<sup>1</sup>, Songyue Zheng<sup>1</sup>, Dongran Song<sup>1</sup>, Guoxun Xiao<sup>2</sup>, Junye Ma<sup>1</sup>, and Young Hoon Joo<sup>3</sup>  
<sup>1</sup>Central South University, China, <sup>2</sup>Beishi Electric Technology Co., Ltd., China, <sup>3</sup>Kunsan National University, Korea

**[ThB3-2]** Output Voltage Control of Hydrogen Engine Generator using A Hill Climbing Method by Adjusting the Hydrogen Flow Rate with A Proportional Control Valve  
16:55~17:20

Hikari Nitta<sup>1</sup>, Nobukazu Hoshi<sup>1</sup>, Koki Ishizuka<sup>1</sup>, and Kazuhito Fukuda<sup>2</sup>  
<sup>1</sup>Tokyo University of Science, Japan, <sup>2</sup>DAYTONA Cooperation, Japan

**[ThB3-3]** Multi-energy Coordinated Regulation Strategy based on the Decomposition of Large-scale New Energy Fluctuations  
17:20~17:45

Bao Guangqing<sup>1</sup>, Zhou Jiawu<sup>1</sup>, Ma Ming<sup>2,3</sup>, and Wang Ningbo<sup>2,3</sup>  
<sup>1</sup>Lanzhou University of Technology, China, <sup>2</sup>Power Science Research Institute of State Grid Gansu Electric Power Company, China, <sup>3</sup>Key Laboratory of New Energy Grid-connected Operation and Control, China

**[ThB3-4]** Development of a Modified SPWM Control Inverter for Tidal Current Generation System  
17:45~18:10

Jia-You Lee<sup>1</sup>, Kuo-Yuan Lo<sup>2</sup>, Chien-Tzu Ko<sup>1</sup>, and Chia-Ling Fan<sup>1</sup>  
<sup>1</sup>National Cheng Kung University, Taiwan, <sup>2</sup>National Kaohsiung University of Science and Technology, Taiwan

**[ThB3-5]** Modeling and Evaluation of Inertia Emulation Control for DFIG Wind Turbine  
18:10~18:35

Haoshu Shao<sup>1</sup>, Xu Cai<sup>1</sup>, Jianwen Zhang<sup>1</sup>, Yunfeng Cao<sup>1</sup>, Fangquan Rao<sup>1</sup>, Dapeng Zheng<sup>2</sup>, Dangsheng Zhou<sup>2</sup>, and Yan Wang<sup>2</sup>  
<sup>1</sup>Shanghai Jiao Tong University, China, <sup>2</sup>Shenzhen Hopewind Electric Co., Ltd., China

Room C (Room 201) 16:30~18:35

**ThC3: High Speed Drives**

**Chair(s)** Bulent Sarioglu (University of Wisconsin-Madison, USA)  
Jae Suk Lee (Chonbuk National University, Korea)

**[ThC3-1]** Study of High Speed SRM Using Vector Control for Electric Vehicle  
16:30~16:55

K. Aiso, M. Takahashi, and K. Akatsu  
Shibaura Institute of Technology, Japan

**[ThC3-2]** A Robust Field-weakening Algorithm for Direct Torque and Flux Controlled IPM Synchronous Machine with Space Vector Modulation  
16:55~17:20

X. Zhang<sup>1</sup> and G. Foo<sup>2</sup>  
<sup>1</sup>Nanyang Technological University, Singapore, <sup>2</sup>Auckland University of Technology, New Zealand

**[ThC3-3]** Operating Area Extension of Surface Mounted Permanent Magnet Motor by LC Network  
17:20~17:45

Hyeon-gyu Choi and Jung-Ik Ha  
Seoul National University, Korea

**[ThC3-4]** Operating Characteristics of a High Speed BLAC Motor According to the Current Shape  
17:45~18:10

Do-Kwan Hong<sup>1</sup>, Tae-Ho Kim<sup>1</sup>, and Dong-Hee Lee<sup>2</sup>  
<sup>1</sup>Korea Electrotechnology Research Institute, Korea, <sup>2</sup>Kyungsoong University, Korea

**[ThC3-5]** An Analytical Approach to Direct Torque and Flux Control of Interior Permanent Magnet Synchronous Machine for Deep Field Weakening Without using Pre-calculated Lookup Tables  
18:10~18:35

S M Showybul Islam Shakib, D. Xiao, R. Dutta, Kazi Saiful Alam, Ilham Osman, M. F. Rahman, and Md. Parvez Akter  
University of New South Wales, Australia

Room D (Room 202) 16:30~18:35

**ThD3: Topologies of Grid-Connected Inverter**

**Chair(s)** Grahame Holmes (RMIT University, Australia)  
Hanju Cha (Chungnam National University, Korea)

**[ThD3-1]** Improved SVM for High Gain Tri-state CSI to Reduce DC Side Inductor Current Ripple  
16:30~16:55

Chufeng Li<sup>1</sup>, Liuchen Chang<sup>1,2</sup>, and Meiqin Mao<sup>1</sup>  
<sup>1</sup>Hefei University of Technology, China, <sup>2</sup>University of New Brunswick, Canada

**[ThD3-2]** A Comparison between Quasi-Z-Source Inverter and Active Quasi-Z-Source Inverter  
16:55~17:20

Truong-Duy Duong<sup>1</sup>, Minh-Khai Nguyen<sup>2</sup>, Young-Cheol Lim<sup>1</sup>, Joon-Ho Choi<sup>1</sup>, and D. Mahinda Vilathgamuwa<sup>2</sup>  
<sup>1</sup>Chonnam National University, Korea, <sup>2</sup>Queensland University of Technology, Australia

**[ThD3-3]** A ZVS-SVM Method for Grid Inverter with Extended Power Factor Angle  
17:20~17:45

Yuying Wu, Ning He, and Dehong Xu  
Zhejiang University, China

**[ThD3-4] Common Mode Voltage Reduction in Four-Leg Inverter with Multicarrier PWM Scheme**

Chung-Chuan Hou, Po-Wei Wang, Ching-Chen Chen, and Chen-Wei Chang  
*Chung Hua University, Taiwan*

**[ThD3-5] Current Self-Balancing Mechanism in ZVS Full-Bridge Converters**

Hongchang Li<sup>1</sup>, Michael A. de Rooij<sup>2</sup>, Jingyang Fang<sup>1</sup>, Haoxin Yang<sup>1</sup>, and Yi Tang<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, Singapore,*  
<sup>2</sup>*Efficient Power Conversion Corporation, USA*

Room E (Room 203) 16:30~18:10

**ThE3: [OS] HVDC Control and Analysis**

**Chair(s)** **Chan-Ki Kim** (Korea Electric Power Research Institute, Korea)  
**Jang-Mok Kim** (Pusan National University, Korea)

**[ThE3-1] Optimal Design Method for Maximum Modulation Index of VSC HVDC based on MMC Considering Compensation Signals and AC Network Conditions**

Soo-Yeon Sim, Chan-Ki Kim, and Ji-Won Kang  
*Korea Electric Power Research Institute, Korea*

**[ThE3-2] Commissioning Results of 20MW VSC-HVDC System for Wind Power Interconnection**

H. J. Kang, J. C. Lee, H. H. Yoo, and H-J Jung  
*Hyosung Corporation, Korea*

**[ThE3-3] Characterization Test and Operational Test for Sub-Modules of 200MW HVDC System-Based Modular Multi-Level Converter**

N. J. Ku, D. Y. Lee, H. H. Yoo, and H. J. Jung  
*Hyosung Corporation, Korea*

**[ThE3-4] Stability and Adaptability Analysis for PLL Synchronized VSC-HVDC with Frequency Regulation Scheme under Islanded Grid**

Meiqing Zhang, Xiaoming Yuan, and Jiabing Hu  
*Huazhong University of Science and Technology, China*

Room F (Room 204) 16:30~17:45

**ThF3: [IS] EV/HEV Technologies**

**Chair(s)** **Goh Teck Chiang** (Toyota Central R&D Labs., Japan)  
**Koji Orikiwa** (Hokkaido University, Japan)

**[ThF3-1] Overview of Power Electronics for Next Generation PHV/EV**

Goh Teck Chiang  
*Toyota Central R&D Labs., Japan*

**[ThF3-2] The New IPM Targeting for Automotive Applications**

Shawn Jang  
*ON Semiconductor, Korea*

**[ThF3-3] Technical Issues in Real-Time Emulation of IPMSM for PHIL Testing**

Yong-Cheol Kwon  
*PLECKO, Korea*

Room G (Room 206)

16:30~18:35

**ThG3: Advances in Simulation, Modeling, and Control of Power Electronics**

**Chair(s)** **Ralph Kennel** (Technical University of Munich, Germany)  
**Jeehoon Jung** (Ulsan National Institute of Science and Technology, Korea)

**[ThG3-1] An Accurate Small Signal Modeling and Control Loop Design of Active Clamp Flyback Converter**

Shengyou Xu, Qinsong Qian, Bowen Ren, and Qi Liu  
*Southeast University, China*

**[ThG3-2] A Precise Stability Criterion for Power Hardware-in-the-loop Simulation System**

Shengbo Wang\*, Binbin Li, Zigao Xu, Xiaodong Zhao, and Dianguo Xu  
*Harbin Institute of Technology, China*

**[ThG3-3] Enhanced Models for Current-Mode Controllers of the Phase-Shifted Full Bridge Converter with Current Doubler Rectifier**

M. R. Ahmed, X. Wei, and Y. Li  
*Zhuzhou CRRC Times Electric UK Innovation Centre, UK*

**[ThG3-4] Tightly Regulated Current-fed LLC Resonant Converter Employing Spread Spectrum Technique to Reduce Electromagnetic Interference**

Mina Kim<sup>1</sup>, Hwa-Pyeong Park<sup>1</sup>, Sang Gyu Cheon<sup>2</sup>, Chang Ui Lee<sup>2</sup>, and Jee-Hoon Jung<sup>1</sup>  
<sup>1</sup>*Ulsan National Institute of Science and Technology, Korea,* <sup>2</sup>*PANASIA Co., Ltd., Korea*

**[ThG3-5] Modeling and Stability Assessment of Single-Phase Droop Controlled Solid State Transformer**

Yos Prabowo, Vishnu Mahadeva Iyer, Byeongheon Kim, and Subhashish Bhattacharya  
*North Carolina State University, USA*

**ThH3: Reliability, Diagnosis, Prognosis, and Protection II**

**Chair(s)**    **Ke Ma** (Shanghai Jiao Tong University, China)  
                 **Kyo-Beum Lee** (Ajou University, Korea)

**[ThH3-1] Gate Waveform Optimization in Emergency Turn-off of IGBT Using Digital Gate Driver**

16:30~16:55

K. Miyazaki<sup>1</sup>, K. Wada<sup>2</sup>, I. Omura<sup>3</sup>, M. Takamiya<sup>1</sup>, and T. Sakurai<sup>1</sup>

<sup>1</sup>The University of Tokyo, Japan, <sup>2</sup>Tokyo Metropolitan University, Japan, <sup>3</sup>Kyusyu Institute of Technology, Japan

**[ThH3-2] A Novel Method for Lithium-ion Battery Remaining Useful Life Prediction Using Time Window and Gradient Boosting Decision Trees**

16:55~17:20

Zhiyong Zheng<sup>1</sup>, Jun Peng<sup>1</sup>, Kunyuan Deng<sup>1</sup>, Kai Gao<sup>2</sup>, Heng Li<sup>1</sup>, Bin Chen<sup>1</sup>, Yingze Yang<sup>1</sup>, and Zhiwu Huang<sup>1</sup>

<sup>1</sup>Central South University, China, <sup>2</sup>Changsha University of Science & Technology, China

**[ThH3-3] Current Distribution of High Speed Parallel DC Fuses for HVDC Protection**

17:20~17:45

T. Sakuraba<sup>1</sup>, S. Chen<sup>2</sup>, A. Gerlaud<sup>3</sup>, and L. Milliere<sup>3</sup>

<sup>1</sup>Mersen Japan K.K., Japan, <sup>2</sup>Mersen Shanghai, China, <sup>3</sup>Mersen France SB, France

**[ThH3-4] Converter-level Reliability of Wind Turbine with Low Sample Rate Mission Profile**

17:45~18:10

Dao Zhou and Frede Blaabjerg

Aalborg University, Denmark

**[ThH3-5] Motor Speed Signature Analysis of Bearing Fault Detection Based on SK and Adaptive Signal Reconstruction with EEMD**

18:10~18:35

Chai Na, Yang Ming, Ren Boyang, and Xu Dianguo  
Harbin Institute of Technology, China