Industrial Seminar

Sunday, May 18, 14:00-17:15
Session Room A
Chairs: Prof. Keiichiro Kondo (Chiba University)
Dr. Hitoshi Hayashiya (East Japan Railway Company)

14:00 **Mr. Keiichiro Yusu**
Project Coordinator, New Energy and Industrial Technology Development Organization (NEDO)
“NEDO’s Power Electronics Projects and Recent Activities”

14:30 **Mr. Naritomo Higuchi**
Chief Engineer, Honda R&D Co., Ltd.
“Power Electronics Technologies for the Sustainable Society with the Joy and Freedom of Mobility”

15:00 **Dr. Shinzo Tamai**
Senior Fellow, Toshiba Mitsubishi-Electric Industrial Systems Corporation
“A Large Capacity Power Converter and Applications for Traction Power Supply Systems”

15:30 Break

15:45 **Dr. Hidenori Hara**
Manager, Yaskawa Electric Corporation
“Advance in Power Electronics Technologies and YASKAWA’s Challenge”

16:15 **Dr. Yasushi Matsumoto**
General Manager, Fuji Electric Co., Ltd.
“Trend of the Power Electronics Products Applying the SiC Power Devices in Japan”

16:45 **Mr. Hirotaka Takahashi**
Senior Engineer, Hitachi, Ltd., Rail Systems Company
“Lithium Ion Batteries Application in Traction Power System”
Program

Opening Ceremony........................................................................................................... Room A

Monday, May 19, 8:30-9:00
Chair: Prof. Atsuo Kawamura, Chair, Organizing Committee

Opening Address Prof. Toshihisa Shimizu, President, IEEJ-IAS / Chair, Steering Committee

Congratulatory Message Prof. Hong-Hee Lee, President, KIPE

Congratulatory Message Mr. Wang Zhihua, Director of Academic Affairs, CES

Congratulatory Message Dr. Dong Tan, President, IEEE-PELS

Review Prof. Takaharu Takeshita, Chair, Technical Program Committee

Isao Takahashi Award Prof. Hirofumi Akagi, Chair, Isao Takahashi Award Committee

Plenary Session........................................................................................................... Room A

Monday, May 19, 9:00-12:00
Chair: Prof. Hiroyuki Ohsaki, Co-Chair, Steering Committee

9:00 Prof. Kouki Matsuse
Department of Electrical Engineering, Meiji University
“Contributions of Japan to Power Electronics and Motor Drive Systems”

Prof. Kouki Matsuse

9:40 Prof. Bo-Hyung Cho
Department of Electrical and Computer Engineering, Seoul National University
“Control of the DC Distribution Microgrid System”

Prof. Bo-Hyung Cho

10:20 Coffee Break

10:40 Prof. Dianguo Xu
Assistant President (International) & Professor (Electrical Engineering), Harbin Institute of Technology (HIT)
“Efficiency Enhancement of General AC Motor Drive Systems”

Prof. Dianguo Xu

11:20 Prof. Johann W. Kolar
Director, Power Electronic Systems Laboratory, Department of Information Technology and Electrical Engineering (D-ITET), Swiss Federal Institute of Technology (ETH) Zurich
“Solid-State-Transformers: Key Components of Future Traction and Smart Grid Systems”

Prof. Johann W. Kolar
**Technical Sessions**

**Room Poster 1, 2 and 3**

**Poster Session 19P1 Power Converters I**

**Chairs:** Drazen Dujic (École Polytechnique Fédérale de Lausanne)
Yukihiko Sato (Chiba University)

**19P1-1** A Novel Control Scheme for Three-Level Full-Bridge Converter Achieving Low THD Output Voltage
Jilong Liu¹, Fei Xiao², Wei Chen², Guorun Yang²
1) Xi’an Jiaotong University, China, 2) Naval University of Engineering, China

**19P1-2** Parallel Connected Three Phase Inverters Based on Modular Design and Distributed Control
Fei Xiao¹, Wei Chen¹, Jilong Liu¹, Hengli Wang¹
1) Naval University of Engineering, China, 2) Xi'an Jiaotong University, China

**19P1-3** Efficiency Investigations of a 3 kW T-Type Inverter for Switching Frequencies up to 100 kHz
Alexander Anthon¹, Zhe Zhang², Michael A. E. Andersen¹, Toke Franke²
1) Technical University of Denmark, Denmark, 2) Danfoss Silicon Power, Germany

**19P1-4** Miniaturization of the Boost-Up Type Active Buffer Circuit in a Single-Phase Inverter
Hiroki Watanabe¹, Kazuhiro Koiwa¹, Jun-ichi Itoh¹, Yoshiya Ohnuma¹, Satoshi Miyawaki²
1) Nagoya University of Technology, Japan, 2) Nagaoka Power Electronics Co., Ltd., Japan

**19P1-5** Testing Facility Using Large Capacity Inverter
Yusuke Ishimaru, Mitsuo Adachi, Masahiko Tsukakoshi, Ritaka Nakamura, Hiroyuki Masuda, Yoshihiro Ogashi, Yuichi Tsuibo
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

**19P1-6** Performance Evaluation under the Actual Operating Condition of a Large Capacity VSI Inverter for Steel Mill Applications
Mostafa Mamun, Daisuke Yoshizawa, Makoto Mukunoki
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

**19P1-7** A Soft-Switching Single-Phase Unified Power Quality Conditioner
Maoh-Chin Jiang, Kai-Chi Chang, Kao-Yi Lu, Bing-Jyun Shih, Tai-Chun Liu
National Ilan University, Taiwan

**19P1-8** Novel Three-Phase PWM AC-AC Converters Solving Commutation Problem
Ashraf Ali Khan, Hyunhak Shin, Honnyong Cha, Heung-Geun Kim
Kyungpook National University, Korea

**19P1-9** Experimental Investigation of Normally-On Type Bidirectional Switch for Indirect Matrix Converters
Kyoungmin Sung¹, Ryuji Iijima¹, Shinichi Nishikawa², Isami Norigoe³, Hiromichi Ohashi²
1) Ibaraki National College of Technology, Japan, 2) National Institute of Advanced Industrial Science and Technology, Japan

**19P1-10** Visualization of PWM Waveforms of Output Voltage and Input Current for a Direct Matrix Converter
Inami Asai, Takaharu Takeshita
Nagoya Institute of Technology, Japan

**19P1-11** Space Vector Modulation Based on Virtual Indirect Control for High Frequency AC-Linked Matrix Converter
Keita Inoue¹, Masashi Shioda¹, Motohumi Katade¹, Akira Goto¹, Shin Morishita¹, Jun-ichi Itoh², Kazuhiro Koiwa²
1) San-Eisha, Ltd., Japan, 2) Nagaoka University of Technology, Japan

**19P1-12** A Fundamental Verification of a Single-Phase to Three-Phase Matrix Converter with a PDM Control Based on Space Vector Modulation
Yuki Nakata, Jun-ichi Itoh
Nagoya University of Technology, Japan

**19P1-13** Steady State Characteristics of the Boost-Type Matrix Converter for Stand-Alone Power Source
Y. Nagano, N. Yamamura, M. Ishida, K. Hirokado
Mie University, Japan
Poster Session 19P3 Electric Machines, Actuators and Sensors I

Chairs: Yu-Jen Wang (National Taipei University of Technology)
       Wataru Kitagawa (Nagoya Institute of Technology)

19P3-1 Enhanced Transverse-Flux Motor with Torus Coils
Junya Tanaka, Kazuto Sakai
Toyo University, Japan

19P3-2 The Influence of Magnetic Properties of Permanent Magnet on the Performance of IPMSM for Automotive Application
S. Yoshioka, S. Morimoto, M. Sanada, Y. Inoue
Osaka Prefecture University, Japan

19P3-3 Characteristics of Interior Permanent Magnet Synchronous Motor with Imperfect Magnets
Syuhei Shinagawa, Takeo Ishikawa, Nobuyuki Kurita
Gunma University, Japan

19P3-4 Study of Stator Structure to Improve Reluctance Torque for IPMSM with Concentrated Winding
R. Morikawa, M. Sanada, S. Morimoto, Y. Inoue
Osaka Prefecture University, Japan

19P3-5 Development and Verification of Energy-Accurate Simulation Models for Permanent Magnet Synchronous Motors in Automation Systems
Frederic Blank, Jörg Roth-Stielow
University of Stuttgart, Germany

19P3-6 Comparison of the Resistance- and Inductance-Based Saliency of a PMSM due to a Short-Circuited Rotor Winding
Johannes Graus, Alexander Rambetius, Ingo Hahn
University of Erlangen-Nuremberg, Germany

19P3-7 Design and Optimization of High-Speed Switched Reluctance Motor Using Soft Magnetic Composite Material
Zwe-Lee Gaing¹, Kuan-Yi Kuó¹, Jia-Sheng Hu¹, Min-Fu Hsieh², Ming-Hsiao Tsai³
1) Kao Yuan University, Taiwan, 2) National University of Tainan, Taiwan, 3) National Cheng Kung University, Taiwan

19P3-8 Influence of Pulse Width Modulation (PWM) on the Iron Losses of Electrical Steel
Andreas Boehm, Ingo Hahn
University of Erlangen-Nuremberg, Germany

19P3-9 Investigation on Iron Loss Characteristics in Star-Connection and Delta-Connection under Three Phase PWM Inverter Excitation
Shunya Odawara, Keisuke Fujisaki, Shuhei Fukuhara
Toyota Technological Institute, Japan

19P3-10 Optimization on Arrangement of Permanent Magnets for Magnetic Levitation System for Thin Steel Plate ( Fundamental Consideration on Levitation Probability)
Hirotaka Ishii, Takayoshi Narita, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan

19P3-11 Effect of a Magnetic Field from the Horizontal Direction on a Magnetically Levitated Steel Plate ( Fundamental Considerations on the Shape Analysis of Ultrathin Steel Plate)
Takeshi Kurihara, Takayoshi Narita, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan

19P3-12 Novel Magnetic Structure of Integrated Differential-Mode and Common-Mode Inductors to Suppress DC Saturation
Kazuhiro Umetani, Takahiro Tera, Kazuhiro Shirakawa
Denso Corporation, Japan

Poster Session 19P4 Motor Drives I

Chairs: Takumi Ohnuma (Numazu National College of Technology)
        Akira Chiba (Tokyo Institute of Technology)

19P4-1 A Novel Control Method in Flux-Weakening Region for Efficient Operation of Interior Permanent Magnet Synchronous Motor
K. Ueda, S. Morimoto, Y. Inoue, M. Sanada
Osaka Prefecture University, Japan
19P4-2  Implementation of the MTPA and MTPV Control with Online Parameter Identification for a High Speed IPMSM Used as Traction Drive
Quoc Khanh Nguyen, Matthias Petrich, Jörg Roth-Stielow
University of Stuttgart, Germany

19P4-3  Correction of Reference Flux for MTPA Control in Direct Torque Controlled Interior Permanent Magnet Synchronous Motor Drives
Atsushi Shinohara, Yukinori Inoue, Shigeo Morimoto, Masayuki Sanada
Osaka Prefecture University, Japan

19P4-4  Voltage Regulation and Maximum Output Power Tracking of a 4.5kW Permanent-Magnet Synchronous Generator
Yuan-Chih Chang, Hsiu-Feng Chang, Wei-Fu Dai, Chun-Wei Wu
National Chung Cheng University, Taiwan

19P4-5  A Novel Flux-Weakening Control Method Based on Single Current Regulator for Permanent Magnet Synchronous Motor
Xiaocun Fang, Taiyuan Hu, Fei Lin, Zhongping Yang
Beijing Jiaotong University, China

19P4-6  Predictive Current Control Method in Induction Motor Speed Sensorless Drive
Sun Wei, Yu Yong, Xu Dianguo, Xu Jin, Ding Li
Harbin Institute of Technology, China

19P4-7  Real-Time Implementation of an Online Model Predictive Control for IPMSM Using Parallel Computing on FPGA
Michael Leuer, Joachim Bocker
Paderborn University, Germany

19P4-8  An Integral Sliding-Mode Controller for Energy Efficiency Improvement in AC Power Source Supplied AC Machine Drives
Hsin-Jang Shieh, Ying-Zuo Chen
National Dong Hwa University, Taiwan

19P4-9  Performance Improvement of Ultra-High-Speed PMSM Drive System Based on DTC by Using SiC Inverter
Ryo Togashi, Yukinori Inoue, Shigeo Morimoto, Masayuki Sanada
Osaka Prefecture University, Japan

19P4-10  Mathematical Model for High-Efficiency Control of Permanent-Magnet Synchronous Motor in Stator Flux Linkage Synchronous Frame
Tatsuki Inoue, Yukinori Inoue, Shigeo Morimoto, Masayuki Sanada
Osaka Prefecture University, Japan

19P4-11  Wide-Speed-Range Operation of DTC-Based PMSM Drive System Using MTPF Control
Yukinori Inoue, Takahiro Ichiya, Shigeo Morimoto, Masayuki Sanada
Osaka Prefecture University, Japan

19P4-12  An Industrial Low-Voltage Inverter for PRM Control
M. Nakamura, T. Oka, K. Oishi
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

19P4-13  Optimal Pulse Pattern Determination Based on Pulse Harmonic Modulation
Kimihisa Furukawa\textsuperscript{1}, Toshiyuki Ajima\textsuperscript{1}, Hideki Miyazaki\textsuperscript{2}
\textsuperscript{1) Hitachi, Ltd., Japan, \textsuperscript{2) Hitachi Automotive Systems, Ltd., Japan}

19P4-14  Method for Auto-Tuning of Current and Speed Controller in IPMSM Drive System Based on Parameter Identification
D. Tadokoro, S. Morimoto, Y. Inoue, M. Sanada
Osaka Prefecture University, Japan

19P4-15  Comparative Study of PWM Strategies for Three-Phase Open-End Winding Induction Motor Drives
B. Zhu\textsuperscript{1}, U. R. Prasanna\textsuperscript{1}, K. Rajashekar\textsuperscript{1}, H. Kubo\textsuperscript{2}
\textsuperscript{1) University of Texas at Dallas, USA, \textsuperscript{2) Meidensha Corporation, Japan}
Poster Session 19P5 Batteries and Fuel Cells I

Chairs: Toshiaki Yachi (Tokyo University of Science)
       Tadashi Suetsugu (Fukuoka University)

19P5-1 10MW, 3.3MWh Energy Storage System Consisting of 4000 Flywheels Controlled by ICT Network for Short Cycle Power Fluctuation Compensation
Koji Kato¹, Satoru Ishigami¹, Youichiro Nakajima¹, Haruki Araï¹, Tetsuya Ueda¹, Tetsuki Iwata, Yoichi Ito¹, Kazumi Sugao²
1) Sanken Electric Co., Ltd, Japan, 2) Belltec, Japan

19P5-2 Versatile Power Transfer Strategies of PV- Battery Hybrid System for Residential Use with Energy Management System
Seong-Chon Choi¹, Min-Ho Sin¹, Dong-Rak Kim¹, Chung Yuen Won¹, Yong Chae Jung²
1) Sungkyunkwan University, Korea, 2) Namseoul University, Korea

19P5-3 High-Efficiency and Cost-Minimization Method of Energy Storage System with Multi Storage Devices for Grid Connection
Hitoshi Haga¹, Toshihiro Shimao¹, Seiji Kondo¹, Koji Kato², Youichi Ito², Kenji Arimatsu³, Katsuhito Matsuda³
1) Nagoya University of Technology, Japan, 2) Sanken Electric Co., Ltd, Japan, 3) Tohoku Electric Power Co., Inc., Japan

19P5-4 Bidirectional DC-DC Converter with Multiple Switched-Capacitor Cells
Yuang-Shung Lee, Hsin-Wei Huang, Tzu-Han Chou
Fu Jen Catholic University, Taiwan

19P5-5 Switched-Capacitor Charge Equalization Circuit for Series-Connected Batteries
Yao-Ching Hsieh, Zheng-Xiu Cai, Wen-Zhe Wu
National Dong Hwa University, Taiwan

Poster Session 19P6 Power Conversion for Renewable Energy I

Chairs: Takayuki Ouchi (Hitachi Research Laboratory)
       Tadashi Suetsugu (Fukuoka University)

19P6-1 Performance Analysis of UniTL-H6 Inverter with SiC MOSFETs
Davide Barater¹, Giampaolo Buticchi¹, Carlo Concari¹, Giovanni Fraceschini¹, Emre Gurpinar², Dipankar De², Alberto Castellazzi²
1) University of Parma, Italy, 2) The University of Nottingham, UK

19P6-2 Maximum Power Point Tracking of Grid-Tied Photovoltaic Power Systems
Ya-Ting Lee¹, Chian-Song Chiu¹, Tse-Wei Chiu¹
1) National Taichung University of Science and Technology, Taiwan, 2) Chung-Yuan Christian University, Taiwan

19P6-3 A New Voltage Type Magnetically Coupled T-Source Inverter
Q. V. Tran, K. S. Low
Nanyang Technological University, Singapore

19P6-4 A High Efficiency Hybrid 7-Level Inverter with Single DC Source
Yanhong Zhang¹, Kazuya Ogura¹, Kazunobu Oi²
1) Meiden Singapore Pte Ltd, Singapore, 2) Meidensha Corporation, Japan

19P6-5 Optimal Idling Control Strategy for Three-Port Full-Bridge Converter
Yongjie Jiang¹, Fuxin Liu¹, Xinbo Ruan¹, Lipeng Wang²
1) Nanjing University of Aeronautics and Astronautics, China, 2) CSR Zhuzhou Electric Locomotive Research Institute Co., Ltd, China

19P6-6 Filter Design for Three-Level Grid-Connected Inverter with Low Switching Frequency
Kangle Ren¹, Xing Zhang¹, Fusheng Wang¹, Yunwu Tu², Lingxiang Wang², Lirong Deng²
1) Hefei University of Technology, China, 2) Sungrow Power Supply Co., Ltd., China

19P6-7 A Novel Efficient T Type Three Level Neutral-Point-Clamped Inverter for Renewable Energy System
Wenlong Wu, Fei Wang, Yong Wang
Shanghai Jiao Tong University, China

19P6-8 A Novel Neutral Point Voltage Automatic Balancing Carrier-Based Modulation Strategy of Three-Level NPC Converter
Ning Li, Yue Wang, Ruigen Niu, Wei Guo, Wanjun Lei, Zhao'an Wang
Xi'an Jiaotong University, China
Poster Session 19P8 Wind Power Systems I

19P8-1 A Novel Method of Suppressing Inrush Currents of Squirrel-Cage Induction Machine Using Matrix Converter in Wind Power Generation Systems
Hiroaki Yamada, Tsuyoshi Hanamoto
Kyushu Institute of Technology, Japan

19P8-2 CLC Filter Design of a Flyback-Inverter for Photovoltaic Systems
Shuai Xiao, Geng Yang, Hua Geng
Tsinghua University, China

19P8-3 Device Loading of Modular Multilevel Converter MMC in Wind Power Application
L. Popova, J. Pyrhönen, K. Ma, F. Blaabjerg
1) Lappeenranta University of Technology, Finland, 2) Aalborg University, Denmark

19P8-4 A Novel Optimal Design of DFIG Crowbar Resistor during Grid Faults
Sheng Hu, Xu Dong Zou, Yong Kang
Huazhong University of Science and Technology, China

19P8-5 DC-Voltage Regulation of a Five Levels Neutral Point Clamped Cascaded Converter for Wind Energy Conversion System
Farid Merahi, Saad Mekhilef, El Madjid Berkouk
1) F. Abbas University, Algeria, 2) University of Malaya, Malaysia, 3) High Polytechnic National School, Algeria

Poster Session 19P7 PV Systems I

19P7-1 A Novel Control Strategy to Suppress DC Current Injection to the Grid for Three-Phase PV Inverter
Tao Zhang, Guofeng He, Min Chen, Dehong Xu
Zhejiang University, China

19P7-2 CLC Filter Design of a Flyback-Inverter for Photovoltaic Systems
Yesl Shin, June-Hee Lee, June-Seok Lee, Kyo-Beum Lee
Ajou University, Korea

19P7-3 Three-Phase Inverter Topologies for Grid-Connected Photovoltaic Systems
Ziya Özkan, Ahmet M. Hava
Middle East Technical University, Turkey

19P7-4 A Three-Port Topology Comparison for a Low Power Stand-Alone Photovoltaic System
Maria C. Mira, Arnold Knott, Michael A. E. Andersen
Technical University of Denmark, Denmark

19P7-5 Effect of Conventional Grid-Voltage Feedforward on the Output Impedance of a Three-Phase Photovoltaic Inverter
T. Messo, J. Jokipii, T. Suntio
Tampere University of Technology, Finland

19P7-6 Power Amplifier Suitable for Photovoltaic Cell Booster
Teruhiko Kohama, Yuki Sogawa, Satoshi Tsuji
Fukuoka University, Japan

19P7-7 Realization Study of Interleaved PV Microinverter by Quadrature-Phase-Shift SPWM Control
Hung-I Hsieh, Guan-Chyun Hsieh, Jiaxin Hou
1) National Chiayi University, Taiwan, 2) Chung Yung Christian University, Taiwan

19P7-8 Current Sensorless MPPT Method for a PV Flyback Microinverters Using a Dual-Mode
June-Hee Lee, June-Seok Lee, Kyo-Beum Lee
Ajou University, Korea

Poster Session 19P6 PV Systems I

19P6-9 A High Voltage Gain Switched-Coupled-Inductor Quasi-Z-Source Inverter
Furqan Ahmed, Honnyong Cha, Su-Han Kim, Heung-Geun Kim
Kyungpook National University, Korea
Poster Session 19P9 Distribution Systems (Microgrid & Others I)

Chairs: Rolando Burgos (Virginia Polytechnic Institute and State University)
Noriyuki Kimura (Osaka Institute of Technology)

19P9-1 A Reactive Power Sharing Method Based on Virtual Capacitor in Islanding Microgrid
Haizhen Xu, Xing Zhang, Fang Liu, Rongliang Shi, Changzou Yu, Wei Zhao, Yong Yu, Wei Cao
1) Heifei University of Technology, China, 2) Sungrow Power Supply Co., Ltd., China

19P9-2 Storage Capacity Performance for Hybrid PV/Diesel System in Sabah Malaysia
Nabil M. Hidayat, Mat Nasir Kar, Mohd Johari Mohd Arif
1) Universiti Teknologi MARA, Malaysia, 2) Jabatan Kerja Raya, Malaysia

19P9-3 New Techniques for Measuring Islanded Microgrid Impedance Characteristics Based on Current Injection
Lixiang Hou, Baoquan Liu, Hongtao Shi, Hao Yi, Fang Zhuo
Xi'an Jiaotong University, China

19P9-4 A General Framework to Design Operation Modes of DC Microgrids without Communication Links
Miao Pan, Na Shen, Geng Yang, Kazunori Morita, Kazuya Ogura, Weiyang Wu
1) Tsinghua University, China, 2) Yanshan University, China, 3) Meidensha Corporation, Japan

19P9-5 Implementation Design of the Converter-Based Galvanic Isolation for Low Voltage DC Distribution
A. Mattsson, V. Vaisanen, P. Nuutinen, T. Kaipia, A. Lana, P. Peltoniemi, P. Silventoinen, J. Partanen
Lappeenranta University of Technology, Finland

Poster Session 19P10 Power Electronics Applied to Distribution Systems

Chairs: King Jet Tseng (Nanyang Technological University)
Noriyuki Kimura (Osaka Institute of Technology)

19P10-1 Peak Detection Method Using Two-Delta Operation for Single Voltage Sag
Woo-Cheol Lee, Taek-Kie Lee
Hankyong National University, Korea

19P10-2 Line Loss Minimization in Radial Distribution System Using Multiple STATCOMs and Static Capacitors
Kensuke Miyazaki, Takaharu Takeshita
Nagoya Institute of Technology, Japan

19P10-3 A Novel Control Method for Individual DC Voltage Balancing in H-Bridge Cascaded STATCOM
Rong Xu, Yong Yu, Rongteng Yang, Lizi Qu, Wei Sun, Dianguo Xu
Harbin Institute of Technology, China

19P10-4 Research on the Control Strategy of STATCOM Based on Modular Multilevel Converter
Wei Zhang, Qiang Gao, Bonan Su, Miaoxin Jin, Dianguo Xu, Jianyu Liu
Harbin Institute of Technology, China

19P10-5 Fault Diagnosis in Large Format LiFePO4 ESS Application through DWT-Based MRA
Jonghoon Kim
Chosun University, Korea

19P10-6 Comparison of Different IGBT Based Designs of Power Electronic Transformer
Xinyu Wang, Shaodi Ouyang, Jinjun Liu, Fei Meng, Riffat Javed
Xi'an Jiaotong University, China

Poster Session 19P11 Railway Applications

Chairs: Masafumi Miyatake (Sophia University)
Yoshinobu Ueda (Meidensha Corporation)

19P11-1 Semi-Adaptive Harmonic Control for Power Balancing Device for AC Traction
Masataka Akagi, Hirotoni Tsuruta, Hiroshi Oso
1) Railway Technical Research Institute, Japan, 2) Japan Railway Construction, Transport and Technology Agency, Japan, 3) Fuji Electric Co., Ltd., Japan

19P11-2 Research of Efficient Main Power Equipment Using SiC Power Device
Kenichi Shibunuma, Mitsuo Shibue, Hiroshi Abiko, Hideki Sonoda, Takahito Ishida, Yoshinori Chiba
1) East Japan Railway Company, Japan, 2) Mitsubishi Electric Corporation, Japan

19P11-3 A High Performance Control Strategy for Three-Level NPC EMU Converters
Song Kejian, Wu Mingli, Wang Hui, Vassilios Georgiis Ageidis
1) Beijing Jiaotong University, China, 2) The University of New South Wales, Australia
19P11-4 A Design of Inrush Current Identification System for High-Speed Train’s Traction Transformer
Weikai Yu1, Xiankai Liu1, Yuzhuo Zhang1, Yuan Cao2, Weigang Ma2, Xinhou Hei3, Zhenhui Huang3, Dawang Jiang4
1) CSR Qingdao Sifang Co., Ltd., China, 2) Beijing Jiaotong University, China, 3) Xi’an University of Technology, China, 4) CNR Trangshan Railway Vehicle Co., Ltd., China

19P11-5 Current Source Inverter Based Cascaded Solid State Transformer for AC to DC Power Conversion
Sudhin Roy, Ankan De, Subhashish Bhattacharya
North Carolina State University, USA

19P11-6 Evaluation of High Voltage 15 kV SiC IGBT and 10 kV SiC MOSFET for ZVS and ZCS High Power DC -DC Converters
Shiva Mohallem, Sachin Madhusoodhanan, Subhashish Bhattacharya
North Carolina State University, USA

Poster Session 19P12 Technology for EV/HEV Applications

19P12-1 The Direct Yaw-Moment Control to Follow the Neutral Steering Path Regardless of Velocity
Young-Jin Jang, Kwang-Hee Nam
Pohang University of Science and Technology, Korea

19P12-2 Next-Generation IGBT Module Structure for Hybrid Vehicle with High Cooling Performance and High Temperature Operation
Akira Morozumi, Hiromichi Gohara, Fumihiko Momose, Takashi Saito, Yoshitaka Nishimura, Eiji Mochizuki, Yoshikazu Takahashi
Fuji Electric Co., Ltd., Japan

19P12-3 Integration of Plug-In Electric Vehicles in Power Systems Using Charging Mode Switching
Wen-Tai Li1, Chao-Kai Wen1, Jung-Chieh Chen2, Jen-Hao Teng2, Pangan Ting3
1) National Sun Yat-sen University, Taiwan, 2) National Kaohsiung Normal University, Taiwan, 3) Industrial Technology Research Institute, Taiwan

19P12-4 A Novel Compensation Method for a Motor Phase Current Sensor Offset Error Varied during a VSI-Motor Drive
Hiroshi Tamura1, Yasuo Noto2, Toshiyuki Ajima1, Jun-ichi Itoh1
1) Hitachi, Ltd., Japan, 2) Hitachi Automotive Systems, Ltd., Japan, 3) Nagaoka University of Technology, Japan

19P12-5 Investigation of Calculation Method of Losses in PWM Inverter with Voltage Booster Using both DC Link Voltage Control and Flux Weakening Control
Akihiro Imakiire1, Masayuki Hikita1, Kichiro Yamamoto2, Ryo Yonemori2
1) Kyushu Institute of Technology, Japan, 2) Kagoshima University, Japan

Poster Session 19P13 Power Supply Technologies for Information and Communication Systems

19P13-1 Dynamic and Steady-State Behavior of a Paralleling Three-Phase AC-to-DC Converter with Reduced DC Bus Capacitor
Uthen Kamnarn1, Yuthana Kanthaphayao2, Viboon Chunkag1
1) Rajamangala University of Technology Lanna, Thailand, 2) Rajamangala University of Technology Suvarnabhumi, Thailand, 3) King Mongkut’s University of Technology North Bangkok, Thailand

19P13-2 Reactive Power Loss Optimization Method for Bi-Directional Isolated DC-DC Converters
Huiqing Wen
Xi’an Jiaotong-Liverpool University, China

P. Durand Estebé1, V. Boitier1, M. Bafleur1, J-M. Dilhac1, S. Berhouet2
1) CNRS, LAAS, France, 2) AIRBUS Flight Test Instrumentation, France
Poster Session 19P14 Electrical Engineering Education I

Chairs: Ansgar Kern (Technische Hochschule Mittelhessen)
       Hirohito Funato (Utsunomiya University)

19P14-1 A Configurable Three-Phased Inverter for Teaching Power Electronics
Ansgar Kern
University of Applied Sciences Giessen Friedberg, Germany

Frederik De Belie, Araz Darba, Jan Melkebeek
Ghent University, Belgium

19P14-3 Development of a Web-Based Remote Experiment System for Electrical Machinery Learners
Makoto Ishibashi¹, Hisao Fukumoto², Tatsuya Furukawa³, Hideaki Itoh³, Masashi Ohchi³
1) Saga University, Japan, 2) Chiba Institute of Technology, Japan

19P14-4 Development of Power Measurement System in Simulated Micro Grid System for Education
Yuki Hira¹, Tatsuya Furukawa¹, Seiichiro Yakabe¹, Hisao Fukumoto¹, Hideaki Itoh³, Masashi Ohchi³
1) Saga University, Japan, 2) Chiba Institute of Technology, Japan

Room A

Oral Session (Organized) 19A1 High Power DC/DC Converters

Chairs: Braham Ferreira (Delft University of Technology)
        Kansuke Fujii (Fuji Electric Co., Ltd.)

19A1-1 Invited Paper
14:00
Power Electronic Technologies for Flexible DC Distribution Grids
Rik W. De Doncker
RWTH Aachen University, Germany

19A1-2 Invited Paper
14:25
2.5kV, 200kW Bi-Directional Isolated DC/DC Converter for Medium-Voltage Applications
Yuji Matsuoka¹, Keiji Wada¹, Mizuki Nakahara¹, Kazuto Takao¹, Kyungmin Sung², Hiromichi Ohashi²
1) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan, 2) Tokyo Metropolitan University, Japan,
3) Toshiba Corporation, Japan, 4) Ibaraki National College of Technology, Japan, 5) National Institute of Advanced Industrial Science and Technology, Japan

19A1-3 Invited Paper
14:50
Power-Loss Breakdown of a 750-V, 100-kW, 20-kHz Bidirectional Isolated DC-DC Converter Using SiC-MOSFET/SBD Dual Modules
Hirofumi Akagi¹, Tatsuya Yamagishi¹, Nadia M. L. Tan¹, Shin-ich Kinouchi¹, Yuji Miyazaki¹, Masao Koyama¹
1) Tokyo Institute of Technology, Japan, 2) Universiti Tenaga Nasional, Malaysia, 3) Mitsubishi Electric Corporation, Japan

19A1-4 Invited Paper
15:15
Design Considerations of a 15kV SiC IGBT Enabled High-Frequency Isolated DC-DC Converter
Awneesh Tripathi¹, Krishna Mainali¹, Dhaval Patel¹, Arun Kadavelugu¹, Samir Hazra¹, Subhashish Bhattacharya¹,
Kamalesh Hatua²
1) North Carolina State University, USA, 2) Indian Institute of Technology Madras, India

19A1-5 Invited Paper
15:40
Common-Mode Currents in Multi-Cell Solid-State Transformers
Jonas E. Huber, Johann W. Kolar
ETH Zurich, Switzerland

Room B

Oral Session 19B1 DC-DC Converters for Vehicle Drive Applications

Chairs: Huang-Jen Chiu (National Taiwan University of Science and Technology)
        Masayoshi Yamamoto (Shimane University)

19B1-1 14:00
Single-Stage Reconfigurable DC/DC Converter for Wide Input Voltage Range Operation in HEVs
Sandra Žejklíková¹, Tomas Reiter¹, Dieter Gerling¹, 2
1) Infineon Technologies AG, Germany, 2) University of Federal Defense Munich, Germany

Monday, May 19: 14:00 - 16:05
Oral Session (Organized) 19D1 Conversion Technologies for Renewable Energy and Energy Saving I

19D1-1 Multi-Loop Controller Design for Diode-Assisted Buck-Boost Voltage Source Inverter
Yan Zhang, Jinjun Liu, Xiaolong Ma, Junjie Feng
Xi’an Jiaotong University, China

19D1-2 Converter in Hybrid Electric Vehicles with MR Fluid-Gap Inductor
Furqan Ahmed, Su-Han Kim, Homyong Cha, Dong-Hun Kim, Heung-Geun Kim
Kyungpook National University, Korea

19D1-3 Intermediate and Light Load Efficiency Improvement of a High Power Density Bidirectional DC-DC
Il-Kuen Won, An-Yeol Ko, Do-Yun Kim, Chung-Yuen Won, Young-Ryul Kim
1) Sungkyunkwan University, Korea, 2) Anyang University, Korea

19D1-4 Regenerative Control of Bi-directional DC-DC Converter Controlling Variable DC-link for FCEV
Yu Hosoyamada, Masahiro Takeda, Naoki Motoi, Atsuo Kawamura
1) Yokohama National University, Japan, 2) Kobe University, Japan

Room C

Oral Session (Organized) 19C1 Electrical Engineering Education II

Chairs: Hirohito Funato (Utsunomiya University)
Masakazu Muneshima (Meidensha Corporation)

19C1-1 The Power Electronics Program at Beijing Jiaotong University
Fei Lin, Zhongping Yang, T. Q. Zheng
Beijing Jiaotong University, China

19C1-2 Efforts for Power Electronics Education in a Start-Up Company
Fumiya Hattori, Jun Imaoka, Manabu Ishitobi, Shinichiho Nagai, Masayoshi Yamamoto
1) POWERELE ACADEMY CO., LTD., Japan, 2) Shimane University, Japan,
3) Nara National College of Technology, Japan, 4) PONY ELECTRIC CO., LTD., Japan

19C1-3 Education for the Engineers of Traction Power Supply Division in East Japan Railway Company
Toshiaki Takino, Tetsuro Iwakami
East Japan Railway Company, Japan

19C1-4 Successful Online Education-GeckoCIRCUITS as Open-Source Simulation Platform
Andreas Müsing, Johann W. Kolar
1) Gecko-Simulations AG, Switzerland, 2) ETH Zurich, Switzerland

19C1-5 An Electric Vehicle Project for ECO-RUN Race - As a Student Project in Ibaraki National College of Technology -
Shinichi Yamagata, Yoshinori Oda, Masanobu Tanai, Kyungjun Sung
Ibaraki National College of Technology, Japan

Room D

Oral Session (Organized) 19D1 Conversion Technologies for Renewable Energy and Energy Saving I

Chairs: Santanu Mishra (Indian Institute of Technology Kanpur)
Kentaro Fukushima (Central Research Institute of Electric Power Industry)

19D1-1 Multi-Loop Controller Design for Diode-Assisted Buck-Boost Voltage Source Inverter
Yan Zhang, Jinjun Liu, Xiaolong Ma, Junjie Feng
Xi’an Jiaotong University, China

19D1-2 Real-Time Simulation of Wind Turbine Converter-Grid Systems
Shahil Shah, Ignacio Vieto, Nian Heng, Jian Sun
Rensselaer Polytechnic Institute, USA

19D1-3 Technologies for Mitigating Fluctuation Caused by Renewable Energy Sources
Shuji Katoh, Shinya Ohara, Tomomichi Itoh
Hitachi, Ltd., Japan

19D1-4 Reliability-Oriented Energy Storage Sizing in Wind Power Systems
Zian Qin, Marco Liserre, Frede Blaabjerg, Poh Chiang Loh
1) Aalborg University, Denmark, 2) Christian-Albrechts-Universität zu Kiel, Germany
Oral Session (Organized) 19E1 Magnetic Components
Chairs: Hitoshi Haga (Nagaoka University of Technology)
        Kan Akatsu (Shibaura Institute of Technology)

19E1-1 Semi-Numerical Method for Loss-Calculation in Foil-Windings Exposed to an Air-Gap Field
Invited Paper
14:00
D. Leuenberger, J. Biela
ETH Zurich, Switzerland

19E1-2 Loss Reduction of Laminated Core Inductor Used in On-board Charger for EVs
Invited Paper
14:25
1) Denso Corporation, Japan, 2) Tokyo Metropolitan University, Japan
Takahiro Tera1, Hiroshi Taki1, Toshihisa Shimizu2

19E1-3 Feasible Evaluations of Coupled Multilayer Chip Inductor for POL Converter
Invited Paper
14:50
1) Shimane University, Japan, 2) Taiyo Yuden Co., Ltd., Japan
Jun Imaoka1, Shota Kimura1, Yuki Itoh1, Masayoshi Yamamoto1, Michiaki Suzuki1, Kenji Kawano2

19E1-4 Optimal Inductor Design for 3-Phase Voltage-Source PWM Converters Considering Different Magnetic Materials and a Wide Switching Frequency Range
Invited Paper
15:15
ETH Zurich, Switzerland
Ralph M. Burkart, Hirofumi Uemura, Johann W. Kolar

19E1-5 Comparative Analysis of Inductor Concepts for High Peak Load Low Duty Cycle Operation
Invited Paper
15:40
ETH Zurich, Switzerland
Michael Leibl, Johann W. Kolar

Oral Session (Organized) 19F1 Advanced Control of Saliency-Based Sensorless Drives and Applications
Chairs: Hisao Kubota (Meiji University)
        Kyohei Kiyota (Tokyo Institute of Technology)

19F1-1 Initial Position Estimation for IPMSMs Using Comb Filters and Effects on Various Injected Signal Frequencies
Invited Paper
14:00
1) Chubu University, Japan, 2) Gifu National College of Technology, Japan, 3) Nagoya University, Japan
Toshiki Suzuki1, Masaru Hasegawa1, Mutuwo Tomita2, Shinji Doki1

19F1-2 Adaptive Signal Injection Method Combined with EEMF Based Position Sensorless Control of IPMSM Drives
Invited Paper
14:25
Numazu National College of Technology, Japan
Takumi Ohnuma, Yuki Makaino, Ryoh Saitoh

19F1-3 Study of Low Speed Sensorless Drives for SPMSM by Controlling Elliptical Inductance
Invited Paper
14:50
1) Toshiba Corporation, Japan, 2) Meiji University, Japan
Sari Maekawa1, Toshifumi Hinata1, Nobuyuki Suzuki1, Hisao Kubota2

19F1-4 Suppression of Injection Voltage Disturbance for High Frequency Square-Wave Injection Sensorless Drive with Regulation of Induced High Frequency Current Ripple
Invited Paper
15:15
1) Seoul National University, Korea, 2) Samsung Electronics Co., Ltd., Korea
Dongouk Kim1, Yong-Cheol Kwon1, Seung-Ki Sul1, Jang-Hwan Kim2, Rae-Sung Yu2

19F1-5 Application Trend of Saliency-Based Sensorless Drives
Invited Paper
15:40
Yaskawa Electric Corporation, Japan
Akira Yamazaki, Kozo Ide

Oral Session (Organized) 19G1 DC Transmission Systems
Chairs: Noriyuki Kimura (Osaka Institute of Technology)
        Yasuyuki Nishida (Chiba Institute of Technology)

19G1-1 Switching-Level Simulation Model of MMC-Based Back-to-Back Converter for HVDC Application
Invited Paper
14:00
Myongji University, Korea
Byung Moon Han, Jong Kyou Jeong
### Room I

**Oral Session 19I1 Matrix Converters**

**Chairs:** Mahmoud Abdelnaby Sayed Abdallah (South Valley University), Hidenori Hara (Yaskawa Electric Corporation)

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<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>14:00</td>
<td>Voltage Ripple Elimination in Inductor-Less AC-to-AC Converters for Multi-Pole Permanent Magnet Synchronous Generators</td>
<td>Koutaro Tanaka, Hideaki Fujita</td>
<td>Tokyo Institute of Technology, Japan</td>
</tr>
<tr>
<td>14:25</td>
<td>A New SVM Method to Reduce Common-Mode Voltage in Direct Matrix Converter</td>
<td>Huu-Nhan Nguyen, Hong-Hee Lee</td>
<td>University of Ulsan, Korea</td>
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<tr>
<td>14:50</td>
<td>Experimental Verification of High Frequency Link DC-AC Converter Using Pulse Density Modulation at Secondary Matrix Converter</td>
<td>Jun-ichi Itoh, Ryo Oshima, Hiroki Takahashi</td>
<td>Nagaoka University of Technology, Japan</td>
</tr>
<tr>
<td>15:15</td>
<td>Loss Analysis and Design Method for High Efficiency Matrix Converter</td>
<td>Kazuhiro Koiwa, Goh Teck Chiang, Jun-ichi Itoh</td>
<td>Nagaoka University of Technology, Japan</td>
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**Room H**

**Oral Session (Organized) 19H1 Bearingless Drive Techniques and Applications I**

**Chairs:** Christof Zwysig (Celeroton AG), Masahide Ooshima (Tokyo University of Science, Sawa)

<table>
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<tr>
<th>Time</th>
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<tr>
<td>14:00</td>
<td>Topology Evaluation of Slotless Bearingless Motors with Toroidal Windings</td>
<td>Daniel Steiner(^1), Thomas Nussbaumer(^1), Johann W. Kolar(^1)</td>
<td>ETH Zurich, Switzerland, 1) ETH Zurich, Switzerland, 2) Levitronix GmbH, Switzerland</td>
</tr>
<tr>
<td>14:25</td>
<td>Winding Arrangement in Single-Drive Bearingless Motor with Radial Gap</td>
<td>Hiroya Sugimoto(^1), Seiyu Tanaka(^1), Akira Chiba(^1), M. A. Rahman(^1)</td>
<td>Tokyo Institute of Technology, Japan, 1) Tokyo Institute of Technology, Japan, 2) Memorial University of Newfoundland, Canada</td>
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<tr>
<td>14:50</td>
<td>Development of a One-Axis Actively Regulated Bearingless Motor with a Repulsive Type Passive Magnetic Bearing</td>
<td>Junichi Asama(^1), Daisuke Watanabe(^1), Takaaki Oiwa(^1), Akira Chiba(^1)</td>
<td>Shizuoka University, Japan, 1) Shizuoka University, Japan, 2) Tokyo Institute of Technology, Japan</td>
</tr>
<tr>
<td>15:15</td>
<td>Control Characteristics of 8/10 and 12/14 Bearingless Switched Reluctance Motor</td>
<td>Zhenyao Xu, Dong-Hee Lee, Jin-Woo Ahn</td>
<td>Kyungsun University, Korea</td>
</tr>
<tr>
<td>15:40</td>
<td>Basic Characteristic of a Two-Unit Outer Rotor Type Bearingless Motor with Consequent Pole Permanent</td>
<td>Masatsugu Takemoto</td>
<td>Hokkaido University, Japan</td>
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**Invited Paper**

**Room H**

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Room J

Oral Session (Organized) 19J1 Novel Technologies on Traction Power Supply Systems

Chairs: Uwe Drofenik (ABB Corporate Research)
Hitoshi Hayashiya (East Japan Railway Company)

19J1-1 European Trends and Technologies in Traction
Invited Paper
14:00
Uwe Drofenik, Francisco Canales
ABB Corporate Research, Switzerland

19J1-2 Co-Phase Power Supply System for HSR
Invited Paper
14:25
Qunzhan Li, Wei Liu, Zeliang Shu, Shaofeng Xie, Fulin Zhou
Southwest Jiaotong University, China

19J1-3 The Application of Electronic Frequency Converter to the Shinkansen Railyard Power Supply
Invited Paper
14:50
Toshimasa Shimizu1, Ken Kunomura1, Masahiko Kai1, Mitsuru Onishi1, Hiroki Miyajima2, Midori Otsuki3, Yoshinori Tsuruma3
1) Central Japan Railway Company, Japan, 2) Toshiba Corporation, Japan, 3) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

19J1-4 Application Examples of Energy Saving Measures in Japanese DC Feeding System
Invited Paper
15:15
Takashi Suzuki1, Hitoshi Hayashiya1, Takashi Yamanoi1, Keiji Kawahara2
1) East Japan Railway Company, Japan, 2) West Japan Railway Company, Japan

19J1-5 Lithium Ion Battery Application in Traction Power Supply System
Invited Paper
15:40
Masato Teshima, Hirotaka Takahashi
Hitachi, Ltd., Japan
Tuesday, May 20: 8:30 - 10:10

Room A

Oral Session (Organized) 20A1 Multilevel and High Power Converters Applications I

Chairs: Subhashish Bhattacharya (North Carolina State University)
Yukihiko Sato (Chiba University)

20A1-1 Integrated Isolation and Voltage Balancing Link of 3-Phase 3-Level PWM Rectifier and Inverter Systems
Invited Paper
8:30
David O. Boillat, Johann W. Kolar
ETH Zurich, Switzerland

20A1-2 Voltage Step-Up Converter Based on Multistage Stacked Boost Architecture (MSBA)
Invited Paper
8:55
Alfred Rufer, Philippe Barrade, Gina Steinke
École Polytechnique Fédérale de Lausanne, Switzerland

20A1-3 Comparison of Cascaded Multilevel Converter Topologies for AC/AC Conversion
Invited Paper
9:20
Kalle Ilves, Luca Bessegato, Staffan Norrga
KTH Royal Institute of Technology, Sweden

20A1-4 Evaluation of Isolated Three-Phase AC-DC Converter Using Modular Multilevel Converter Topology
Invited Paper
9:45
Toshiki Nakanishi, Jun-ichi Itoh
Nagaoka University of Technology, Japan

Room B

Oral Session 20B1 Contactless Power Transfer System for Moving Applications

Chairs: Takehiro Imura (The University of Tokyo)
Koji Orikawa (Nagaoka University of Technology)

20B1-1 Self-Decoupled Dual Pick-Up Coils with Large Lateral Tolerance for Roadway Powered Electric Vehicles
8:30
Su Y. Choi, Sung W. Lee, Eun S. Lee, Seog Y. Jeong, Beom W. Gu, Chun T. Rim
1) Korea Advanced Institute of Science and Technology, Korea, 2) Samsung Electronics Co., Ltd., Korea

20B1-2 Contactless Power Transfer System Suitable for Low Voltage and Large Current Charging for EDLCs
8:55
Takahiro Kudo, Takahiro Toi, Yasuyoshi Kaneko, Shigeru Abe
Saitama University, Japan

20B1-3 Excitation System by Contactless Power Transfer System with the Primary Series Capacitor Method
9:20
Ryosuke Nozawa, Ryota Kobayashi, Hikaru Tanifuji, Yasuyoshi Kaneko, Shigeru Abe
Saitama University, Japan

20B1-4 Design of Ferrite Cores of Inductive Power Collection Coils for Moving Vehicles
9:45
Daisuke Shimode, Toshiaki Murai, Tadashi Sawada
Central Japan Railway Company, Japan

Room C

Oral Session 20C1 Switched Reluctance Motors

Chairs: Zwe-Lee Gaing (Kao Yuan University)
Yoshiaki Kano (Toyota National College of Technology)

20C1-1 Torque/Current Ratio Improvement and Vibration Reduction of Switched Reluctance Motors Using Multi-Stage Structure
8:30
Ryota Matsui, Noriya Nakao, Kan Akatsu
Shibaura Institute of Technology, Japan

20C1-2 Improvement of Efficiency by Stepped-Skewing Rotor for Switched Reluctance Motors
8:55
Makoto Sugiuura, Yuii Ishihara, Hiroki Ishikawa, Haruo Naitoh
Gifu University, Japan

20C1-3 A Single Phase SRM Driven by Commercial AC Power Supply
9:20
Kohei Aiso, Noriya Nakao, Kan Akatsu
Shibaura Institute of Technology, Japan
Oral Session 20D1 DC-AC Converters

Chairs: Daniel Siemaszko (CERN)
Kenichiro Sano (Central Research Institute of Electric Power Industry)

20D1-1 Detailed Analysis and a General Design Procedure of Damped LCL Filters in Three Phase Voltage Source Converters
8:30
Baoquan Liu, Shaohui Zhong, Yixin Zhu, Hao Yi, Fang Zhuo
Xi’an Jiaotong University, China

20D1-2 70 kHz, 15 kW Silicon-Carbide MOSFET Inverter for Industrial Induction Heating Systems
8:55
Shohei Komeda, Yoshiki Tsuboi, Hideaki Fujita
Tokyo Institute of Technology, Japan

20D1-3 A Study on Efficiency Improvement of High-Frequency Current Output Inverter Based on Immittance Conversion Element
9:20
Shun Suzuki, Toshihisa Shimizu
Tokyo Metropolitan University, Japan

20D1-4 High-Speed Switching Method of MOSFET Using Voltage Boost Auxiliary Circuit Fed by Gate Drive Power Supply -Applications to Chopper and Half-Bridge Inverter and Their Operation Characteristics-
9:45
Toshihiko Noguchi, Munehiro Murata
Shizuoka University, Japan

Oral Session 20E1 Converter Control for Renewable Energies I

Chairs: Teuvo Suntio (Tampere University of Technology)
Eiji Hiraki (Okayama University)

20E1-1 Operating Strategy for Bi-Directional LLC Resonant Converter with Seamless Operation
8:30
Seiya Abe¹, Toshiyuki Zaitsu², Junichi Yamamoto², Tamotsu Ninomiya¹
1) International Centre for the Study of East Asian Development, Japan, 2) Texas Instruments Japan Ltd., Japan

20E1-2 Negative Sequence Current Injection Control Algorithm Compensating for Unbalanced PCC Voltage in Medium Voltage PMSG Wind Turbines
8:55
Jayoon Kang¹, Daesu Han¹, Yongseug Suh¹, Byoungchang Jung¹, Jeongjoong Kim¹, Jonghyung Park², Youngjoon Choi²
1) Chonbuk National University, Korea, 2) Hyosung Co., Korea

20E1-3 Optimization of an Off-Grid Hybrid System for Supplying Offshore Platforms in Arctic Climates
9:20
Maria Kalogera, Pavol Bauer
Delft University of Technology, The Netherlands

20E1-4 Active Damping Control of LLCL Filters for Three-Level T-Type Grid Converters
9:45
Payam Alemi, Dong-Choon Lee
Yeungnam University, Korea

Oral Session 20F1 Batteries and Fuel Cells II

Chairs: Pekik Argo Dahono (Institute of Technology Bandung)
Kentaro Fukushima (Central Research Institute of Electric Power Industry)

20F1-1 Developing a New Topology for the DC-DC Converter Used in Fuel Cell-Electric Double Layer Capacitor Hybrid Power Source System for Mobile Devices
8:30
Shuhei Tosaka, Tatsuya Yamanaka, Noboru Katayama, Masanori Hayase, Kiyoshi Dowaki, Sumio Kogoshi
Tokyo University of Science, Japan

20F1-2 Multiple Output Charger Based on Phase Shift Full Bridge Converter with Novel Time Division Multiple Control Technique
8:55
Van-Long Tran, Woojin Choi
Soongsil University, Korea
20F1-3 DC-Breaker for a Multi-Megawatt Battery Energy Storage System
9:20 Georgios D. Demetriades, Willy Hermansson, Jan R. Svensson, Konstantinos Papastergiou, Tomas Larsson
ABB Corporate Research, Sweden

20F1-4 Energy Management Method Using the IIR Filter for PEMFC-Supercapacitor Hybrid Power Source
9:45 Tatsuya Yamanaka, Shuhei Tosaka, Noboru Katayama, Sumio Kogoshi
Tokyo University of Science, Japan

Room G

Oral Session 20G1 Advanced Controls of PMSM Drives

Chairs: Masaru Hasegawa (Chubu University)
Akira Chiba (Tokyo Institute of Technology)

20G1-1 Advanced Torque and Current Control Techniques for PMSMs with a Real-Time Simulator Installed Behavior Motor Model
8:30 Ryo Tanabe, Kan Akatsu
Shibaura Institute of Technology, Japan

20G1-2 Compensation of the Current Measurement Error with Periodic Disturbance Observer for Motor Drive
8:55 Takashi Yamaguchi¹, Yugo Tadano¹, Nobukazu Hoshi²
1) Meidensha Corporation, Japan, 2) Tokyo University of Science, Japan

20G1-3 Rapid and Stable Speed Control of SPMSM Based on Current Differential Signal
9:20 Jun Kitajima, Kiyoshi Ohishi
Nagaoka University of Technology, Japan

20G1-4 Parallel Connected Multiple Drive System Using Small Auxiliary Inverter for Numbers of PMSM
9:45 Tsuyoshi Nagano, Jun-ichi Itoh
Nagaoka University of Technology, Japan

Room H

Oral Session 20H1 Applications for Transmission and Distribution Systems

Chairs: Po-Tai Cheng (National Tsing Hua University)
Shoji Nishikata (Tokyo Denki University)

20H1-1 A Transformer Inrush Reduction Technique for Low-Voltage Ride-Through Operation of Renewable Converters
8:30 Hsin-Chih Chen, Ping-Heng Wu, Po-Tai Cheng
National Tsing Hua University, Taiwan

20H1-2 A Cell Capacitor Energy Balancing Control of Modular Multilevel Converter Considering the Unbalanced AC Grid Conditions
8:55 Jae-Jung Jung, Shenghui Cui, Sungmin Kim, Seung-Ki Sul
Seoul National University, Korea

20H1-3 Fault Current Limitation Using Thyristor Based Devices
9:20 Wilson Komatsu¹, Antonio Ricardo Giaretta¹, Rubens Domingos de Miranda¹, José Antonio Jardini¹, Ronaldo Pedro Casolari², Ricardo Leon Vasquez-Arnez², Toshiaki Hojo³, Eden Luiz Carvalho Jr.³, Paulo Koiti Maezono¹
1) Polytechnic School of the University of São Paulo, Brazil, 2) Foundation for the Technological Development of the Engineering Sciences, Brazil, 3) Transmissoras Brasileiras de Energia/Empresa Amazonense de Transmissão de Energia S. A., Brazil

20H1-4 DC-DC Boost Converter Based MSHE-PWM Cascaded Multilevel Inverter Control for STATCOM Systems
9:45 Kah Haw Law¹, Mohamed S. A. Dahidah²
1) The University of Nottingham Malaysia Campus, Malaysia, 2) Newcastle University, UK
**Room J**

**Oral Session 20J1 Railway Applications**

Chairs: Mark-Matthias Bakran (University of Bayreuth)  
Masaumi Miyatake (Sophia University)

**20J1-1** Introduction and Effectiveness of STATCOM to the Independent Power System of JR East  
8:30  
Masataro Omi, Masato Ando, Takeshi Masui, Yasuhisa Horita  
1) East Japan Railway Company, Japan, 2) Mitsubishi Electric Corporation, Japan, 3) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan  

**20J1-2** The Analysis of Time-Varying Resonances in the Power Supply Line of High Speed Trains  
8:55  
Xi Chu, Fei Lin, Zhongping Yang  
Beijing Jiaotong University, China  

**20J1-3** Fuzzy Feed-Forward Charge/Discharge Control of Stationary Energy Storage Systems for DC Electric Railways  
9:20  
Takuya Kikuchi, Hironori Taga, Ryo Takagi  
Kogakuin University, Japan  

**20J1-4** Train Group Control for Energy-Saving DC-Electric Railway Operation  
9:45  
Shoichiro Watanabe, Takaumi Koseki  
The University of Tokyo, Japan

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**Room A**

**Oral Session (Organized) 20A2 Multilevel and High Power Converter Applications I**

Chairs: Alfred Rufer (École Polytechnique Fédérale de Lausanne)  
Yugo Tadano (Meidensha Corporation)

**20A2-1** Transformer-less Unified Power Flow Controller Using the Cascade Multilevel Inverter  
10:40  
Fang Zheng Peng, Shao Zhang, Shuitao Yang, Deepak Gunasekaran, Ujjwal Karki  
Michigan State University, USA  

**20A2-2** A New Power Flow Controller Using Six Multilevel Cascaded Converters for Distribution Systems  
11:05  
Ryoji Tsuruta, Tatsuya Hosaka, Hideaki Fujita  
Tokyo Institute of Technology, Japan  

**20A2-3** A Proposal of Modular Multilevel Converter Applying Three Winding Transformer  
11:30  
Shunsuke Tamada, Yosuke Nakazawa, Shoichi Irokawa  
Toshiba Corporation, Japan  

**20A2-4** Back-to-Back System for Five-Level Converter with Common Flying Capacitors  
11:55  
Isamu Hasegawa, Shotaro Urushibata, Takeshi Kondo, Kuniaki Hirao, Takashi Kodama, Hui Zhang  
1) Meidensha Corporation, Japan, 2) Meiden Singapore, Singapore
Oral Session 20B2 Converters for Vehicle Applications

Chairs: Yen-Shin Lai (National Taipei University of Technology)
Nobukazu Hoshi (Tokyo University of Science)

20B2-1 Harmonic Modeling of a Vehicle Traction Circuit towards the DC Bus
10:40 Saeid Haghbin, Andreas Karvonen, Torbjörn Thiringer
Chalmers University of Technology, Sweden

20B2-2 AC/DC Converter Based on Instantaneous Power Balance Control for Reducing DC-Link Capacitance
11:05 Akira Tokumasu¹, Hiroshi Taki¹, Kazuhiro Shirakawa¹, Keiji Wada¹
1) Denso Corporation, Japan, 2) Tokyo Metropolitan University, Japan

20B2-3 Modular Converter Architecture for Medium Voltage Ultra Fast EV Charging Stations: Dual Half-Bridge-Based Isolation Stage
11:30 Michail Vasiladiotis¹, Behrouz Bahrami², Niklaus Burger¹, Alfred Rufer¹
1) École Polytechnique Fédérale de Lausanne, Switzerland, 2) Georgia Institute of Technology, USA

20B2-4 New Interleaved Current-Fed Resonant Converter with Significantly Reduced High Current Output Filter for EV and HEV Application
11:55 Dongok Moon, Junsung Park, Sewan Choi
Seoul National University of Science and Technology, Korea

Oral Session 20C2 Special Machines and Actuators

Chairs: Ned Mohan (University of Minnesota)
Akira Chiba (Tokyo Institute of Technology)

20C2-1 15 Phase Induction Motor Drive with 1:3:5 Speed Ratios Using Pole Phase Modulation
10:40 B. S. Umesh, K. Sivakumar
Indian Institute of Technology Hyderabad, India

20C2-2 Mathematical Model of Novel Wound-Field Synchronous Motor Self-Excited by Space Harmonics
11:05 Masahiro Aoyama¹,², Toshihiko Noguchi¹
1) Shizuoka University, Japan, 2) Suzuki Motor Corporation, Japan

20C2-3 Dual Purpose No Voltage Winding Design for the Bearingless Ac Homopolar and Consequent Pole Motors
11:30 Eric Severson¹, Robert Nilssen², Tore Undeland², Ned Mohan¹
1) University of Minnesota, USA, 2) Norwegian University of Science and Technology, Norway

20C2-4 Harvesting Energy from Ship Rolling Using an Eccentric Disk Revolving in a Hula-Hoop Motion
11:55 Yu-Jen Wang¹, Yu-Ti Hao¹
1) National Taipei University of Technology, Taiwan, 2) National Cheng Kung University, Taiwan

Oral Session (Organized) 20D2 Wireless Power Transfer and Energy Storage Systems

Chairs: Tsai-Fu Wu (National Tsing Hua University)
Hideki Ayano (Tokyo National College of Technology)

20D2-1 Load-Independent Current Output of Inductive Power Transfer Converters with Optimized Efficiency
10:40 Wei Zhang¹, Siu-Chung Wong¹, Chi K. Tse¹, Qianhong Chen¹
1) The Hong Kong Polytechnic University, Hong Kong, 2) Nanjing University of Aeronautics and Astronautics, China

20D2-2 Voltage Control of Inductive Contactless Power Transfer System with Coaxial Coreless Transformer for DC Power Distribution
11:05 Yushi Miura, Satoshi Ojika, Toshifumi Ise
Osaka University, Japan

20D2-3 Contactless High Power Transformer Technologies for Railway Vehicles
11:30 Keiichiro Kondo, Kohei Yamamoto, Satoshi Kitazawa
Chiba University, Japan

20D2-4 Two-Switch Voltage Equalizer Based on Half-Bridge Converter with Multi-Stacked Current Doublers for Series-Connected Batteries
11:55 Masatoshi Uno, Akio Kukita
Japan Aerospace Exploration Agency, Japan
Room E

Oral Session 20E2 Converter Control for Renewable Energy II

Chairs: Kouji Hisanaga (NEC Corporation)
Takashi Nabeshima (Oita University)

20E2-1 Optimal Energy Storage System Planning for Microgrids with Contract Capacity Constraint
10:40
Shu-Hung Liao, Jen-Hao Teng, Yung-Ching Huang, Dong-Jing Lee
1) National Sun Yat-sen University, Taiwan, 2) Industrial Technology Research Institute, Taiwan

20E2-2 Optimal Zero Sequence Injection in Multilevel Cascaded H-Bridge Converter under Unbalanced Photovoltaic Power Generation
11:05
Yifan Yu, Georgios Konstantinou, Branislav Hredzak, Vassilios G. Agelidis
The University of New South Wales, Australia

20E2-3 Simple Method for Measuring Output Impedance of a Three-Phase Inverter in Dq-Domain
11:30
Juha Jokipii, Tuomas Messio, Teuvo Suntio
Tampere University of Technology, Finland

20E2-4 Analysis and Design of Power Management Scheme for an On-Board Solar Energy Storage System
11:55
1) Yangzhou University, China, 2) Aston University, UK, 3) Gunma University, Japan

Room F

Oral Session 20F2 Micro Grid Applications

Chairs: Daniel Siemaszko (CERN)
Satoshi Ohtsu (NTT Facilities Research Institute Inc.)

20F2-1 LVRT Control Strategy of CSC-DPMSG-WGS under Unbalanced Grid Faults
10:40
Meiqin Mao, Yong Ding, Shiting Weng, Liuchen Chang
1) Heifei University of Technology, China, 2) University of New Brunswick, Canada

20F2-2 A New Current Control Droop Strategy for VSI-Based Islanded Microgrids
11:05
B. Shoeiby, R. Davoodnezhad, D. G. Holmes, B. P. McGrath
RMIT University, Australia

20F2-3 Power Exchange Using PFC for Micro Grid
11:30
Tomoyasu Sakai, Takashi Takeda, Kazuto Yukita, Yasuyuki Goto, Katsuhiro Ichiyanagi, Hiroshi Morita
1) Aichi Institute of Technology, Japan, 2) Kinden Corporation, Japan

20F2-4 Adaptive Thermal Control for Power Fluctuation to Improve Lifetime of IGBTs in Multi-MW Medium Voltage Wind Power Converter
11:55
Gen Chen, Jianwen Zhang, Miao Zhu, Ningyi Dai, Xu Cai
1) Shanghai Jiao Tong University, China, 2) University of Macau, China

Room G

Oral Session 20G2 State Estimation for PMSM Drives

Chairs: Yukinori Inoue (Osaka Prefecture University)
Akio Toba (Fuji Electric Co., Ltd.)

20G2-1 Determination of Rotor Temperature for an Interior Permanent Magnet Synchronous Machine Using a Precise Flux Observer
10:40
Andreas Specht, Oliver Wallscheid, Joachim Böcker
University of Paderborn, Germany

20G2-2 Monitoring Critical Temperatures in Permanent Magnet Synchronous Motors Using Low-Order Thermal Models
11:05
Tobias Huber, Wilhelm Peters, Joachim Böcker
University of Paderborn, Germany

20G2-3 Robust Current Control Insensitive to Gain Deviation and Offset of Inverter DC-Link Current Sensor for SPMSM
11:30
Kei Matsuura, Itaru Ando, Kiyoshi Ohishi, Masataka Mtsushashi
1) Akita National College of Technology, Japan, 2) Nagaoka University of Technology, Japan

20G2-4 Auto-Tuning Method of Inductances for Permanent Magnet Synchronous Motors
11:55
Naofumi Nomura, Shinichi Higuchi
Fuji Electric Co., Ltd., Japan
Oral Session 20H2 Distribution Systems (Converter Control)

Chairs: Takanori Isobe (University of Tsukuba)
Toshifumi Ise (Osaka University)

20H2-1 An Impedance-Based Stability Analysis Method for Paralleled Voltage Source Converters
10:40 Xiongfei Wang, Frede Blaabjerg, Poh Chiang Loh
Aalborg University, Denmark

20H2-2 Dynamic Characteristics and Stability Comparisons between Virtual Synchronous Generator and Droop Control in Inverter-Based Distributed Generators
11:05 Jia Liu, Yushi Miura, Toshifumi Ise
Osaka University, Japan

20H2-3 Embedded Limitations and Protections for Droop-Based Control Schemes with Cascaded Loops in the Synchronous Reference Frame
11:30 Salvatore D’Arco1, Giuseppe Guidi1, Jon Are Suul1,2
1) SINTEF Energy Research, Norway, 2) Norwegian University of Science and Technology, Norway

20H2-4 Virtual Synchronous Generator Control with Double Decoupled Synchronous Reference Frame for Single-Phase Inverter
11:55 Yuko Hirase1, Osamu Noro1, Eiji Yoshimura1, Hidehiko Nakagawa1, Kenichi Sakimoto2, Yuji Shindo2
1) Kawasaki Technology Co., Ltd., Japan, 2) Kawasaki Heavy Industries, Ltd., Japan

Oral Session 20I2 Power Supplies for ICT Systems

Chairs: Yoichi Ishizuka (Nagasaki University)
Masahito Shoyama (Kyushu University)

20I2-1 Contactless DC Connector Based on GaN LLC Converter for Next Generation Data Centers
10:40 Yusuke Hayashi1, Hajime Toyoda1, Toshifumi Ise2, Akira Matsumoto2
1) Osaka University, Japan, 2) NTT Facilities, Inc., Japan

20I2-2 Analysis of Mis-Interruption of Semiconductor Breaker in DC Power Feeding System
11:05 Kensuke Murai, Koki Asakimori, Yasuyuki Kanai, Tadatoshi Babasaki
NTT, Japan

20I2-3 A Reliable Electronic Choke with No Need of Gain Adjustment for Wire Communication System
11:30 Akihiko Katsuki1, Kohei Shibahara1, Tomohiko Abe2, Tomohiko Ikeda2, Tatsuya Nakamura3, Tatsuya Misuki3, Shigetaka Maeyama4
1) Nagasaki University, Japan, 2) Kyushu Institute of Technology, Japan, 3) TDK Corporation, Japan

20I2-4 Design of New Control Strategies for a Four-Leg Three-Phase Inverter to Eliminate the Neutral Current under Unbalanced Loads
11:55 Zhao-Qin Guo, Sanjib Kumar Panda, I. V. Prasanna
National University of Singapore, Singapore

Oral Session 20J2 Inverter Control for Motor Drives

Chairs: Surapong Suwankawin (Chulalongkorn University)
Mahmoud Abdelnaby Sayed Abdallah (South Valley University)

20J2-1 Research Trends of Modular Multilevel Cascade Inverter (MMCI-DSCC)-Based Medium-Voltage Motor Drives in a Low-Speed Range
10:40 Yuhei Okazaki, Hitoshi Matsui, Makoto Hagiwara, Hirofumi Akagi
Tokyo Institute of Technology, Japan

20J2-2 An Input Switched Multilevel Inverter for Open-end Winding Induction Motor Drive
11:05 B. Zhu1, Y. Jia1, U. R. Prasanna1, K. Rajashekar2, H. Kubo2
1) University of Texas at Dallas, USA, 2) Meidensha Corporation, Japan

20J2-3 Variable Carrier Frequency Mixed PWM Technique Based on Current Ripple Prediction for Reduced Switching Loss
11:30 Hajime Kubo, Yasuhiro Yamamoto
Meidensha Corporation, Japan
20J2-4  Sliding Mode PWM for Effective Current Control in Switched Reluctance Machine Drives
11:35  Iakovos Manolas¹, Georgios Papafotiou¹, Stefanos N. Manias²
¹) ABB AB, Corporate Research, Sweden, 2) ABB, Drives and Controls, Switzerland, 3) National Technical University of Athens, Greece

**Room A**

**Oral Session (Organized) 20A3 Multilevel and High Power Converter Applications II**

**Chairs:** Po-tai Cheng (*National Tsing Hua University*)
Koji Kato (*Sanken Electric Co., Ltd.*)

**20A3-1**  Solid State Transformer and MV Grid Tie Applications Enabled by 15 kV SiC IGBTs and 10 kV SiC MOSFETs Based Multilevel Converters
**Invited Paper**
13:20  Sachin Madhusoodhanan¹, Awneesh Tripathi¹, Dhaaval Patel¹, Krishna Mainali¹, Arun Kadavelugu¹, Samir Hazra¹, Subhashish Bhattacharya¹, Kamalesh Hatua¹
¹) North Carolina State University, USA, 2) Indian Institute of Technology Madras, India

**20A3-2**  Generalized Modular Multilevel Converter and Modulation
**Invited Paper**
13:45  Hui Liu, Poh Chiang Loh, Frede Blaabjerg
Aalborg University, Denmark

**20A3-3**  Average Power Control of DC Bus Voltages of Cascaded H-Bridge Multilevel Converters
**Invited Paper**
14:10  Chia-Tse Lee, Hsien-Chih Chen, Ching-Wei Wang, Ching-Hsiang Yang, Po-Tai Cheng
National Tsing Hua University, Taiwan

**20A3-4**  Analysis and Comparison of High Power Semiconductor Device Losses in 5MW PMSG MV Wind Turbines
**Invited Paper**
14:35  Kihyun Lee¹, Kyungsub Jung¹, Seunghee Song¹, Yongsoo Sung¹, Changwoo Kim¹, Hyoyol Yoo², Sunsoon Park²
¹) Chonbuk National University, Korea, 2) Dawonsys Co., Korea

**20A3-5**  Application of Modular Matrix Converter to Wind Turbine Generator
**Invited Paper**
15:00  Kentaro Inomata, Hidenori Hara, Shinya Morimoto, Junji Fujii, Kotaro Takeda, Eiji Yamamoto
Yaskawa Electric Corporation, Japan

**Room B**

**Oral Session (Organized) 20B3 Motion Control and Haptics**

**Chairs:** Kiyoshi Ohishi (*Nagaoka University of Technology*)
Hiroshi Fujimoto (*The University of Tokyo*)

**20B3-1**  Free Motion Mechanical Power Factor; Comparison between Robots in Different Structure and Coordinate
**Invited Paper**
13:20  Takahiro Mizuguchi, Takahiro Nozaki, Kouhei Ohnishi
Keio University, Japan

**20B3-2**  Analysis of Settling Behavior and Design of Cascaded Precise Positioning Control in Presence of Nonlinear Friction
**Invited Paper**
13:45  Michael Ruderman, Makoto Iwasaki
Nagoya Institute of Technology, Japan

**20B3-3**  Field and Bench Test Evaluation of Range Extension Control System for Electric Vehicles Based on Front and Rear Driving-Braking Force Distributions
**Invited Paper**
14:10  Hiroshi Fujimoto¹, Shingo Harada¹, Yuichi Goto², Daisuke Kawano¹
¹) The University of Tokyo, Japan, 2) National Traffic Safety and Environment Laboratory, Japan

**20B3-4**  Vibration Suppression of Integrated Resonant and Time Delay System by Reflected Wave Rejection
**Invited Paper**
14:35  Eiichi Saito¹, Roberto Oboe², Seiichiro Katsura¹
¹) Keio University, Japan, 2) University of Padova, Italy

**20B3-5**  Thrust Characteristics Improvement of a Circular Shaft Motor for Direct-Drive Applications
**Invited Paper**
15:00  Mototsugu Omura, Tomoyuki Shimon, Yasutaka Fujimoto
Yokohama National University, Japan
Oral Session (Organized) 20C3 Bearingless Drive Techniques and Applications II

Chairs: Wolfgang Gruber (Johannes Kepler University Linz)
       Junichi Asama (Shizuoka University)

20C3-1  Design of a Bearingless Flux-Switching Slice Motor
Invited Paper
13:20  Wolfgang Gruber¹, Karlo Radman¹, Reto T. Schöb²
       1) Johannes Kepler University Linz, Austria, 2) Levitronix GmbH, Switzerland

20C3-2  Proposal of a Permanent Magnet Hybrid Type Axial Magnetically Levitated Motor
Invited Paper
13:45  Nobuyuki Kurita, Takeo Ishikawa, Hiromu Takada, Genri Suzuki
       Gunma University, Japan

20C3-3  Comparison of High Speed Bearingless Drive Topologies with Combined Windings
Invited Paper
14:10  Hubert Mitterhofer¹, Branimir Mrak², Wolfgang Gruber²
       1) Linz Center of Mechatronics GmbH, Austria, 2) Johannes Kepler University Linz, Austria

20C3-4  High-speed Magnetically Levitated Reaction Wheel Demonstrator
Invited Paper
14:35  Christof Zwysig¹, Thomas Baumgartner¹, Johann W. Kolar³
       1) Celeroton Ltd., Switzerland, 2) ETH Zurich, Switzerland

20C3-5  Stabilized Suspension Control Considering Armature Reaction in a D-q Axis Current Control Bearingless Motor
Invited Paper
15:00  Masahide Ooshima, Yoshito Kumakura
       Tokyo University of Science, Suwa, Japan

Room D

Oral Session 20D3 Resonant Converters

Chairs: Juergen Biela (ETH Zurich)
       Tomokazu Mishima (Kobe University)

20D3-1  Analysis and Design of a High-Frequency Isolated Dual-Tank LCL Resonant AC-DC Converter
13:20  Yimian Du, Ashoka K. S. Bhat
       University of Victoria, Canada

20D3-2  Verification of LLC Resonant Converter Applied a Current-Balancing High-Frequency Transformer with Multi-Output Windings
13:45  Jun Araki¹, Ikki Shinozaki¹, Hirohito Funato¹, Satoshi Ogasawara², Daichi Murakami³, Yukitsugu Hirota³, Teruyoshi Mihara¹, Masayuki Mouri¹, Fumihiro Okazaki³
       1) Utsunomiya University, Japan, 2) Hokkaido University, Japan, 3) Calsonic Kansei Corporation, Japan

20D3-3  Light-Load Efficiency Improvement Strategy for LLC Resonant Converter Utilizing a Step-Gap Transformer
14:10  Wen-Nan Huang¹, Shi-Hui Lee², Ching-Guo Chen²
       1) Chioncy Power Technology Co., Ltd., Taiwan, 2) National Taipei University of Technology, Taiwan

20D3-4  A Novel Accurate Primary Side Control (PSC) Method for Half-Bridge (HB) LLC Converter
14:35  Jae-Bum Lee¹, Chong-Eun Kim¹, Jae-Hyun Kim¹, Cheol-O Yeon¹, Young-Do Kim¹, Gun-Woo Moon¹
       1) Korea Advanced Institute of Science and Technology, Korea, 2) Samsung Electro-Mechanics, Korea

20D3-5  A Simple Control Scheme for Improving Light-Load Efficiency in a Full-Bridge LLC Resonant Converter
15:00  Jae-Hyun Kim¹, Chong-Eun Kim¹, Jae-Bum Lee¹, Young-Do Kim¹, Han-Shin Youn¹, Gun-Woo Moon¹
       1) Korea Advanced Institute of Science and Technology, Korea, 2) Samsung Electro-Mechanics, Korea

Room E

Oral Session 20E3 Wind Power Systems II

Chairs: Frede Blaabjerg (Aalborg University)
        Kansuke Fuji (Fuji Electric Co., Ltd.)

20E3-1  Power Conditioner for Stabilizing Power Disturbance Caused of Wind Turbine Generator System
13:20  Yasunao Saga, Kansuke Fuji, Kazuyuki Yoda
        Fuji Electric Co., Ltd., Japan

20E3-2  Control Implementation of the Full-Scale Wind Power Converter without Grid Voltage Sensors
13:45  Jianwen Zhang, Han Wang, Miao Zhu, Xu Cai
        Shanghai Jiao Tong University, China
**20E3-3**  
A Front-to-Front (FTF) System Consisting of Multiple Modular Multilevel Cascade Converters for Offshore Wind Farms  
14:10  
Firman Sasongko, Makoto Hagiwara, Hirofumi Akagi  
*Tokyo Institute of Technology, Japan*

**20E3-4**  
Optimized Design for Multi-MW Wind Power Converter Based on Efficiency and Reliability  
14:35  
Gen Chen¹, Jianwen Zhang¹, Miao Zhu¹, Ningyi Dai¹, Xu Cai¹  
¹University of Macau, China

**20E3-5**  
Modelling, Design and Control of Grid Connected Converter for High Altitude Wind Power Application  
15:00  
Jeevan Adhikari, Akshay K. Rathore, S. K. Panda  
*National University of Singapore, Singapore*

**Room F**

**Oral Session (Organized) 20F3 Conversion Technologies for Renewable Energy and Energy Saving II**

**Invited Paper**  
**13:20**  
**Practical Study of a High Step-Down Converter**  
Masahito Jinno¹, Hong-Wei Su¹, Jiung-Lin Tsai¹, Hirofumi Matsuo²  
¹I-Shou University, Taiwan, ²Nagasaki University, Japan

**20F3-1**  
Balanced Discharging of Power Bank with Buck-Boost Battery Power Modules  
14:10  
Chin-Sien Moo¹, Tsung-Hsi Wu¹, Chih-Hao Hou¹, Yao-Ching Hsieh¹  
¹National Sun Yat-sen University, Taiwan, ²National Dong Hwa University, Taiwan

**20F3-2**  
Y-Source Impedance-Network-Based Isolated Boost DC/DC Converter  
14:35  
Yam P. Siwakoti¹, Graham E. Town¹, Poh Chiang Loh², Frede Blaabjerg³  
¹Macquarie University, Australia, ²Aalborg University, Denmark

**20F3-3**  
Multi-Phase DC-DC Converter with Ripple-less Operation for Thermo-Electric Generator  
15:00  
Noriyuki Kimura, Koji Niijima, Toshimitsu Morizane, Hideki Omori  
*Osaka Institute of Technology, Japan*

**Room G**

**Oral Session 20G3 PMSM Position Sensorless Controls**

**Invited Paper**  
**13:20**  
**Position Sensorless Start-Up Method of Surface Permanent Magnet Synchronous Motor Using Nonlinear Rotor Position Observer**  
Tsuyoshi Hanamoto¹, Hiroaki Yamada¹, Yoshihiro Okuyama²  
¹Kyushu Institute of Technology, Japan, ²Shimadzu Corporation, Japan

**20G3-1**  
Sensorless Control of PMSM for the Whole Speed Range Using Two-Degree-of-Freedom Current Control and HF Test Current Injection for Low Speed Range  
13:45  
Markus Seilmeier, Bernhard Piepenbreier  
*University of Erlangen-Nuremberg, Germany*

**20G3-2**  
Ellipse-Trajectory-Oriented Vector Control for Energy Efficient/Wide-Speed-Range Drives of Sensorless PMSM  
14:10  
Shinji Shinnaka¹, Yuki Amano²  
¹Kanagawa University, Japan, ²Kokusai Denki Co., Ltd., Japan

**20G3-3**  
Development of Position Sensorless Control for Permanent-Magnet Synchronous Generator Drive  
14:35  
Yuan-Chih Chang, Chia-Yu Lin, Wei-Fu Dai, Chun-Wei Wu  
*National Chung Cheng University, Taiwan*

**20G3-4**  
Control of a 750kW Permanent Magnet Synchronous Motor  
15:00  
Liping Zheng, Dong Le  
*Calnetix Technologies, LLC, USA*
Room H

Oral Session (Organized) 20H3 Micro Grid and Smart Grid as Future Grid Solutions

Chairs: Olav Bjarte Fosso (Norwegian University of Science and Technology)
        Gabriel Ortiz (ETH Zurich)

20H3-1 Regional Smart Grid of Island in China with Multifold Renewable Energy
Invited Paper
13:20
Xu Cai¹, Zheng Li²
1) Shanghai Jiao Tong University, China, 2) Donghua University, China

20H3-2 Stabilizing Small Island Power System with Renewables by Use of Power Conditioning Systems
-Japanese Island System Case-
Invited Paper
13:45
Jumpei Baba
The University of Tokyo, Japan

20H3-3 Power Electronics Solutions Applied to a Variety of Demonstrative Microgrid Projects
Invited Paper
14:10
Yoshinobu Ueda
Meidensha Corporation, Japan

20H3-4 Moving towards the Smart Grid: the Norwegian Case
Invited Paper
14:35
Olav B. Fosso¹, Marta Molinas¹, Kjell Sand¹, Grete H. Coldevin²
1) Norwegian University of Science and Technology, Norway, 2) The Norwegian Smartgrid Centre, Norway

20H3-5 Power Electronics Technology in Smart Grid Projects -Applications and Experiences-
Invited Paper
15:00
Takenori Kobayashi
Toshiba Corporation, Japan

Room I

Oral Session (Organized) 2013 Technological Innovation in Motors for EV/HEV by Japanese Electric Companies

Chairs: Kan Akatsu (Shibaura Institute of Technology)
        Nobuyuki Matsui (Chubu University)

2013-1 EV and HEV Motor Development in TOSHIBA
Invited Paper
13:20
Masanori Arata¹, Yoshihiro Kurihara¹, Daisuke Misu¹, Masakatsu Matsuhara²
1) Toshiba Corporation, Japan, 2) Toshiba Industrial Products and Systems Corporation, Japan

2013-2 Motor Stator with Thick Rectangular Wire Lap Winding for HEVs
Invited Paper
13:45
Takashi Ishigami, Yuichiro Tanaka, Hiroshi Homma
Hitachi, Ltd., Japan

2013-3 Comparison Study of Various Motors for EVs and the Potentiality of a Ferrite Magnet Motor
Invited Paper
14:10
Daiki Matsuhashi, Keisuke Matsuo, Takashi Okitsu, Tadashi Ashikaga, Takayuki Mizuno
Meidensha Corporation, Japan

2013-4 Optimal Field Excitation Control of a Claw Pole Motor for Hybrid Electric Vehicle
Invited Paper
14:35
M. Azuma, M. Hazeyama, M. Morita, Y. Kuroda, A. Daikoku, M. Inoue
Mitsubishi Electric Corporation, Japan

2013-5 A Wide Speed Range High Efficiency EV Drive System Using Winding Changeover Technique and SiC Devices
Invited Paper
15:00
Yushi Takatsuka, Hidenori Hara, Kenji Yamada, Akihiko Maemura, Tsuneo Kume
Yaskawa Electric Corporation, Japan

Room J

Oral Session (Organized) 20J3 Application of Wide-Band Gap Semiconductors

Chairs: Brendan McGrath (RMIT University)
        Jun-ichi Itoh (Nagaoka University of Technology)

20J3-1 Performance Comparison of a GaN GIT and a Si IGBT for High-Speed Drive Applications
Invited Paper
13:20
Arda Tüysüz, Roman Bosshard, Johann W. Kolar
ETH Zurich, Switzerland

20J3-2 Wide-Band Gap Devices in PV Systems - Opportunities and Challenges
Invited Paper
13:45
C. Sintamarean, E. Eni, F. Blaabjerg, R. Teodorescu, H. Wang
Aalborg University, Denmark
20J3-3  Power Electronics Equipments Applying Novel SiC Power Semiconductor Modules
Invited Paper
14:10
Kazuaki Mino, Ryuji Yarnada, Hiroshi Kimura, Yasushi Matsumoto
Fuji Electric Co., Ltd., Japan

20J3-4  Experimental Verification of an EMC Filter Used for PWM Inverter with Wide Band-Gap Devices
Invited Paper
14:35
Jun-ichi Itoh, Takahiro Araki, Koji Orikawa
Nagaoka University of Technology, Japan

20J3-5  Packaging for SiC Power Device
Invited Paper
15:00
Tsuyoshi Funaki
Osaka University, Japan

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**Room A**

Oral Session (Organized) 20A4 System Integration for Power Converters

Chairs: Dong-Choon Lee (Yeungnam University)
Keiji Wada (Tokyo Metropolitan University)

20A4-1  The Next-Generation High Power Density Inverter Technology for Vehicle
Invited Paper
15:55
Kinya Nakatsu1,2, Ryuichi Saito2
1) Hitachi, Ltd., Japan, 2) Ibaraki University, Japan, 3) Hitachi Automotive Systems, Ltd., Japan

20A4-2  EMI Prediction Method for SiC Inverter by the Modeling of Structure and the Accurate Model of Power Device
Invited Paper
16:20
Sari Maekawa1, Junichi Tsuda1, Atsuhiko Kuzumaki1, Shuhei Matsumoto1, Hiroshi Mochikawa1, Hisao Kubota2
1) Toshiba Corporation, Japan, 2) Meiji University, Japan

20A4-3  System Integration of GaN Technology
Invited Paper
16:45
J. A. Ferreira1, J. Popovic1, J. D. van Wyk1, F. Pansier3
1) Delft University of Technology, The Netherlands, 2) University of Johannesburg, South Africa,
3) NXP Semiconductors, The Netherlands

20A4-4  Power Losses of Multilevel Converters in Terms of the Number of the Output Voltage Levels
Invited Paper
17:10
Nagaoka University of Technology, Japan

20A4-5  A Large Capacity 3-Level IEGT Inverter
Invited Paper
17:35
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

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Room B

Oral Session (Organized) 20B4 Robotics and Mechatronics

Chairs: Yasutaka Fujimoto (Yokohama National University)
Toshiyuki Murakami (Keio University)

20B4-1  Vibration Suppressing Control Method of Angular Transmission Error of Cycloid Gear for Industrial Robots
Invited Paper
15:55
Takashi Yoshioka, Yosei Hirano, Kiyoshi Ohishi, Toshimasa Miyazaki, Yuki Yokokura
Nagaoka University of Technology, Japan

20B4-2  An Advanced Position Control of Overhead Crane by Sway Suppression Method Emulating Natural Damping
Invited Paper
16:20
Toshiyuki Kurabayashi, Chuan Yang, Toshiyuki Murakami
Keio University, Japan

20B4-3  A Robotic Cane for Walking Assistance
Invited Paper
16:45
Kyohei Shimizu1, Issam Smadi2, Yasutaka Fujimoto1
1) Yokohama National University, Japan, 2) Jordan University of Science and Technology, Jordan

20B4-4  Hand Position Estimation in Binocular Visual Space Using Linear Approximation of Kinematics
Invited Paper
17:10
Satoshi Komada1, Santiago Turpin1, Kento Hashimoto1, Daisuke Yashiro1, Junji Hirai1
1) Mie University, Japan, 2) Ford, Spain

20B4-5  Contact State Recognition Based on Haptic Signal Processing for Robotic Tool Use
Invited Paper
17:35
Ryohei Matsuzaki, Jun Okuma, Sho Sakaino, Toshiaki Tsuji
Saitama University, Japan
Room C

Oral Session (Organized) 20C4 Recent Trends of a Next-Generation Application Oriented Electric Machines and their Magnetic Materials

Chairs: Takashi Kosaka (Nagoya Institute of Technology)
Masatsugu Takemoto (Hokkaido University)

20C4-1 Recent Technical Trends in Magnetic Materials
Invited Paper
15:55
Kiyoshi Wajima¹, Yasuhiro Marukawa², Hiroaki Toda³, Chio Ishihara⁴, Takashi Kosaka⁵
1) Nippon Steel and Sumitomo Metal Corporation, Japan, 2) Hitachi Metals, Ltd., Japan,
3) JFE Steel Corporation, Japan, 4) Hitachi Chemical Co., Ltd., Japan, 5) Nagoya Institute of Technology, Japan

20C4-2 Multi-Domain Co-Simulation with Numerically Identified PMSM Interworking at HILS for Electric Propulsion
Invited Paper
16:20
Gyeong-Jae Park¹, Hochang Jung², Yong-Jae Kim³, Sang-Yong Jung³
1) Sungkyunkwan University, Korea, 2) Korea Automotive Technology Institute, Korea, 3) Chosun University, Korea

20C4-3 Recent Technical Trends in PMSM
Invited Paper
16:45
Shigeo Morimoto¹, Yoshinari Asano², Takashi Kosaka³, Yuji Enomoto⁴
1) Osaka Prefecture University, Japan, 2) Daikin Industries, Ltd., Japan, 3) Nagoya Institute of Technology, Japan,
4) Hitachi, Ltd., Japan

20C4-4 Recent Technical Trends in SRM and FSM
Invited Paper
17:10
Yoshiaki Kano
Toyota National College of Technology, Japan

20C4-5 Recent Technical Trends in Variable Flux Motors
Invited Paper
17:35
Akio Toba¹, Akihiro Daikoku², Noriyoshi Nishiyama³, Yuichi Yoshikawa³, Yosuke Kawazoe⁴
1) Fuji Electric Co., Ltd., Japan, 2) Mitsubishi Electric Corporation, Japan, 3) Panasonic Corporation, Japan,
4) Yaskawa Electric Corporation, Japan

Room D

Oral Session 20D4 Grid Connected Inverters

Chairs: Tzung-Lin Lee (National Sun Yat-sen University)
Makoto Hagiwara (Tokyo Institute of Technology)

20D4-1 A General Discrete Time Model to Evaluate Active Damping of Grid Converters with LCL Filters
15:55
S. G. Parker, B. P. McGrath, D. G. Holmes
RMIT University, Australia

20D4-2 Analysis and Reduction of Power Losses in PV Converters for Grid Connection to Low-Voltage Three-Phase Three-Wire Systems
16:20
Ryosuke Amma, Hideaki Fujita
Tokyo Institute of Technology, Japan

20D4-3 Design of Grid Connected PWM Converters Considering Topology and PWM Methods for Low-Voltage Renewable Energy Applications
16:45
Emre Kantar, Ahmet M. Hava
Middle East Technical University, Turkey

20D4-4 Performance of Dead Time Compensation Methods in Three-Phase Grid-Connection Converters
17:10
Tomoyuki Mannen, Hideaki Fujita
Tokyo Institute of Technology, Japan

20D4-5 D-Σ Digital Control for Three-Phase Bi-Directional Inverters
17:35
T.-F. Wu¹, C.-H. Chang², L.-C. Lin³
1) National Tsing Hua University, Taiwan, 2) National Chung Cheng University, Taiwan
Room E

Oral Session (Organized) 20E4 What is the Leading Power Device for the Next-Generation Home and Consumer Appliances?

Chairs: Hirofumi Uemura (ETH Zurich)
Makoto Kitabatake (Panasonic Corporation)

20E4-1 Invited Paper 15:55
Expectations of Next-Generation Power Devices for Home and Consumer Appliances
Akihiko Kanouda, Hiroyuki Shoji, Takae Shimada, Toshikazu Okubo
Hitachi, Ltd., Japan

20E4-2 Invited Paper 16:20
Application Trend and Foresight of SiC Power Devices to Air Conditioners
Mamoru Kamikura, Yuichiro Murata, Tomohiro Kutsuki, Katsuhiko Saito
Mitsubishi Electric Corporation, Japan

20E4-3 Invited Paper 16:45
Recent Technical Trends and Future Prospects of IGBTs and Power MOSFETs
Tsuneo Ogura
Toshiba Corporation, Japan

20E4-4 Invited Paper 17:10
Recent Development and Future Prospects of Power SiC Devices
T. Nakamura, Y. Nakano, M. Aketa, T. Hanada
Rohn Co., Ltd., Japan

20E4-5 Invited Paper 17:35
Recent Advances and Future Prospects on GaN-Based Power Devices
Tetsuzo Ueda
Panasonic Corporation, Japan

Room F

Oral Session (Organized) 20F4 Conversion Technologies for Renewable Energy and Energy Saving III

Chairs: Jonas Huber (ETH Zurich)
Takashi Nabeshima (Oita University)

20F4-1 Invited Paper 15:55
Scaling and Balancing of Multi-Cell Converters
Matthias Kasper, Dominik Bortis, Johann W. Kolar
ETH Zurich, Switzerland

20F4-2 Invited Paper 16:20
Hybrid Modulated Universal Soft-Switching Current-Fed DC/DC Converter for Wide Voltage Regulation for PV/Fuel Cells/Battery Applications
Radha Sree Krishna Moorthy, Akshay Kumar Rathore
National University of Singapore, Singapore

20F4-3 Invited Paper 16:45
High Efficiency Power Converters for Battery Energy Storage Systems
Noriko Kawakami, Yukihisa Iijima, Haiqing Li, Satoru Ota
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

20F4-4 Invited Paper 17:10
Implementation of Bridgeless Cuk Power Factor Corrector with Positive Output Voltage
Hong-Tzer Yang, Hsin-Wei Chiang
National Cheng Kung University, Taiwan

20F4-5 Invited Paper 17:35
A Novel Synchronous Rectifier Method for a LLC Resonant Converter with Voltage-Doubler Rectifier
Koji Murata, Fujio Kurokawa
Nagasaki University, Japan

Room G

Oral Session (Organized) 20G4 Novel Technologies in Railway Traction Systems

Chairs: Zhongping Yang (Beijing Jiaotong University)
Keiichiro Kondo (Chiba University)

20G4-1 Invited Paper 15:35
Latest Developments in Increasing the Power Density of Traction Drives
Mark-M. Bakran1, Andreas März1, Bernd Laska2, Eberhard Krafft3, Olaf Korner1, Andreas Nagel2
1) University of Bayreuth, Germany, 2) Siemens AG, Germany

Invited Paper 15:55
Invited Paper 16:20
Invited Paper 16:45
Invited Paper 17:10
Invited Paper 17:35
Room H

Oral Session (Organized) 20H4 Power Electronics for Distributed Energy Systems

Chairs: Patricio Cortes (ETH Zurich)
        Yushi Miura (Osaka University)

20H4-1 Power Electronic-Based Protection for Direct-Current Power Distribution in Micro-Grids
Invited Paper
15:55
K. J. Tseng, Guomin Luo
1) Nanyang Technological University, Singapore, 2) Beijing Jiaotong University, China

20H4-2 A Concept of High Power DC/DC Converter with Double Low Power Outputs
Invited Paper
16:20
Masahide Hojo, Tomoya Nishioka, Kenji Yamanaka
The University of Tokushima, Japan

20H4-3 Performance Evaluation for Grid Impedance Based Islanding Detection Method
Invited Paper
16:45
Ning Liu, A. S. Aljankawey, C. P. Diduch, L. Chang, Meiqin Mao, Pegah Yazdkhasti, Jianhui Su
1) Hefei University of Technology, China, 2) University of New Brunswick, Canada

20H4-4 Identifying Natural Degradation/Aging in Power MOSFETs in a Live Grid-Tied PV Inverter Using Spread Spectrum Time Domain Reflectometry
Invited Paper
17:10
Qian Li, Faisal H. Khan
University of Utah, USA

20H4-5 Control Method for Inductive Power Transfer with High Partial-Load Efficiency and Resonance Tracking
Invited Paper
17:35
R. Bosshard, J. W. Kolar, B. Wunsch
1) ETH Zurich, Switzerland, 2) ABB Switzerland Ltd., Switzerland

Room I

Oral Session (Organized) 2014 Simulation and Modeling of Power Electronics and Automotive Systems

Chairs: Jian Sun (Rensselaer Polytechnic Institute)
        Toshiji Kato (Doshisha University)

2014-1 Standard Models for Smart Grid Simulations
Invited Paper
15:55
Taku Noda, Shinji Kato, Tomohiro Nagashima, Yoichi Sekiha, Takayuki Sekiue, Hirokazu Tokuda, Yuichi Kabasawa, Masaaki Kounoto
1) Central Research Institute of Electric Power Industry, Japan, 2) Kobe City College of Technology, Japan, 3) Denryoku Computing Center, Japan 4) ANSYS Japan K.K., Japan, 5) Fuji Electric Co., Ltd., Japan, 6) Tohoku Electric Power Co., Inc., Japan, 7) Panasonic Corporation, Japan
2014-2  Model Development for Motor Drive System Simulations
Hiroki Ishikawa¹, Nobuhiro Umeda², Noriyuki Kimura², Masahiro Ikeda³, Takashi Abe³, Toshiji Kato³,
Yutaka Kubota³, Koichi Shigematsu³, Junichi Shimomura³, Yukinori Inoue³, Yusuke Kohno³
¹) Gifu University, Japan, 2) Yaskawa Electric Corporation, Japan, 3) Osaka Institute of Technology, Japan,
4) Nagasaki Institute of Applied Science, Japan, 5) Nagasaki University, Japan, 6) Doshisha University, Japan,
7) Mitsubishi Heavy Industries, Ltd., Japan, 8) Cybernet Systems Co., Ltd., Japan, 9) Meidensha Corporation, Japan,
10) Osaka Prefecture University, Japan, 11) Toshiba Corporation, Japan

2014-3  Practical Simulation Examples of Automotive and Power Supply Systems
Takashi Abe¹, Kentaro Fukushima¹, Takayuki Sekisue¹, Koichi Shigematsu¹, Junichi Ichihara¹, Toshiji Kato¹,
Hiroki Ishikawa¹, Yusuke Kouno¹, Masaaki Konoto¹, Ryoji Saito¹, Yasuyuki Nishida¹
¹) Nagasaki University, Japan, 2) Central Research Institute of Electric Power Industry, Japan, 3) ANSYS Japan K.K.,
Japan, 4) Cybernet Systems Co., Ltd., Japan, 5) AZAPA Co., Ltd., Japan, 6) Doshisha University, Japan,
7) Gifu University, Japan, 8) Toshiba Corporation, Japan, 9) Panasonic Corporation, Japan,
10) Formerly with Origin Electric Co., Ltd., Japan, 11) Chiba Institute of Technology, Japan

2014-4  Admittance Matrices of Voltage Source Converters for Distributed Generators
K. L. Lian, T. D. Huang
National Taiwan University of Science and Technology, Taiwan

2014-5  FPGA-Based Simulation of Power Electronics Using Iterative Methods
Huiguo Zhang¹, Jian Sun²
¹) Changshu Institute of Technology, China, 2) Rensselaer Polytechnic Institute, USA

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Room J

Oral Session (Organized) 20J4 Power Supplies on Chip

**Chairs:** Tat-Sing Paul Chow (Rensselaer Polytechnic Institute)
Satoshi Matsumoto (Kyushu Institute of Technology)

20J4-1  Gallium Arsenide IC Technology for Power Supplies on Chip
T. Paul Chow, Vipindas Pala, Han Peng, Mona Hella
Rensselaer Polytechnic Institute, USA

20J4-2  Silicon on Nanocrystalline and Microcrystalline Diamond Stacking Structure for Power Supply on Chip
Takatoshi Yamada, Masataka Hasegawa
National Institute of Advanced Industrial Science and Technology, Japan

20J4-3  A Novel Load Regulation Technique for Power-SoC with Parallel Connected POLs
Seiya Abe¹, Akira Hidaka¹, Jungsik Rikitake¹, Satoshi Matsumoto¹, Tamotsu Ninomiya¹
¹) The International Centre for the Study of East Asian Development, Japan, 2) Kyushu Institute of Technology, Japan

20J4-4  Matrix-POL Architecture for Integrated Power Supply
Yoichi Ishizuka¹, Kiminori Tanaka¹, Ryota Shibahara¹, Seiya Abe², Tamotsu Ninomiya²
¹) Nagasaki University, Japan, 2) The International Centre for the Study of East Asian Development, Japan

20J4-5  On-Chip Buck Converter with Spiral Ferrite Inductor and Reducing IR Drop in 3D Stacked Integration
Hiroshi Fuketa, Yasuhiro Shinozuka, Koichi Ishida, Makoto Takamiya, Takayasu Sakurai
The University of Tokyo, Japan
Oral Session 21A1 DC-DC Converters I

Room A

**Chairs:** Sanjib Kumar Panda (National University of Singapore)
Yushi Miura (Osaka University)

**Oral Session 21A1 DC-DC Converters I**

***8:30***

**21A1-1**

**DCM Analysis of a Single SiC Switch Based ZVZCS Tapped Boost Converter**

Bo H. Choi, Eun S. Lee, Ji H. Kim, Chun T. Rim
Korea Advanced Institute of Science and Technology, Korea

**21A1-2**

**Effect of Input and Output Terminal Sources on Dynamic Behavior of Switched-Mode Converters**

T. Suntio¹, J. Viinamäki¹, J. Jokipii², T. Messo¹, M. Sibon², A. Kuperman²
1) Tampere University of Technology, Finland, 2) Ariel University, Israel

**21A1-3**

**A Fully Soft-Switched Multiphase DC-DC Converter with Reduced Switch Count for High Power Application**

Minjae Kim, Daeki Yang, Sewan Choi
Seoul National University of Science and Technology, Korea

**21A1-4**

**A Static Characteristic Analysis of Proposed Bi-Directional Dual Active Bridge DC-DC Converter**

Shun Nagata¹, Mika Takasaki¹, Yutaka Furukawa¹, Toshiro Hirose², Yoichi Ishizuka¹
1) Nagasaki University, Japan, 2) Koga System Works, Japan, 3) Nishimu Electronics Industries Co., Ltd., Japan

Room B

**Oral Session 21B1 Energy Storage System for EVs**

**Chairs:** Feel-soon Kang (Hanbat National University)
Keiichiro Kondo (Chiba University)

**21B1-1**

**Hybrid Battery Charging System Combining OBC with LDC for Electric Vehicles**

Seonghye Kim, Feel-soon Kang
Hanbat National University, Korea

**21B1-2**

**Transient Behavior of the Dual Active Bridge Converter in High Efficient Energy Conversion System**

Kohei Aoyama¹, Naoki Motori², Yukinori Tsuruta¹, Atsuo Kawamura¹
1) Yokohama National University, Japan, 2) Kobe University, Japan

**21B1-3**

**State-of-Charge Estimation for Lithium-Ion Battery Pack Using Reconstructed Open-Circuit-Voltage Curve**

Chang Yoon Chun, Gab-Su Seo, Sung Hyun Yoon, Bo-Hyung Cho
Seoul National University, Korea

**21B1-4**

**System Design of Electric Assisted Bicycle Using EDLCs and Wireless Charger**

Jun-ichi Itoh, Kenji Noguchi, Koji Orikawa
Nagaoka University of Technology, Japan

Room C

**Oral Session 21C1 Gate Drive Technologies**

**Chairs:** Hideaki Fujita (Tokyo Institute of Technology)
Kaoru Katoh (Hitachi, Ltd.)

**21C1-1**

**Study on Low-Loss Gate Drive Circuit for High Efficiency Server Power Supply Using Normally-Off SiC-JFET**

Kaoru Katoh, Katsumi Ishikawa, Ayumu Hatanaka, Kazutoshi Ogawa, Satoru Akiyama, Takashi Ogawa,
Natsuki Yokoyama, Naoki Maru, Osamu Takahashi, Koji Nishisu
Hitachi, Ltd., Japan

**21C1-2**

**A Short Circuit Protection Method Based on a Gate Charge Characteristic**

Takeshi Horiguchi¹, Shin-ichi Kinouchi², Yasushi Nakayama³, Takeshi Oi³, Hiroaki Urushihata³, Shoji Okamoto³,
Shinji Tominaña¹, Hirofumi Akagi³
1) Mitsubishi Electric Corporation, Japan, 2) Kanazawa Institute of Technology, Japan, 3) Tokyo Institute of
Technology, Japan

**21C1-3**

**Highly Reliable 1200-V P-Type MOSFET for Level-Shift Circuit Used in Driver IC**

Naoki Sakurai¹, Masashi Yura², Takuma Hakutou²
1) Hitachi, Ltd., Japan, 2) Hitachi Automotive Systems, Ltd., Japan
Oral Session 21D1 AC-DC Converters

Chairs: Yongsug Suh (Chonbuk National University)
        Kazuaki Mino (Fuji Electric Co., Ltd.)

21D1-1 Output Ripple Minimization of Single-Stage Power Factor Corrected Bi-Directional Buck AC/DC Converter
8:30 Balaji Veerasamy, Wataru Kitagawa, Takaharu Takeshita
Nagoya Institute of Technology, Japan

21D1-2 Three-Phase Isolated Full-Bridge Boost PFC with Flyback Passive Auxiliary Converter
8:55 Tao Meng, Shuai Yu, Hongqi Ben, Guo Wei, Shaohua Sun
Harbin Institute of Technology, China

21D1-3 Control and Experiment of a Modular Push-Pull PWM Converter for a Battery Energy Storage System
9:20 Makoto Hagiwara, Hirofumi Akagi
Tokyo Institute of Technology, Japan

21D1-4 Active Front-End Topology for 5 Level Medium Voltage Drive System with Isolated DC Bus
9:45 Toshiaki Oka,1 Mike Daskalos,2 John Kleinecke,2 Hironobu Kusunoki,1 Masahiko Tsukakoshi1
1) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan, 2) Toshiba International Corporation, USA

Oral Session 21E1 DC-DC Converters for Renewable Energy I

Chairs: Dehong Xu (Zhejiang University)
        Kimihiro Nishijima (Oita University)

21E1-1 A Dual Active Bridge DC-DC Converter with Optimal DC-Link Voltage Scaling and Flyback Mode for Enhanced
        Low-Power Operation in Hybrid PV/Storage Systems
8:30 Shahab Poshtkouhi, Olivier Trescases
University of Toronto, Canada

21E1-2 Novel Modular Multiple-Input Bidirectional DC-DC Power Converter (MIPC)
8:55 Andrew Hintz, Udupi R. Prasanna, Kaushik Rajashekara
University of Texas at Dallas, USA

21E1-3 Single-Switch PWM Converter Integrating Voltage Equalizer for Photovoltaic Modules under Partial Shading
9:20 Masatoshi Uno, Akio Kukita
Japan Aerospace Exploration Agency, Japan

21E1-4 New DC Rail Side Soft-Switching PWM DC-DC Converter with Voltage Doubler Rectifier for PV Generation
        Interface
9:45 Khairy Sayed, Soon-Kurl Kwon, Katsumi Nishida, Mutsuo Nakaoka
1) Sohag University, Egypt, 2) Kyungnam University, Korea, 3) Ube National College of Technology, Japan,
4) Yamaguchi University, Japan

Oral Session 21F1 EMI in Power Electronics

Chairs: Donald Grahame Holmes (RMIT University)
        Keiji Wada (Tokyo Metropolitan University)

21F1-1 Modeling Method of Stray Magnetic Couplings in an EMC Filter for a SiC Solar Inverter
8:30 Takashi Masuzawa, Eckart Hoene, Stefan Hoffmann, Klaus-Dieter Lang
1) Denso Corporation, Japan, 2) Fraunhofer IZM, Germany

21F1-2 DC Bus Voltage EMI Mitigation in Three-Phase Active Rectifiers Using a Virtual Neutral Filter
8:55 S. G. Parker, D. S. Segaran, D. G. Holmes, B. P. McGrath
RMIT University, Australia
21F1-3 Effects of Transformer Structures on the Noise Balancing and Cancellation Mechanisms of Switching Power Converters
Hung-I Hsieh, Sheng-Fang Shih
National Chiayi University, Taiwan

21F1-4 A Novel Technique for Reducing Leakage Current by Application of Zero-Sequence Voltage
Hideki Ayano, Kouhei Murakami, Yoshihiro Matsui
Tokyo National College of Technology, Japan

Room G

Oral Session 21G1 Distribution Systems (Power Quality)
Chairs: Wilson Komatsu (The University of São Paulo)
Ruben Inzunza (Toshiba Mitsubishi-Electric Industrial Systems Corporation)

21G1-1 AC-Choppers Using Instantaneous Voltage Control Technique to Solve Voltage Sag Problems
8:30 Surin Khomfoi
King Mongkut’s Institute of Technology Ladkrabang, Thailand

21G1-2 Voltage Regulation in Distribution System Using the Combined DVR
8:55 Sota Nakamura, Mutsumi Aoki, Hiroyuki Ukai
Nagoya Institute of Technology, Japan

21G1-3 Nonlinear Control of Three-Phase Four-Wire Dynamic Voltage Restorers for Distribution System
9:20 Seon-Yeong Jeong1, Thanh Hai Nguyen1, Dong-Choon Lee1, Jang-Mok Kim1
1) Yeungnam University, Korea, 2) Pusan National University, Korea

21G1-4 Disturbance Calculation Based on Space Vector Dot Product: Applications to Compensators
9:45 Kelly Caroline Minguainca de Carvalho, Naji Rajai Nasri Arna, Wilson Komatsu, Fernando Ortiz Martinez, Ricardo Souza Figueredo, Lourenço Matakas Junior
University of São Paulo, Brazil

Room H

Oral Session 21H1 Control Techniques of Various Motors I
Chairs: Ralph Mario Kennel (Technische Universitaet Muenchen)
Takeo Ishikawa (Gunma University)

21H1-1 Proposal of 6th Radial Force Control Based on Flux Linkage -- Verification on Load Condition --
8:30 Masato Kanematsu1, Takayuki Miyajima1, Hiroshi Fujimoto1, Yoichi Hori1, Toshio Enomoto2, Masahiko Kondou2, Hiroshi Komiya1, Kantaro Yoshimoto2, Takayuki Miyakawa2
1) The University of Tokyo, Japan, 2) Nissan Motor Co., Ltd., Japan

21H1-2 Air Gap Control of Multi-Phase Transverse Flux Permanent Magnet Linear Synchronous Motor by Using Independent Vector Control
8:55 Seon-Hwan Hwang1, Deok-Ie Bang1, Ji-Won Kim2
1) Kyungnam University, Korea, 2) Korea Electrotechnology Research Institute, Korea

21H1-3 Modified Direct Instantaneous Torque Control of Switched Reluctance Motor with High Torque per Ampere and Reduced Source Current Ripple
9:20 Rohit Suryadevara, B. G. Fernandes
Indian Institute of Technology Bombay, India

21H1-4 Control of Wound Field Synchronous Motor Integrated with ZSI
9:45 G. Tajima1, T. Kosaka1, N. Matsu1, K. Tonogi2, N. Minoshima2, T. Yoshida2
1) Nagoya Institute of Technology, Japan, 2) Toyota Industries Corporation, Japan

Room I

Oral Session (Organized) 21I1 Recent Advancements in Sensorless-Control Oriented Design of PM Motors and Drives
Chairs: Seung-Ki Sul (Seoul National University)
Kozo Ide (Yaskawa Electric Corporation)

21I1-1 A Novel IPMSM Model for Robust Position Sensorless Control to Magnetic Saturation
8:30 Atsushi Matsumoto1, Masaru Hasegawa2, Shinji Doki3
1) Nagoya University, Japan, 2) Chubu University, Japan
Room J

Oral Session 21J1 Motion Control and Robotics I

Chair: Kenji Natori (Chiba University)
Kiyoshi Ohishi (Nagaoka University of Technology)

21J1-1 Force Sensorless Bilateral Control Using a Dynamical Asymmetric Compensator
8:30
Ryota Hama, Jun Imai, Akiko Takahashi, Shigeyuki Funabiki
Okayama University, Japan

21J1-2 Design of m-IPD Controller of Multi-Inertia System Using Differential Evolution
8:55
Hidehiro Ikeda¹, Tsuyoshi Hanamoto²
1) Nishi-Nippon Institute of Technology, Japan, 2) Kyushu Institute of Technology, Japan

21J1-3 A Guide to Design Disturbance Observer Based Motion Control Systems
9:20
Emre E. Sariyildiz, Kouhei Ohnishi
Keio University, Japan

9:45
Seppo E. Saarakkala, Marko Hinkkanen
Aalto University, Finland

Room A

Oral Session 21A2 DC-DC Converters II

Chair: Sewan Choi (Seoul National University of Science and Technology)
Hitoshi Haga (Nagaoka University of Technology)

21A2-1 Inductor Loss Calculation of Coupled Inductors for High Power Density Boost Converter
10:40
Yuki Itoh, Shota Kimura, Jun Imaoka, Masayoshi Yamamoto
Shimane University, Japan

21A2-2 1.2kW Dual-Active Bridge Converter Using SiC Power MOSFETs and Planar Magnetics
11:05
D. De, A. Castellazzi, A. Lamantia
University of Nottingham, UK

21A2-3 Analysis of Hysteresis and Eddy-Current Losses for a Medium-Frequency Transformer in an Isolated DC-DC Converter
11:30
Mizuki Nakahara, Keiji Wada
Tokyo Metropolitan University, Japan

21A2-4 Experimental Verification of Capacitive Power Transfer Using One Pulse Switching Active Capacitor for Practical Use
11:55
Tatsuaki Kitabayashi, Hirohito Funato, Hiroya Kobayashi, Katsuya Yamauchi
Utsunomiya University, Japan

Wednesday, May 21: 10:40 - 12:20
Oral Session 21B2 Power Electronics and Design Methodology Applied to Home Applications

Chairs: Chun T. Rim (Korea Advanced Institute of Science and Technology)  
Kaoru Inoue (Doshisha University)

21B2-1 A Single-Stage High-PF Driver for Supplying a T8-Type LED Lamp
10:40  
I-Shou University, Taiwan

21B2-2 Elimination of Electrolytic Capacitor in AC-DC System of LED Driver
11:05  
Rijalul Fahmi Mustapa, Nabil M. Hidayat, Rahayu Tukiman  
Universiti Teknologi MARA, Malaysia

11:30  
Tomokazu Mishima1, Yuki Nakagawa1, Mutsuo Nakaoka2  
1) Kobe University, Japan, 2) Kyungnam University, Korea

21B2-4 Application of Virtual Validation System for Inverter Heat Pump System
11:55  
Masaki Kanamori1, Koji Noda1, Takahisa Endo1, Nobuyuki Suzuki1  
1) Toshiba Carrier Corporation, Japan, 2) Toshiba Corporation, Japan

Room C

Oral Session 21C2 IGBT & Related Assembly Technologies

Chairs: Hiroshi Tadano (University of Tsukuba)  
Hideaki Fujita (Tokyo Institute of Technology)

21C2-1 Test Setup for Accelerated Test of High Power IGBT Modules with Online Monitoring of $V_{ce}$ and $V_{f}$ Voltage during Converter Operation
10:40  
Angel Ruiz de Vega1, Pramod Chimire1, Kristian Bonderup Pedersen1, Ionut Trintis1, Szymon Beczkowski1, Stig Munk-Nielsen1, Bjørn Rannestad1, Paul Thøgersen1  
1) Aalborg University, Denmark, 2) kk-electronic a/s, Denmark

21C2-2 Design of High-Speed IGBT-Based Switching Modules for Pulsed Power Applications
11:05  
Andreas Kluge1, Lutz Goehler1, Henry Guelder1, Thomas Trompa1, David Mory1, Karl-Heinz Segsa1  
1) TU Dresden, Germany, 2) HTW Dresden, Germany, 3) Lasertechnik Berlin GmbH, Germany, 4) Spree Hybrid & Kommunikationstechnik GmbH, Germany

21C2-3 Comparative Suitability Evaluation of Reverse-Blocking IGBTs for Current-Source Based Converter
11:30  
Ankan De, Sudhin Roy, Subhashish Bhattacharya  
North Carolina State University, USA

21C2-4 New Reverse-Conducting IGBT (1200V) with Revolutionary Compact Package
11:55  
Fuji Electric Co., Ltd., Japan

Room D

Oral Session 21D2 PFC Converters

Chairs: Brendan Peter McGrath (RMIT University)  
Ikuya Sato (Fuji Electric Co., Ltd.)

21D2-1 An Improved Modulated Carrier Control of Single-Phase CCM Boost PFC Converter
10:40  
Hyejin Kim1, Bo-Hyung Cho2, Hangeek Choi1  
1) Seoul National University, Korea, 2) Fairchild Semiconductor, USA

21D2-2 Modified Interleaved Current Sensorless Control for Three-Level Boost PFC Converter with Asymmetric Loads
11:05  
Hung-Chi Chen, Jhen-Yu Liao  
National Chiao Tung University, Taiwan

21D2-3 A Novel Critical-Conduction-Mode Bridgeless Interleaved Boost PFC Rectifier
11:30  
Guoen Cao, Hee-Jun Kim  
Hanyang University, Korea
Room E

Oral Session 21E2 PV Systems II

Chairs: Hung-I Hsieh (National Chiayi University) Masatoshi Nakahara (Sojo University)

21E2-1 Linear Over-Modulation Strategy for Current Control in Photovoltaic Inverter
10:40
Yongssoon Park1, Seung-Ki Sul1, Ki-Nam Hong1
1) Seoul National University, Korea, 2) LG U+ Corp., Korea

21E2-2 Design of Decentralized Voltage Control for PV Inverters to Mitigate Voltage Rise in Distribution Power System without Communication
11:05
Tzung-Lin Lee, Shih-Sian Yang, Shang-Hung Hu
National Sun Yat-sen University, Taiwan

21E2-3 Stability Analysis and Active Damping for LLCL-Filter Based Grid-Connected Inverters
11:30
Min Huang1, Frede Blaabjerg1, Poh Chiang Loh1, Weimin Wu1
1) Aalborg University, Denmark, 2) Shanghai Maritime University, China

21E2-4 Integrated Common and Differential Mode Filter Applied to a Single-Phase Transformerless PV Microinverter with Low Leakage Current
11:55
Ricardo Souza Figueiredo, Kelly Caroline Mingorancisa de Carvalho, Lourenço Matakasa Junior
University of São Paulo, Brazil

Room F

Oral Session 21F2 Modeling and Simulation

Chairs: Dushan Boroyevich (Virginia Polytechnic Institute and State University) Takashi Abe (Nagasaki University)

21F2-1 Design and Integration of Interphase Inductors for Interleaved Three Phase Voltage-Source-Inverters in DC-Fed Motor Drive Systems
10:40
Xuning Zhang, Dushan Boroyevich, Rolando Burgos
Virginia Polytechnic Institute and State University, USA

21F2-2 A Novel Transformer Model Using Magnetic Circuit
11:05
Fuminori Nakamura1, Toshiumi Isé1
1) Mitsubishi Electric Corporation, Japan, 2) Osaka University, Japan

21F2-3 Hardware-In-the-Loop Simulation of a Machine Model with Real-Time Animation
11:30
Xiaojie Zhuang1, Ryosuke Terabe1, Shinya Hibino1, Takayuki Ozaki1, Masaya Harakawa1, Tetsuki Nagano1
1) Mitsubishi Electric Corporation, Japan, 2) Mitsubishi Electric Engineering Corporation, Japan

21F2-4 Development of Real Time Digital Simulator for Self-Commutated SVC to Suppress Voltage Flicker
11:55
Yutaka Terao1, Yasuhiro Shishida1, Yoshinori Tsuruma1, Tomoisugu Ishizuka1, Fumio Aoyama1, Teruo Yoshino1, Yutaka Kato1, Jean Bélanger1
1) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan, 2) NEAT Co., Ltd, Japan, 3) OPAL-RT TECHNOLOGIE, Inc., Canada

Room G

Oral Session (Organized) 21G2 Microgrids & FACTS

Chairs: Xu Cai (Shanghai Jiao Tong University) Noriyuki Kimura (Osaka Institute of Technology)

21G2-1 Operational Aspects and Power Architecture Design for a Microgrid to Increase the Use of Renewable Energy in Wireless Communication Networks
10:40
Alexis Kwasinski1, Andres Kwasinski2
1) The University of Texas at Austin, USA, 2) Rochester Institute of Technology, USA

21G2-2 P+ Multiple Resonant Control for Output Voltage Regulation of Microgrid with Unbalanced and Nonlinear Loads
11:05
Kyungbae Lim1, Jaeho Choi1, Juyoung Jang2, Jaesik Kim1, Junghum Lee2
1) Chungbuk National University, Korea, 2) POSCO Energy Co., Ltd., Korea
21G2-3  
Invited Paper  
11:30  
130MVA-STATCOM for Transient Stability Improvement  
Takao Imanishi¹, Yoshinobu Nagatomo¹, Shinya Iwasaki¹, Kenji Masaki², Toshiyuki Fujii², Jun Ieda³  
¹) The Kansai Electric Power Co., Inc., Japan, ²) Mitsubishi Electric Corporation, Japan, ³) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

21G2-4  
Invited Paper  
11:55  
Improved Droop Controller for Microgrid Inverter Considering the Line Impedance Mismatching  
Du Yan, Liuchen Chang, Meiqin Mao, Jianhui Su, Ning Liu  
Hefei University of Technology, China

Room H

Oral Session 21H2 Control Techniques of Various Motors II  
Chairs: Wilhelm Peters (University of Paderborn)  
Tadanoa Zanma (Chiba University)

21H2-1  
10:40  
Suppression Control Method for Iron Loss of MATRIX Motor under Flux Weakening Utilizing Individual Winding Current Control  
Hiroki Hijikata¹, Kan Akatsu¹, Yoshihiro Miyama², Hideaki Arita², Akihiro Daikoku²  
¹) Shibaura Institute of Technology, Japan, ²) Mitsubishi Electric Corporation, Japan

21H2-2  
11:05  
Performance Analysis of a New Concentrated-Winding Interior Permanent Magnet Synchronous Machine under Field Oriented Control  
D. Nguyen¹, R. Dutta¹, J. Fletcher¹, F. Rahman¹, Howard Lovatt¹  
¹) The University of New South Wales, Australia, ²) Commonwealth Scientific and Industrial Research Organisation, Australia

21H2-3  
11:30  
Online Particle Swarm Optimization for Sensorless IPMSM Drives Considering Parameter Variation  
Z. Q. Song¹, D. Xiao², M. F. Rahman¹  
¹) Yangzhou Polytechnic College, China, ²) The University of New South Wales, Australia

21H2-4  
11:55  
A DTC-PWM Control Scheme of PMSM Based on 12-Sectors Division and Speed Information  
Yunchang Kwak, Jin-Woo Ahn, Dong-Hee Lee  
Kyungsung University, Korea

Room I

Oral Session (Organized) 21I2 Conversion Technologies for Renewable Energy and Energy Saving IV  
Chairs: Yaow-Ming Chen (National Taiwan University)  
Yoichi Ishizuka (Nagasaki University)

21I2-1  
10:40  
Control of Power Flow between the Wind Generator and Network  
Péter Stumpf, István Nagy, István Vajk  
Budapest University of Technology and Economics, Hungary

21I2-2  
11:05  
Advances in Nanogrid Technology and Its Integration into Rural Electrification in India  
Santanu Mishra, Olive Ray  
Indian Institute of Technology Kanpur, India

21I2-3  
11:30  
Study and Implementation of Seven-Level Inverter Using Coupled Inductor and Switched-Capacitor  
Yi-Chun Lin, Jiann-Fuh Chen, Wen-Chien Hsu, Sheng-Kai Kao  
National Cheng Kung University, Taiwan

21I2-4  
11:55  
Cascaded Multilevel Converter Based Bidirectional Inductive Power Transfer (BIPT) System  
Bac Xuan Nguyen¹, D. M. Vilathgamuwa¹, Gilbert Foo¹, Andrew Ong¹, Prasad K. Sampath¹, Udaya K. Madawala¹  
¹) Nanyang Technological University, Singapore, ²) University of Auckland, New Zealand

Room J

Oral Session 21J2 Power Supply Control  
Chairs: Byungcho Choi (Kyungpook National University)  
Masahito Shoyama (Kyushu University)

21J2-1  
10:40  
Undersampling Control of a Bidirectional Cascaded Buck+Boost Dc-Dc Converter  
Martin Rosekeit¹, Philipp Joebges¹, Markus Lelie¹, Dirk Uwe Sauer¹, Rik W. De Doncker¹  
¹) RWTH Aachen University, Germany, ²) JARA-Energy, Germany
21J2-2 Sub-Microsecond Response Digital Controller for POL
Hirotaka Nonaka¹, Yoichi Ishizuoka³, Kenji Mii¹, Fumiaki Takenami¹, Daisuke Kanemoto³
1) Nagasaki University, Japan, 2) The University of Yamanashi, Japan

21J2-3 Gain Controlled High Efficiency Power Factor Correction Circuit
Yu Yonezawa¹, Hiroshi Nakao¹, Tomotake Sasaki¹, Yoshihito Matsui¹, Yoshiyasu Nakashima¹, Junji Kaneko¹, Hiroshi Shimamori², Yukio Yoshino², Hisato Hosoyama³, Atsushi Manabe¹, Shun Motizuki³, Shigebaru Yamashita⁴
1) Fujitsu Laboratories Ltd., Japan, 2) Fujitsu Ltd., Japan, 3) Fujitsu Advanced Technologies Ltd., Japan, 4) Fujitsu Telecom Networks Ltd., Japan

21J2-4 Design of Quasi-Resonant Flyback Converter Control IC with DCM and CCM Operation
Kai-Hui Chen, Tsong-Juu Liang
National Cheng Kung University, Taiwan

Wednesday, May 21: 12:35 - 14:05

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**Poster Session 21P1 DC-DC Converters III**

**Chairs:** Yoshiya Ohnuma (Nagaoka Power Electronics Co., Ltd.)
Hideki Ayano (Tokyo National College of Technology)

**21P1-1** Load Transient Response Improvement Based on PID Control
Y. T. Yau, K. I. Hwu
National Taipei University of Technology, Taiwan

**21P1-2** An Active-Clamping Forward Converter with Non-Linear Step-Down Conversion
Jing-Yuan Lin¹, Yu-Kang Lo¹, Huang-Jen Chiu¹, Chao-Fu Wang², Chien-Yu Lin²
1) National Tainan College, Taiwan, 2) National Taiwan University of Science and Technology, Taiwan

**21P1-3** Switching Loss Minimization of 3-Phase Interleaved Bidirectional DC-DC Converter
Eui-Cheol Nho¹, Jae-Hun Jung¹, Hak-Soo Kim¹, In-Dong Kim¹, Heung-Geun Kim², Tae-Won Chun³
1) Pukyong National University, Korea, 2) Kyungpook National University, Korea, 3) University of Ulsan, Korea

**21P1-4** Modified Three-Phase Three-Level Dc-Dc Converter -Adopting Asymmetrical Duty Cycle Control
Yue Chen, Xuling Chen, Fuxin Liu, Xinbo Ruan
Nanjing University of Aeronautics and Astronautics, China

**21P1-5** Deadbeat Control of Power Leveling Unit with Bidirectional Buck/Boost DC/DC Converter
Shin-ichi Hamasaki, Ryosuke Mukai, Yoshihiro Yano, Mineo Tsuji
Nagasaki University, Japan

**21P1-6** Design of Optimized On-Off Control to Improve Efficiency of Paralleled Converter System
Teruhiko Kohama, Yuki Sogawa, Satoshi Tsuji
Fukuoka University, Japan

**21P1-7** Efficiency Improvements in a Single Active Bridge Modular DC-DC Converter with Snubber Capacitance Optimisation
Yeh Ting, Sjoerd de Haan, Jan A. Ferreira
Delft University of Technology, The Netherlands

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**Poster Session 21P2 Power Converters III**

**Chairs:** Kenichiro Sano (Central Research Institute of Electric Power Industry)
Hideki Ayano (Tokyo National College of Technology)

**21P2-1** A Wireless Power Transfer System Optimized for High Efficiency and High Power Applications
Mohammad Bani Shamsheh¹, Atsuo Kawamura¹, Itsuo Yuzuruhara¹, Atsushi Takayanagi¹
1) Yokohama National University, Japan, 2) Kyosan Electric Manufacturing Co., Ltd., Japan

**21P2-2** Non-Iterative LCL Filter Design for Three-Phase Two-Level Voltage-Source PWM Converters
Byung-Geuk Cho, Seung-Ki Sul
Seoul National University, Korea

**21P2-3** DSP-Based Interleaved Buck Power Factor Corrector
Yu-Chen Liu, Tsan Chen, Po-Jung Tseng, Yu-Kang Lo, Huang-Jen Chiu
National Taiwan University of Science and Technology, Taiwan
21P2-4 The Average Model of a Three-Phase Three-Stage Power Electronic Transformer
Shaodi Ouyang, Jinjun Liu, Xinyu Wang, Xiaojian Wang, Fei Meng, Javid Riffat
Xi’an Jiaotong University, China

21P2-5 A Multi-Carrier PWM for AC-DC-AC Converter without DC Link Electrolytic Capacitor
Chung-Chuan Hou, Hsin-Ping Su
Chung Hua University, Taiwan

21P2-6 A Decoupling Offset-Based PWM Control for a Multilevel Inverter under DC Voltage Unbalance
Nho Van Nguyen1, Tam Khanh Tu Nguyen1, Hong-Hee Lee2
1) Ho Chi Minh City University of Technology, Vietnam, 2) University of Ulm, Korea

21P2-7 $\eta - \rho$ Pareto Optimization of 3-Phase 3-Level T-Type AC-DC-AC Converter Comprising Si and SiC Hybrid Power Stage
Hirofumi Uemura1, Florian Krismer1, Yasuhiro Okuma2, Johann W. Kolar1
1) ETH Zurich, Switzerland, 2) Fuji Electric Co., Ltd., Japan

Poster Session 21P3 Power Devices and System Integration

21P3-1 Practical Investigation of the Gate Bias Effect on the Reverse Recovery Behavior of the Body Diode in Power MOSFETs
Kristian Lindberg-Poulsen, Lars Press Petersen, Zhiwei Ouyang, Michael A. E. Andersen
Technical University of Denmark, Denmark

21P3-2 An Online $V_{ce}$ Measurement and Temperature Estimation Method for High Power IGBT Module in Normal PWM Operation
Pramod Ghimire1, Angel Ruiz de Vega1, Szymon Beczkowski1, Stig Munk-Nielsen1, Bjørn Rannestad7
Paul Bach Thøgersen1
1) Aalborg University, Denmark, 2) kk-electronic a/s, Denmark

21P3-3 Evaluation on Iron Loss Characteristics in Series Connection and Parallel Connection of Loads with Inverter Excitation
Shunya Odawara, Keisuke Fujisaki
Toyota Technological Institute, Japan

21P3-4 Loss and Thermal Model for Power Semiconductors Including Device Rating Information
K. Ma, A. S. Bahman, S. M. Beczkowski, F. Blaabjerg
Aalborg University, Denmark

21P3-5 Improving Reliability of IGBT Surface Electrode for 200 °C Operation
Tomohiro Nishimura, Yoshinari Ikeda, Hiroaki Hōkazono, Eiji Mochizuki, Yoshikazu Takahashi
Fuji Electric Co., Ltd., Japan

21P3-6 Influence of Carrier Frequency on Iron Loss Taking Account of Dead Time Effect
Ryosuke Kogi, Shunya Odawara, Keisuke Fujisaki
Toyota Technological Institute, Japan

21P3-7 Decrease of SiC-BJT Driver Losses by One-Step Commutation
Henry Barth, Wilfried Hofmann
TU Dresden, Germany

21P3-8 Power Profile Based Selection and Operation Optimization of Parallel-Connected Power Converter Combinations
T. Vogt1, A. Peters1, N. Fröhleke1, J. Böcker2, S. Kempen2
1) University of Paderborn, Germany, 2) AEG Power Solutions, Germany

21P3-9 A Novel Power Loss Calculation Method for IGBTs in Power Converters via Chaotic SPWM Control
Boyu Wang, Hong Li, Xiaojie You, Trillion Zheng
Beijing Jiaotong University, China
21P3-10 Loss Analysis and Soft-Switching Characteristics of Flyback-Forward High Gain DC/DC Converter with GaN FET
Yajing Zhang, Trillion Q. Zheng, Yan Li
Beijing Jiaotong University, China

21P3-11 Insulated Metal Substrate for Power Modules Using Anodic Oxide Film of Aluminum
Takeshi Tokuyama, Jumpei Kusukawa, Kinya Nakatsu
Hitachi, Ltd., Japan

21P3-12 A Fast-Transient-Response Buck Converter with Split-Type III Compensation and Charge-Pump Circuit Technique
Jiann-Jong Chen, Wei-Ting Hsu, Jih-Hua Yu, Yuh-Shyan Hwang, Cheng-Chieh Yu
National Taipei University of Technology, Taiwan

21P3-13 Advantages of Low Parasitic Inductance Packages of Power MOSFET for Server Power Applications
Wonsuk Choi, Dongkook Son, Dongwook Kim
Fairchild Semiconductor, Korea

21P3-14 Modular Integration of a Matrix Converter
Adane Kassa Solomon, Robert Skuriat, Alberto Castellazzi, Pat Wheeler
University of Nottingham, UK

21P3-15 A Modular Nanosecond Pulse Generation System for Plasma-Assisted Ignition
Peng Gao, John Fletcher, Sean O’Byrne
The University of New South Wales, Australia

21P3-16 Development of a Single Switch Cell for Modular Nanosecond Pulse Generation Systems
Peng Gao, John Fletcher, Sean O’Byrne
The University of New South Wales, Australia

21P3-17 Advantage of Super Junction MOSFET for Power Supply Application
K. Tabira, S. Watanabe, T. Shimatou, T. Watashima, S. Takenoiri
Fuji Electric Co., Ltd., Japan

Poster Session 21P4 Modeling, Simulation, EMI and Reliability
Chairs: Lian Kuo Lung (National Taiwan University of Science and Technology)
Hiroki Ishikawa (Gifu University)

21P4-1 Study on an Accurate Calculation of the Conducted EMI Noise of the Power Converters
Shinpei Omata, Toshihisa Shimizu
Tokyo Metropolitan University, Japan

21P4-2 An Exact Discrete-Time Model Considering Dead-Time Nonlinearity for an H-Bridge Grid-Connected Inverter
Ruiliang Xie, Xiang Hao, Xu Yang, Wenjie Chen, Lang Huang, Chao Wang
Xi’an Jiaotong University, China

21P4-3 Theoretical Analysis of the Duality Principle Applied to Interleaved Topologies
M. L. A. Caris, H. Huisman, J. L. Duarte
Eindhoven University of Technology, The Netherlands

21P4-4 A New Impedance Measurement Method Based on High Frequency Compensation
Xiaolong Yue, Fang Zhuo, Hao Yi
Xi’an Jiaotong University, China

21P4-5 Numerical and Experimental Investigation of Parasitic Edge Capacitance for Photovoltaic Panel
Wenjie Chen, Xiaomei Song, Hao Huang, Xu Yang
Xi’an Jiaotong University, China

21P4-6 Vehicle Interior Noise Control of Ultra-Compact Electric Vehicle (Fundamental Consideration Using Rectangular Enclosure)
Taro Kato, Ryosuke Suzuki, Hideaki Kato, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan
Considerations for the Propagation Path of Conducted Noise in Air Conditioners
Tsuyoshi Tokiwa, Masaki Kanamori, Takahisa Endo, Mikiya Iida, Satoshi Ogasawara, Yizhanyi Tang
1) Toshiba Carrier Corporation, Japan, 2) Toshiba Corporation, Japan, 3) Hokkaido University, Japan

Iron Loss Evaluation of Iron Powder Core Suitable for Inductor Used in Power Converters
Tomohiro Mori, Kazunori Igarashi, Kinji Kana gawa, Nobuyuki Yamashita, Toshihisa Shimizu, Yosio Bizen
1) Mitsubishi Materials Corporation, Japan, 2) Tokyo Metropolitan University, Japan

Optimized Tuning Method of Stationary Frame Proportional Resonant Current Controllers
Fernando Ortiz Martinz, Kelly Caroline Mingorancia de Carvalho, Naji Rajai Nasriama, Wilson Komatsu, Lourenço Matakas Junior
Polytechnic School of the University of São Paulo, Brazil

Petre-Marian Nicolae, Ileana-Diana Nicolae, Lucian-Dinuț Popa, Marian-Ștefan Nicolae
University of Craiova, Romania

The Research on Reliability and Real-Time of the Scheme of Process Layer GOOSE Network in Smart Substation Based on Artificial Cobweb Topology Structure
Xiaosheng Liu, Honglin Zhu, Dianguo Xu, Yanxiang Li
Harbin Institute of Technology, China

Efficiency Improvement of a Self-Start Type Permanent Magnet Synchronous Motor
H. Saikusa, S. Arikawa, T. Higuchi, Y. Yokoi, T. Abe
Nagasaki University, Japan

Consideration of Optimal Number of Poles and Frequency for High-Efficiency Permanent Magnet Motor
Daisuke Misu, Makoto Matsu shita, Katsutoku Takeuchi, Koji Oishi, Mitsuhiro Kawamura
1) Toshiba Corporation, Japan, 2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

Basic Study on the Suitable Structure of a Permanent Magnet Synchronous Motor with a Powder Magnetic Core
Shizuka Hashimoto, Masayuki Sanada, Shigeo Morimoto, Yukinori Inoue
Osaka Prefecture University, Japan

Characteristics of a Half-Wave Rectified Brushless Synchronous Generator
Yuki Hirakawa, Tsu yoshi Higuchi, Yuichi Yokoi, Takashi Abe
Nagasaki University, Japan

Modeling of Wound Rotor Synchronous Machines Considering Harmonics, Geometric Saliencies and Saturation Induced Saliencies
Alexander Rambetius, Sven Luthardt, Bernhard Piepen breier
University of Erlangen-Nuremberg, Germany

Design and Comparison of High Frequency Transformers Using Foil and Round Windings
Kartik V. Iyer, William P. Robbins, Ned Mohan
University of Minnesota, USA

A Method to Calculate the Performance of Linear Induction Motors Using Simple Two-Phase Model
Hideaki Hirahara, Shu Yamamoto, Takahiro Ara, Toshihisa Shimizu
1) Tokyo Metropolitan University, Japan, 2) Polytechnic University, Japan

An ESP Downhole Parameters Monitoring System Based on Current Loop Transmission Method
Miaoxin Jin, Qiang Gao, Wei Zhang, Dianguo Xu
Harbin Institute of Technology, China

Bending Magnetic Levitation Control for Thin Steel Plate (Experimental Consideration Using Sliding Mode Control)
Hikaru Yonezawa, Hiroki Marumori, Takayoshi Narita, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan

Transformer Winding Losses with Round Conductors for Duty-Cycle Regulated Square Waves
Kartik V. Iyer, William P. Robbins, Kaushik Basu, Ned Mohan
University of Minnesota, USA
21P5-11 Simulation of Resin Molded Type Sensor in Pole Switch for Power Delivery Systems
Tatsuya Furukawa¹, Shoichiro Muta¹, Hisao Fukumoto¹, Hideaki Itoh¹, Masashi Ohchi²
1) Saga University, Japan, 2) Chiba Institute of Technology, Japan

Poster Session 21P6 Motor Drives II

Chairs: Iakovos Manolas (ABB Corporate Research)
Wolfgang Gruber (Johannes Kepler University Linz)

21P6-1 Robust Startup Control of Sensorless PMSM Drives with Self-Commissioning
Chiao-Chien Lin, Ying-Yu Tzou
National Chiao Tung University, Taiwan

21P6-2 Position Sensorless Control of PMSM with a Low-Frequency Signal Injection
Tomohiro Nimura¹, Shinji Doki¹, Masami Fujitsuna²
1) Nagoya University, Japan, 2) Denso Corporation, Japan

21P6-3 A Comparison of Different Sensorless Position Acquisition Methods at Low Speeds for a Permanent Magnet Synchronous Machine in Vehicle Applications
Oliver Lehmann, Matthias Zehelein, Johannes Schuster, Jörg Roth-Stielow
University of Stuttgart, Germany

21P6-4 Stability Comparison of IPMSM Sensorless Vector Control Systems Using Extended EMF
Mineo Tsuji, Hiroshi Mizusaki, Shin-ichi Hamasaki
Nagasaki University, Japan

21P6-5 Induction Machine Based Flywheel Speed Estimation at Stand-By Mode
Rongqiang Liu, David Xu
Ryerson University, Canada

21P6-6 Symmetrical Signaling System for Sensor-Less SRM Drive
Kenji Yamamoto¹, Hisashi Takahashi¹, Nobumasa Ushiro², Koki Shirasawa²
1) Shizuoka Institute of Science and Technology, Japan, 2) Sinfonia Technology Co., Ltd, Japan

21P6-7 Digital Integrators for Condition Monitoring: a DC and Multitone Signal Analysis
L. Peretti
ABB Corporate Research, Sweden

21P6-8 Audible Noise Reduction Method in IPMSM Position Sensorless Control Based on High-Frequency Current Injection
Yuki Tauchi, Hisao Kubota
Meiji University, Japan

21P6-9 A Novel Design for Induction Motor Flux Estimation Using Impulsive Observer
Peng Wang¹, Yan Li², Jianwen Zhang¹, Xu Cai¹, Zhengzhi Han¹
1) Shanghai Jiao Tong University, China, 2) China Electric Power Research Institute, China

21P6-10 Load Torque and Inertia Simulation Based on Double-Stator Permanent-Magnet Synchronous Motor
Zhe Wang, Mingyan Wang, Ben Guo, Chai Feng
Harbin Institute of Technology, China

21P6-11 Independent Speed and Position Control of Two Permanent Magnet Synchronous Motors Fed by a Four-Leg Inverter
Yuji Kubo¹, Hisao Kubota¹, Takayuki Moroi¹, Kouki Matsuse¹, Kaushik Rajashekara²
1) Meiji University, Japan, 2) The University of Texas at Dallas, USA

21P6-12 Minimization of Stator Currents for Mono Inverter Dual Parallel PMSM Drive System
Yongjae Lee, Jung-Ik Ha
Seoul National University, Korea

21P6-13 Performance Comparison of Inverter and Drive Configurations with Open-End and Star-Connected Windings
Markus Neubert, Stefan Koschik, Rik W. De Doncker
RWTH Aachen University, Germany
21P6-14 Input Current Harmonics Reduction Control for Electrolytic Capacitor Less Inverter Based IPMSM Drive System
Kodai Abe, Kiyoshi Ohishi, Hitoshi Haga
Nagaoka University of Technology, Japan

Poster Session 21P7 Motion Controls and Robotics II

Chairs: Yasutaka Fujimoto (Yokohama National University)
Toshiyuki Murakami (Keio University)

21P7-1 Noncontact Guide System for Traveling Elastic Steel Plates (Theoretical Study on the Shape of Traveling Steel Plate)
Kouichi Sakaba, Takayoshi Narita, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan

21P7-2 Active Seat Suspension for Ultra-Compact Vehicle (Fundamental Consideration on Electromyogram When Fall from the Bump)
Masahiro Mashino, Masaki Ishida, Keita Sunaga, Hideaki Kato, Shinya Hasegawa, Yasuo Oshinoya
Tokai University, Japan

21P7-3 Adaptive Current Tracking of Three-Phase Active Power Filter Using Backstepping Control
Yunmei Fang, Juntao Fei, Shixi Hou, Weili Dai
Hohai University, China

21P7-4 Fast Identification of Resonance Characteristic for 2-Mass System with Elastic Load
Ming Yang, Liang Hao, Dianguo Xu
Harbin Institute of Technology, China

21P7-5 Autonomous Navigation System Based on Collision Danger-Degree for Unmanned Ground Vehicle
Takashi Yasuno, Daiki Tanaka, Akinobu Kuwahara
The University of Tokushima, Japan

Poster Session 21P8 Power Conversion for Renewable Energy II

Chairs: Toshimitsu Morizane (Osaka Institute of Technology)
Kenichi Onda (Hitachi Research Laboratory)

21P8-1 A High-Performance Bidirectional DC-DC Converter for DC Micro-Grid System Application
Shu-Wei Kuo1, Shih-Jen Cheng, Yu-Kang Lo, Huang-Jen Chiu, Chung-Yi Lin2, CS Yang2
1) National Taiwan University of Science and Technology, Taiwan, 2) Flextronics Power, Taiwan

21P8-2 Improvement in Efficiency of LED Lighting System
K. I. Hwu1, W. Z. Jiang2, Jenn-Jong Shieh2
1) National Taipei University of Technology, Taiwan, 2) Ta Hwa University of Science and Technology, Taiwan

21P8-3 Comparison and Evaluation of Vibration-Based Piezoelectric Power Generators
Amat A. Basari1, Sosuke Awaji2, Yunshun Zhang1, Song Wang1, Seiji Hashimoto1, Shunji Kumagai2, Makoto Kasai1, Kenji Suto2, Wei Jiang3, Shuren Wang3
1) Gunma University, Japan, 2) Mitsuba Corporation, Japan, 3) Yangzhou University, China

21P8-4 Battery Selection for Hybrid Energy Systems and Thermal Management in Arctic Climates
Maria Kaloger, Pavol Bauer
Delft University of Technology, The Netherlands

21P8-5 100kW PV PCS with Natural Convection Cooling for Outdoor Installation
Yasuhiro Jin, Kazumasa Matsuoka, Takehiro Takahashi, Nobuhiro Takahashi
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

21P8-6 A New PLL Based on Fast Positive and Negative Sequence Decomposition Algorithm with Matrix Operation Under Distorted Grid Conditions
Shaohua Sun, Hongqi Ben, Tao Meng, Jinyong Zhang
Harbin Institute of Technology, China
Poster Session 21P9 PV Systems III

Chairs: Teruhiko Kohama (Fukuoka University)
Kentaro Fukushima (Central Research Institute of Electric Power Industry)

21P9-1 Performance Improvement of Photovoltaic Power Generation Systems Using On-Off Control Methods
Kenji Matsumoto, Shinichi Nomura
Meiji University, Japan

21P9-2 Low Voltage PV Power Integration into Medium Voltage Grid Using High Voltage SiC Devices
Ritwik Chattopadhyay1, Subhashish Bhattacharya1, Nicole C. Foureaux2, Sidelmo M. Silva2, Braz Cardoso F.2,
Helder de Paula2, Igor A. Pires2, Portraitio C. Cortizio2, Lênin Moraes2, José A. de S. Brito2
1) North Carolina State University, USA, 2) Universidade Federal de Minas Gerais, Brazil, 3) COELBA, Brazil

21P9-3 A Novel Global Maximum Power Point Tracking Method for Photovoltaic Generation System Operating under Partially Shaded Condition
Jing-Hsiao Chen1, Yu-Shan Cheng1, Shun-Chung Wang2, Jia-Wei Huang1, Yi-Hua Liu1
1) National Taiwan University of Science and Technology, Taiwan, 2) Lunghwa University of Science and Technology, Taiwan, 3) Industrial Technology Research Institute, Taiwan

21P9-4 An Application of Z-Source Converter to Batteries Charge with a Photovoltaic System
H. Razik1, C. Maret2, Y. Zitouni3
1) Université Claude Bernard Lyon 1, France, 2) APAVE SUDEUROPE, France

21P9-5 PCS with Scanning-Type MPPT Control for Industrial Grid-Connected PV Power Generation System
Kazutaka Itako
Kanagawa Institute of Technology, Japan

Poster Session 21P10 Power Electronics Applied to Transmission and Distribution Systems I

Chairs: Alexis Kwasinski (The University of Texas at Austin)
Yushi Miura (Osaka University)

21P10-1 Feasible Method of Calculating Leakage Reactance of 9-Winding Transformer for High-Voltage Inverter System
Hisao Fukumoto1, Tatsuya Furukawa1, Hideaki Ito1, Masashi Ohchi1
1) Saga University, Japan, 2) Chiba Institute of Technology, Japan

21P10-2 High Power HVDC-DC Converters for the Interconnection of HVDC Lines with Different Line Topologies
André Schön, Mark-M. Bakran
University of Bayreuth, Germany

21P10-3 Characterization of a Current Shunt and an Inductive Voltage Divider for PMU Calibration
Saytaro Kon1, Tatsuji Yamada2
1) National Metrology Institute of Japan, Japan, 2) National Institute of Advanced Industrial Science and Technology, Japan

21P10-4 Distributed Series/Hybrid-Shunt Compensation for Harmonic Mitigation in Commercial Facilities
Rogério Azevedo Diniz1, Igor A. Pires2, Gleisson J. França3, Braz J. Cardoso4
1) Banco do Brasil, Brazil, 2) Universidade Federal de Minas Gerais, Brazil

21P10-5 Robust Control Design for the Voltage Tracking Loop of a DVR
Bruno Augusto Ferrari, Kelly Caroline Mingorance da Carvalho, Naji Rajai Nasri Ama, Fernando Ortiz Martinz,
Lourenço Matakas Junior
Polytechnic School of the University of São Paulo, Brazil

21P10-6 Multi-Port Solid State Transformer for Inter-Grid Power Flow Control
Sudhin Roy, Ankan De, Subhashish Bhattacharya
North Carolina State University, USA

Poster Session 21P11 Power Electronics Applied to Transmission and Distribution Systems II

Chairs: Noriko Kawakami (Toshiba Mitsubishi-Electric Industrial Systems Corporation)
Masahide Hojo (The University of Tokushima)

21P11-1 Reactive Power Control Strategy Based on DC Capacitor Voltage Control for Active Load Balancer in Three-Phase Four-Wire Distribution Systems
Tint Soe Win1, Yoshihiro Hisada1, Toshihiko Tanaka1, Eiji Hiraki2, Masayuki Okamoto2, Seong Ryong Lee3
1) Yamaguchi University, Japan, 2) Okayama University, Japan, 3) Ube National College of Technology, Japan, 4) Kunsan National University, Korea
21P11-2 Voltage Sag Ride-Through Performance of Virtual Synchronous Generator
Jaber Alipoor, Yushi Miura, Toshifumi Ise
Osaka University, Japan

21P11-3 Control of Distributed Generation Systems under Unbalanced Voltage Conditions
R. Kabiri, D. G. Holmes, B. P. McGrath
RMIT University, Australia

21P11-4 Stability Analysis of Grid-Connected Inverters with LCL-Filter Based on Harmonic Balance and Floquet Theory
Jing Bian, Hong Li, Trillion Q. Zheng
Beijing Jiaotong University, China

21P11-5 Comparative Evaluation of Passive Damping Topologies for Parallel Grid-Connected Converters with LCL Filters
Remus Beres1, Xiongfei Wang1, Frede Blaabjerg1, Marco Liserre2, Claus Leth Bak1
1) Aalborg University, Denmark, 2) Christian-Albrechts University of Kiel, Germany

Poster Session 21P12 Power Electronics and Drives Applied to Home Appliances
Chairs: Chun-An Cheng (I-Shou University)
Hideki Omori (Osaka Institute of Technology)

21P12-1 Study and Implementation of a SEPIC LED Driver with Adjustable Output Voltage
Po-Jung Tseng1, Yu-Chen Liu1, Yu-Kang Lo1, Huang-Jen Chiu1, Yun-Chu Chiu1
1) National Taiwan University of Science and Technology, Taiwan, 2) Lite-On Technology Corporation., Taiwan

21P12-2 An Interleaved Single-Stage LLC Resonant Converter Used for Multi-Channel LED Driving
Chien-Hsuan Chang, Chun-An Cheng, Masahito Jinno, Hung-Liang Cheng
I-Shou University, Taiwan

21P12-3 A Novel Type of Wireless V2H System with Bidirectional Resonant Single-Ended Inverter
Hiroki Fukuoka1, Yuichi Iga1, Hideki Omori1, Tosimitsu Morizane1, Noriyuki Kimura1, Mutuo Nakaoka2
1) Osaka Institute of Technology, Japan, 2) Kyungnam University, Korea

21P12-4 Design and Implementation of an Interleaved BCM Boost PFC Control IC
Kuan-Hsien Chou, Tsormg-Juu Liang, Kai-Hui Chen, Ji-Shiang Lee
National Cheng Kung University, Taiwan

21P12-5 Low Capacitive Inductors for Fast Switching Devices in Active Power Factor Correction Applications
Juan C. Hernandez, Lars P. Petersen, Michael A. E. Andersen
Technical University of Denmark, Denmark

21P12-6 Temperature-Robust LC3 LED Driver with Low THD, High Efficiency, and Long Life
Eun S. Lee1, Bo H. Choi1, Jun P. Cheon1, Bong C. Kim1, Chun T. Rim1
1) Korea Advanced Institute of Science and Technology, Korea, 2) Optomind Inc., Korea

21P12-7 Optimizing Repulsive Lorentz Forces for a Levitating Induction Cooker
Claudius M. Zingerli, Thomas Nussbaumer, Johann W. Kolar
ETH Zurich, Switzerland

Wednesday, May 21: 14:20 - 16:00

Room A

Oral Session 21A3 DC-DC Converters IV
Chairs: Dehong Xu (Zhejiang University)
Seiya Abe (International Center for the Study of East Asian Development)

21A3-1 Design of a Modular Resonant Converter for 25kV-8A DC Power Supply of RF Cavities
14:20
Daniel Siemaszko, Serge Pittet, Davide Aguglia, Louis de Mallac
European Organisation for Nuclear Research, Switzerland

21A3-2 A Novel Transformer-Less Interleaved Four-Phase High Step-Down DC Converter with Low Switch Voltage Stress
14:45
Ching-Tasi Pan1, Chen-Feng Chuang1, Chia-Chi Chu1, Hao-Chien Cheng1
1) National Tsing Hua University, Taiwan, 2) ASUSTeK Computer Inc, Taiwan
21A3-3 Efficiency Improvement of Power Supply with Transient Current Circuit Using Digital Control
15:10 Haruomi Takashita, Masahito Shoyama, Yu Yonezawa, Yoshiyasu Nakashima
1) Kyushu University, Japan, 2) Fujitsu Laboratories Ltd., Japan

21A3-4 Ultra High Step-Down Converter
15:35 Y. T. Yau, K. I. Hwu
National Taipei University of Technology, Taiwan

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**Room B**

**Oral Session 21B3 Digital Control and Modulation**

*Chairs: Stone Cheng (National Chiao Tung University)*
*Shin-ichi Hamasaki (Nagasaki University)*

21B3-1 Digital Control of PWM Inverter Using Ultra High Speed Network for Feedback Signals with Communication
14:20 Ryo Saito, Kazuo Tsuchida, Tomoki Yokoyama
Tokyo Denki University, Japan

21B3-2 100 kHz DC Chopper Digitally Gate Controlled with Partial Turn-off Switching Using SiC-MOSFET and FPGA
14:45 Yukinori Tsuruta, Atsuo Kawamura
Yokohama National University, Japan

21B3-3 Variable Carrier Deadbeat Control with Digital Hysteresis Method Using SoC-FPGA for Utility Interactive Inverter
15:10 Shunsuke Ohashi, Morito Yoshida, Tomoki Yokoyama
Tokyo Denki University, Japan

21B3-4 A Space Vector Modulation Strategy for Three-Level Operation Based on Dual Two-Level Voltage Source Inverters
15:35 Yuttana Kumsuwan, Watcharin Srirattanawichaikul
Chiang Mai University, Thailand

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**Room C**

**Oral Session 21C3 Wide-Band Gap Semiconductor Devices & their Applications**

*Chairs: Alberto Castellazzi (University of Nottingham)*
*Satoshi Matsumoto (Kyushu Institute of Technology)*

21C3-1 Investigation on the Parallel Operation of All-GaN Power Module and Thermal Performance Evaluation
14:20 Stone Cheng, Po-Chien Chou
National Chiao Tung University, Taiwan

21C3-2 Full Silicon Carbide Boost Chopper Module for High Frequency and High Temperature Operation
14:45 Sami Pettersson, Slavo Kicin, Toni Holm, Enea Bianida, Francisco Canales
ABB Switzerland Ltd., Switzerland

21C3-3 Development of Ultrahigh Voltage SiC Power Devices
1) National Institute of Advanced Industrial Science and Technology, Japan, 2) New Japan Radio Co. Ltd., Japan, 3) Fuji Electric Co. Ltd., Japan, 4) Toshiba Corporation, Japan, 5) Kansai Electric Power Co., Inc., Japan, 6) Kyoto University, Japan

21C3-4 High Switching Performance of 1.7kV, 50A SiC Power MOSFET over Si IGBT for Advanced Power Conversion Applications
15:35 Samir Hazra, Ankan De, Subhashish Bhattacharya, Lin Cheng, John Palmour, Marcelo Schupbach, Brett Hull, Scott Allen
1) North Carolina State University, USA, 2) Cree, Inc., USA
Oral Session 21D3 Multilevel Converters

Chairs: Kalle Ilves (KTH Royal Institute of Technology), Makoto Hagiwara (Tokyo Institute of Technology)

21D3-1 Control Method for Five Level Converter with Common Flying Capacitors to Avoid Voltage Level Skip
14:20
Wei Yan1, Hui Zhang1, Kazuya Ogura1, Shota Urushibata1
1) Meiden Singapore, Singapore, 2) Meidensha Corporation, Japan

21D3-2 Low-Complexity Analytical Approximations of Switching Frequency Harmonics of 3-Phase N-Level Voltage-Source PWM Converters
14:45
Ralph M. Burkart, Johann W. Kolar
ETH Zurich, Switzerland

21D3-3 Dynamic Voltage Balancing Algorithm for Modular Multilevel Converter with Three-Level Flying Capacitor Submodules
15:10
Apparao Dekka1, Bin Wu1, Navid R. Zargari2
1) Ryerson University, Canada, 2) Rockwell Automation, Canada

21D3-4 Modular Medium Voltage Drive for Demanding Applications
15:35
Drazen Dujic, Jonas Wahlstroem, Juan-Alberto Marrero Sosa, Dominik Fritz
ABB Switzerland Ltd, Switzerland

Oral Session 21E3 PV Systems IV

Chairs: Toru Sai (Toyo Polytechnic University), Satoshi Ohtsu (NTT Facilities Research Institute Inc.)

21E3-1 Asymmetrical Fault Ride-Through of Three-Phase PV Systems Using Four-Wire Dc-Ac Converters
14:20
Shivkumar Iyer1, Yunwei Li1, Bin Wu1, B. N. Singh1
1) Ryerson University, Canada, 2) University of Alberta, Canada, 3) Hydro One Inc., Canada

21E3-2 Operation Mode Analysis for Solving the Partial Shadow in a Novel PV Power Generation System
14:45
Qi Zhang1, Xiangdong Sun1, Yanru Zhong1, Mikihiro Matsui2, Lie Guo1
1) Xi’an University of Technology, China, 2) Tokyo Polytechnic University, Japan

21E3-3 Analysis of Partial Power Processing Distributed MPPT for a PV Powered Electric Aircraft
15:10
Ahmad Diab Marzouk1, Sébastien Fournier-Bidoz2, Jessica Yablecki1, Kenneth McLean1, Olivier Trescases2
1) University of Toronto, Canada, 2) Solar Ship Inc., Canada

21E3-4 Impacts of Rectifier Circuit Loads on Islanding Detection of Photovoltaic Systems
15:35
Yoshiaki Yoshida1, Hirokazu Suzuki2
1) Hiroshima Institute of Technology, Japan, 2) The University of Tokyo, Japan

Oral Session (Organized) 21F3 Rare Earth-Free/-Less Machines

Chairs: Masatsugu Takemoto (Hokkaido University), Shigeo Morimoto (Osaka Prefecture University)

21F3-1 Induction Motor Made of SMC
14:20
Invited Paper
Masayuki Morimoto, Mamiko Inamori
Tokai University, Japan

21F3-2 Estimation and Comparison of the Windage Loss of a 60 kW Switched Reluctance Motor for Hybrid Electric Vehicles
14:45
Invited Paper
Kyohei Kiyota, Takeo Kakishima, Akira Chiba
Tokyo Institute of Technology, Japan

21F3-3 Development of High-Power PMA SynRM Using Ferrite Magnets for Reducing Rare-Earth Material Use
15:10
Invited Paper
Masayuki Sanada, Shigeo Morimoto, Yukinori Inoue
Osaka Prefecture University, Japan

21F3-4 Consideration of 10kW In-Wheel Type Axial-Gap Motor Using Ferrite Permanent Magnets
15:35
Invited Paper
Koichi Sone1, Masatsugu Takemoto1, Satoshi Ogawara2, Kenichi Takezaki3, Wataru Hino3
1) Hokkaido University, Japan, 2) Dynax Corporation, Japan
Oral Session 21G3 Distribution System (Microgrid & Others II)

Chairs: Meiqin Mao (Hefei University of Technology)  Jumpei Baba (The University of Tokyo)

21G3-1 Power Control Method for Multi-Parallel DC Distribution System through the Equivalent Circuit Model  
14:20  Seok-Jin. Hong¹, Soo-Cheol. Shin¹, Hee-Jun. Lee¹, Taeck-Kie. Lee², Chung-Yeun Won¹  
¹) Sungkyunkwan University, Korea, ²) Hankyong National University, Korea

21G3-2 A Communication-Less Distributed Voltage Control Strategy for a Multi-Bus AC Islanded Microgrid  
14:45  Yanbo Wang¹, Xiongfei Wang¹, Yanjun Tian², Zhe Chen², Yongdong Tan¹  
¹) Southw>  
21G3-3 An Enhanced Load Power Sharing Strategy for Low-Voltage Microgrids Based on Inverse-Droop Control Method  
15:10  Yixin Zhu, Fang Zhuo, Baoquan Liu, Hao Yi  
Xi’an Jiaotong University, China

21G3-4 Adding Virtual Resistance in Source Side Converters for Stabilization of Cascaded Connected Two Stage Converter Systems with Constant Power Loads in DC Microgrids  
15:35  Mingfei Wu, Dylan D. C. Lu  
The University of Sydney, Australia

Oral Session 21H3 Predictive Control for Motor Drives

Chairs: Junichi Asama (Shizuoka University)  Shinji Doki (Nagoya University)

21H3-1 Expansion of Operating Range and Improvement of Torque Response of PMSM Drive by Using Model Predictive Control  
14:20  Hirotugu Ohata, Takuya Sakamoto, Shinji Doki  
Nagoya University, Japan

21H3-2 Nonlinear Model Predictive Torque Control of a Load Commutated Inverter and Synchronous Machine  
14:45  Stefan Almér, Thomas Besselmann, Joachim Ferreau  
ABB Corporate Research, Switzerland

21H3-3 Model Predictive Current Control for PMSM Considering Number of Switching Operations  
15:10  Tadanao Zamma, Yuji Yasumura, Kang Zhi Liu  
Chiba University, Japan

21H3-4 Predictive Indirect Matrix Converter Fed Torque Ripple Minimization with Weighting Factor Optimization  
15:35  Muslem Uddin¹, Saad Mekhlief¹, Marco Rivera¹, Jose Rodriguez³  
¹) University of Malaya, Malaysia, ²) Universidad de Talca, Chile, ³) Universidad Técnica Federico Santa María, Chile

Oral Session (Organized) 21I3 Conversion Technologies for Renewable Energy and Energy Saving V

Chairs: Akshay Kumar Rathore (National University of Singapore)  Matthias Kasper (ETH Zurich)

21I3-1 High-Power Density Hybrid Converter Topologies for Low-Power Dc-Dc SMPS  
14:20  Aleksandar Radoi, S. M. Alshansizzaman, Behzad Mahdavikhah, Aleksandar Prodić  
University of Toronto, Canada

21I3-2 Coupled Inductor Based Current-Fed Switched Inverter for Low Voltage Renewable Interface  
14:45  Soumya Shubhra Nag, Santanu Kumar Mishra  
Indian Institute of Technology, India

21I3-3 A Semi-Isolated Multi-Input Converter for Hybrid PV/Wind Power Charger System  
15:10  Yaow-Ming Chen, Cheng-Wei Chen, Kun-Hung Chen  
National Taiwan University, Taiwan

21I3-4 HFL PV Micro-Inverter with Front-End Current-Fed Converter and Half-Wave Cycloconverter  
15:35  D. R. Nayanasiri, D. M. Vilathgumawa, D. L. Maskell  
Nanyang Technological University, Singapore
Room J

Oral Session (Organized) 21J3 Power Supply Technologies for Information and Communication Systems I

Chairs: Dan Chen (National Taiwan University)  
Tadashi Suetsugu (Fukuoka University)

21J3-1 Comprehensive Study about Stability Issues of Multi-Module Distributed System  
Invited Paper  
14:20  
Fangcheng Liu, Jinjun Liu, Haodong Zhang, Danhong Xue, Qinyun Dou  
Xi’an Jiaotong University, China

21J3-2 Characteristics Study of Neural Network Aided Digital Control for DC-DC Converter  
Invited Paper  
14:45  
Hidenori Maruta, Masashi Motomura, Fujio Kurokawa  
Nagasaki University, Japan

21J3-3 Zero Current Switching Current-Fed Parallel Resonant Push-Pull (CFPRPP) Converter  
Invited Paper  
15:10  
Radha Sree Krishna Moorthy, Akshay Kumar Rathore  
National University of Singapore, Singapore

21J3-4 Characteristics of Transmission Carrier in a New Wire Communication System by the Use of High-Ripple DC-DC Converter  
15:35  
Akihiko Katsuki1, Kosuke Morita2, Kazufumi Masutomo2, Tatsuya Mizuki1, Kohei Shibahara1, Shigetaka Maeyama3  
1) Nagasaki University, Japan, 2) Kyushu Institute of Technology, Japan, 3) TDK Corporation, Japan

Room A

Oral Session 21A4 DC-DC Converters V

Chairs: Heung-Geun Kim (Kyungpook National University)  
Masatoshi Uno (Japan Aerospace Exploration Agency)

21A4-1 5MHz PWM-Controlled Current-Mode Resonant DC-DC Converter Using GaN-FETs  
16:30  
Akinori Hariya1, Ken Matsura1, Hiroshige Yanagi1, Satoshi Tomioka1, Yoichi Ishizuka1, Tamotsu Ninomiya3  
1) Nagasaki University, Japan, 2) TDK-Lambda Corporation, Japan, 3) The International Centre for the Study of East Asian Development, Japan

21A4-2 Design and Performance Evaluation of Digital Control for LLC Series Resonant Dc-to-Dc Converters  
16:55  
Syam Kumar Pidaparthi1, Byungcho Choi1, Jinhaeng Jang2  
1) Kyungpook National University, Korea, 2) LG Electronics, Korea

21A4-3 Experimental Verification of Noiseless Sampling for Buck Chopper Circuit with Current Control  
17:20  
Shun Takeuchi, Keiji Wada  
Tokyo Metropolitan University, Japan

21A4-4 Control Characteristics Improvement of Full-Bridge DC-DC Converter with Snubber Capacitor  
17:45  
Kazuhide Domoto1, Yoichi Ishizuka1, Seiya Abe2, Tamotsu Ninomiya2  
1) Nagasaki University, Japan, 2) International Centre for the Study of East Asian Development, Japan

21A4-5 DCM Control Method of Boost Converter Based on Conventional CCM Control  
18:10  
Le Hoai Nam, Koji Orikawa, Jun-ichi Itoh  
Nagaoka University of Technology, Japan

Room B

Oral Session 21B4 HVDC & Low Frequency Transmission Systems

Chairs: Peter Lehn (University of Toronto)  
Shinzo Tamai (Toshiba Mitsubishi-Electric Industrial Systems Corporation)

21B4-1 Technical Assessment of Load Commutation Switch in Hybrid HVDC Breaker  
16:30  
Arman Hassanpoor1, Jürgen Häfner2, Björn Jacobson1  
1) KTH Royal Institute of Technology, Sweden, 2) ABB AB, Sweden, 3) ABB AB, China

21B4-2 Control of Hexagonal Modular Multilevel Converter for 3-Phase BTB System  
16:55  
Shin-ichi Hamasaki, Kazuki Okamura, Takashi Tsubakidani, Mineo Tsuji  
Nagasaki University, Japan
21B4-3 A Synthesized Capacitors Voltage Control for Modular Multilevel Converter in HVDC Application  
17:20 Rongfeng Yang, Shunke Sui, Binbin Li, Wei Wang, Dianguo Xu  
Harbin Institute of Technology, China

21B4-4 Operating Phase and Frequency Selection of Low Frequency AC Transmission System Using Cycloconverters  
17:45 Achara Pichetjamroen, Toshifumi Ise  
Osaka University, Japan

21B4-5 Fast Acting DC Circuit Breaker for HVDC Transmission Line Based on DC/DC Chopper  
18:10 Liangyi Tang1, Bin Wu2, Venkata Yaramasu2, Weirong Chen1, Hussain S. Athab2  
1) Southwest Jiaotong University, China, 2) Ryerson University, Canada

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**Room C**

**Oral Session 21C4 SiC Devices & Related Assembly Technology**

**Chairs:** Stone Cheng *(National Chiao Tung University)*  
Tsyuoshi Funaki *(Osaka University)*

**21C4-1 1700V Si-IGBT and SiC-SBD Hybrid Module for AC690V Inverter System**  
16:30 Haining Wang, O. Ikawa, S. Miyashita, T. Nishimura, S. Igarashi  
Fuji Electric, Co., Ltd., Japan

**21C4-2 Switching Simulation of SiC High-Power Module with Low Parasitic Inductance**  
16:55 Takashi Yamamoto, Kohei Hasegawa, Masaaki Ishida, Kazuto Takao  
Toshiba Corporation, Japan

**21C4-3 Switching Performance of Parallel-Connected Power Modules with SiC MOSFETs**  
17:20 Juan Colmenarejos1, Dimosthenis Pefitis2, Hans-Peter Nee2, Jacek Rabkowski2  
1) KTH Royal Institute of Technology, Sweden, 2) Warsaw University of Technology, Poland

**21C4-4 Built-In Reliability Design of a High-Frequency SiC MOSFET Power Module**  
17:45 Jianfeng Li1, Emre Gurpinar2, Saul Lopez-Arevalo2, Alberto Castellazzi2, Liam Mills2  
1) The University of Nottingham, UK, 2) TT Electronics, UK

**21C4-5 Experimental Switching Frequency Limits of 15 kV SiC N-IGBT Module**  
18:10 Arun Kadavelugu1, Subhashish Bhattacharya1, Sei-Hyung Ryu2, Edward Van Brunt1, Dave Grider2, Scott Leslie3  
1) North Carolina State University, USA, 2) Cree, Inc., USA, 3) Powerex, Inc., USA

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**Room D**

**Oral Session 21D4 Modular Multilevel Converters**

**Chairs:** Vassilios Georgios Agelidis *(The University of New South Wales)*  
Shigenori Inoue *(Hitachi, Ltd.)*

**21D4-1 Selection of Suitable Carrier-Based PWM Method for Modular Multilevel Converter**  
16:30 Barış Çiftçi1,2, Feyzullah Ertürk1, Ahmet M. Hava1  
1) Middle East Technical University, Turkey, 2) ASELSAN A.Ş., Turkey

**21D4-2 Control and Experiment of a 380-V, 15-kW Motor Drive Using Modular Multilevel Cascade Converter Based on Triple-Star Bridge Cells (MMCC-TSBC)**  
16:55 Wataru Kawamura, Makoto Hagiwara, Hirofumi Akagi  
Tokyo Institute of Technology, Japan

**21D4-3 A Power Electronic Transformer with Sinusoidal Voltages and Currents Using Modular Multilevel Converter**  
17:20 Ashish Kumar Sahoo, Ned Mohan  
University of Minnesota, USA

**21D4-4 Varying and Unequal Carrier Frequency PWM Techniques for Modular Multilevel Converters**  
17:45 Georgios Konstantinou1, Rosheila Darus1, Josep Pou1,2, Salvador Ceballos3, Vassilios G. Agelidis1  
1) The University of New South Wales, Australia, 2) Technical University of Catalonia, Spain, 3) Tecnalia Energy, Spain

**21D4-5 Comparison of Phase-Shifted and Level-Shifted PWM in the Modular Multilevel Converter**  
18:10 Rosheila Darus1,2, Georgios Konstantinou1, Josep Pou1,2, Salvador Ceballos3, Vassilios G. Agelidis1  
1) The University of New South Wales, Australia, 2) Universiti Teknologi MARA, Malaysia, 3) Technical University of Catalonia, Spain, 4) TECNALIA, Spain
Oral Session 21E4 PV Systems V

16:30
A Single-Phase Power Conditioner with a Buck-Boost-Type Power Decoupling Circuit
Shota Yamaguchi, Toshihisa Shimizu
Tokyo Metropolitan University, Japan

16:55
A Novel Asymmetrical FLC-Based MPPT Technique for Photovoltaic Generation System
Yi-Hsun Chiu, Yu-Shan Cheng, Yu-Hua Liu, Shun-Chung Wang, Zong-Zhen Yang
1) National Taiwan University of Science and Technology, Taiwan, 2) Lunghwa University of Science and Technology, Taiwan, 3) Industrial Technology Research Institute, Taiwan

17:20
A Novel Current Link Distributed MPPT PV System - Overall System Prototyping and Evaluation -
Mikihiko Matsui, Toru Sai, Akira Kitamura, Xiang-Dong Sun, Byung-Gyu Yu
1) Tokyo Polytechnic University, Japan, 2) Xi'an University of Technology, China, 3) Kongju National University, Korea

17:45
Power Flow Control and MPPT Parameter Selection for Residential Grid-Connected PV Systems with Battery Storage
Chokchai Chuenwattanapranit
Burapha University, Thailand

18:10
A Maximum Power Point Tracking Method with Ripple Current Orientation
Chin-Sien Moo, Gwo-Bin Wu
National Sun Yat-sen University, Taiwan

Oral Session 21F4 Permanent Magnet Synchronous Motors

16:30
Output Characteristics of a Surface Permanent Magnet-Type Vernier Motor - Comparison of Test Results and Calculation -
Yasuhiro Kataoka, Masakazu Takayama, Yoshihisa Shimizu, Yoshitarou Matsushima
1) Akita Prefectural University, Japan, 2) Shizuoka University, Japan

16:55
Topology Optimization for Skew of SPMSM by Using Multi-Step Parallel GA
Wataru Kitagawa, Takaharu Takeshita
Nagoya Institute of Technology, Japan

17:20
Loss Minimization Design Using Magnetic Equivalent Circuit for a Permanent Magnet Synchronous Motor
Daisuke Sato, Jun-ichi Itoh
Nagoya University of Technology, Japan

17:45
The Proposal of a New Motor Which Has a High Winding Factor and a High Slot Fill Factor
Shinji Makita, Yasuhide Ito, Tomohiro Aoyama, Shinji Doki
1) Denso Corporation, Japan, 2) Asmo Co., Ltd, Japan, 3) Nagoya University, Japan

18:10
Variable Leakage Flux Interior Permanent Magnet Synchronous Machine for Improving Efficiency on Duty Cycle
Masanao Minowa, Hiroki Hijikata, Kan Akatsu, Takashi Kato
1) Shibaura Institute of Technology, Japan, 2) Nissan Motor Co., Ltd, Japan

Oral Session (Organized) 21G4 Power Electronics for High Power Applications

16:30
History and Trends of Converter Technology for DC and AC Transmission in Japan
Teruo Yoshino
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
Oral Session 21H4 Various Topics of IM Drives

Chairs: Liping Zheng (Calnetix Technologies, LLC)
Shinji Doki (Nagoya University)

21H4-1 An Energy Saving Drive Method of an Induction Motor with the Suppression of Sudden Acceleration and Deceleration
16:30
Yuji Asano, Kaoru Inoue, Keito Koterai, Toshiji Kato
Doshisha University, Japan

21H4-2 Field Oriented Control of Sensorless Linear Induction Motor Using Matrix Converter
16:55
Mahmoud A. Sayed, Essam Ebaid Mohamed, Tarek Hassan Mohamed, Takaharu Takeshita
1) South Valley University, Egypt, 2) Asswan University, Egypt, 3) Nagoya Institute of Technology, Japan

21H4-3 A Stator-Equation-Based Reduced-Order Observer for Position-Sensorless Vector Control System of Doubly-Fed Induction Machines
17:20
Somrat Smiththisomboon, Surapong Suwankawin
Chulalongkorn University, Thailand

21H4-4 Input Current Ripple Analysis of Inverter Fed Dual Three-Phase AC Motors
17:45
Pekik Argo Dahono, Andri Satria
Institute of Technology Bandung, Indonesia

21H4-5 Offline Extraction of Induction Machine Parameters for Control Strategy Synthesis
18:10
Stefan Koschik, Florian Bauer, R. W. De Doncker
RWTH Aachen University, Germany

Oral Session 21I4 DC-DC Converters for Renewable Energy II

Chairs: Aleksandar Prodic (University of Toronto)
Terukazu Sato (Oita University)

21I4-1 High Current Planar Transformer for Very High Efficiency Isolated Boost DC-DC Converters
16:30
Riccardo Pittini, Zhe Zhang, Michael A. E. Andersen
Technical University of Denmark, Denmark

21I4-2 High Voltage-Gain Interleaved Boost DC-DC Converter Discarded Electrolytic Capacitor
16:55
Quang Trong Nha, Huang-Jen Chiu, Yu-Kang Lo, Pham Phu Hieu
National Taiwan University of Science and Technology, Taiwan

21I4-3 Parallel Bi-Directional DC-DC Converter for Energy Storage System
17:20
Takayuki Ouchi, Akihiko Kanoda, Naoya Takahashi
1) Hitachi, Ltd., Japan, 2) Hitachi Advanced Digital, Co., Ltd., Japan

21I4-4 Charging Scenario of Serial Battery Power Modules with Buck-Boost Converters
17:45
Jhen-Yu Jian, Chu-Shen Chang, Chin-Sien Moo, Hau-Chen Yen
1) National Sun Yat-sen University, Taiwan, 2) Far East University, Taiwan
<table>
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<tr>
<th>Session Time</th>
<th>Paper Title</th>
<th>Authors</th>
<th>Affiliation</th>
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<tr>
<td>18:10</td>
<td>Comparative Thermal Performance Evaluation of SiC MOSFETs and Si MOSFET for 1.2 kW 300 kHz DC-DC Boost Converter as a Solar PV Pre-Regulator</td>
<td>Taekyun Kim, Minsoo Jang, Vassilios G. Agelidis</td>
<td>The University of New South Wales, Australia</td>
</tr>
<tr>
<td>16:30</td>
<td>Tolerance Analysis of a Constant-On Time Current-Mode Voltage Regulator with Adaptive Voltage Position Feature</td>
<td>Chih Wei Chen¹, Dan Chen¹, Shin Shiung Wang²</td>
<td>1) National Taiwan University, Taiwan, 2) Richtek Technology Corporation, Taiwan</td>
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<tr>
<td>16:55</td>
<td>FPGA-Based Digital-Controlled Power Converter Designed with Universal Input Meeting 80 Plus Platinum Efficiency Code and Standby Power Code for Sever Power Applications</td>
<td>Yen-Shin Lai¹, Kung-Min Ho²</td>
<td>1) National Taipei University of Technology, Taiwan, 2) AcBel Polytech Inc., Taiwan</td>
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<td>17:20</td>
<td>Static and Dynamic Analyses of Digital Peak Current Mode DC-DC Converter</td>
<td>Kazuhiro Kajiwara, Fujio Kurokawa, Yuichiro Shibata</td>
<td>Nagasaki University, Japan</td>
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<td>17:45</td>
<td>Extended Discrete Control of Class E Amplifier in Order to Achieve Nominal Operation</td>
<td>Tadashi Suetsugu, Xiujin Wei, Shotaro Kuga</td>
<td>Fukuoka University, Japan</td>
</tr>
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<td>18:10</td>
<td>Adaptive Power Efficiency Control by Computer Power Consumption Prediction Using Performance Counters</td>
<td>Shinichi Kawaguchi, Toshiaki Yachi</td>
<td>Tokyo University of Science, Japan</td>
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