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"


Mr. Keiichiro Yusu

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"


Mr. Naritomo Higuchi

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"


Dr. Shinzo Tamai

15:30 Break

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


Dr. Hidenori Hara

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


Dr. Yasushi Matsumoto

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


Mr. Hirotaka Takahashi

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

Monday, May 19: 12:30 - 14:00

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 Liu[1], Fei Xiao[2], Wei Chen[2], Guorun Yang[2]
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 Xiao[1], Wei Chen[1], Jilong Liu[2], Hengli Wang[1]
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 Anthon[1], Zhe Zhang[1], Michael A. E. Andersen[1], Toke Franke[2]
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 Watanabe[1], Kazuhiro Koiwa[1], Jun-ichi Itoh[1], Yoshiya Ohnuma[2], Satoshi Miyawaki[2]
1) Nagaoka 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 Tsuboi
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
Kyungmin Sung[1], Ryuji Iijima[1], Shinichi Nishikawa[2], Isami Norigoe[2], Hiromichi Ohashi[2]
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 Inoue[1], Masashi Shioda[1], Motohumi Katade[1], Akira Goto[1], Shin Morishita[1], Jun-ichi Itoh[2], Kazuhiro Koiwa[2]
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
Nagaoka 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

19P1-14 Design Procedure for Output Current Control and Damping Control of Matrix Converter
Hiroki Takahashi, Jun-ichi Itoh
Nagaoka University of Technology, Japan

Poster Session 19P2 Power Converters II

Chairs: Fang Zhuo *(Xi'an Jiaotong University)*
Koji Orikawa *(Nagaoka University of Technology)*

19P2-1 A Novel LCL Filter Parameter Design Method Basing on Resonant Frequency Optimization of Three-Level NPC Grid Connected Inverter
Ning Li, Yue Wang, Ruigen Niu, Wei Guo, Wanjun Lei, Zhao'an Wang
Xi'an Jiaotong University, China

19P2-2 Design and Analysis of Isolated Bi-Directional DC/DC Converter Using Quasi-Resonant ZVS
Yong-Su Noh[1], Chung-Yuen Won[1], Min-Seok Oh[2], Jin-Yong Jeon[3], Yong-Chae Jung[4]
1) Sungkyunkwan University, Korea, 2) INTECH-FA, Korea, 3) Samsung Electronics Co., Ltd., Korea
4) Namseoul University, Korea

19P2-3 An Active-Clamping ZVS Flyback Converter with Integrated Transformer
Jing-Yuan Lin[1], Yu-Kang Lo[2], Huang-Jen Chiu[2], Chao-Fu Wang[2], Chien-Yu Lin[2]
1) National Taitung College, Taiwan, 2) National Taiwan University of Science and Technology, Taiwan

19P2-4 PFM and PWM Hybrid Controlled LLC Converter
Junichi Yamamoto[1], Seiya Abe[2], Toshiyuki Zaitsu[1], Tamotsu Ninomiya[2]
1) Texas Instruments Japan Ltd., Japan, 2) International Centre for the Study of East Asian Development, Japan

19P2-5 Discussions on Various Voltage Equalizers for EDLCs Using CW Circuit
Hlaing Kyi Pyar Khant[1], Keiju Matsui[1], Masaru Hasegawa[1], Mikio Yasubayashi[1], Masayoshi Umeno[1], Eiji Ooishi[2]
1) Chubu University, Japan, 2) Minna-Denryoku, Inc., Japan

19P2-6 Isolation System with Wireless Power Transfer for Multiple Gate Driver Supplies of a Medium Voltage Inverter
Keisuke Kusaka[1], Koji Orikawa[1], Jun-ichi Itoh[1], Kazunori Morita[2], Kuniaki Hirao[2]
1) Nagaoka University of Technology, Japan, 2) Meidensha Corporation, Japan

19P2-7 Study and Implementation of a 15-W Power Amplifier for Piezoelectric Actuator
Yu-Kang Lo[1], Huang-Jen Chiu[1], Yu-Chen Liu[1], Chung-Yi Lin[2], Shih-Jen Cheng[2], CS Yang[2]
1) National Taiwan University of Science and Technology, Taiwan, 2) Flextronics Power, Taiwan

19P2-8 Isolated Voltage-Boosting Converter
K. I. Hwu[1], W. Z. Jiang[1], Jenn-Jong Shieh[2]
1) National Taipei University of Technology, Taiwan, 2) Ta Hwa University of Science and Technology, Taiwan

19P2-9 High Voltage Conversion Ratio Cascade Boost Converter with DC Snubber
Yuang-Shung Lee, Ling-Chia Yu, Tzu-Han Chou
Fu Jen Catholic University, Taiwan

19P2-10 Design-Oriented Analysis of Resonance Damping and Harmonic Compensation for *LCL*-Filtered Voltage Source Converters
Xiongfei Wang, Frede Blaabjerg, Poh Chiang Loh
Aalborg University, Denmark

19P2-11 State-Space Average Modeling of Bidirectional DC-DC Converter for Battery Charger Using LCLC Filter
Sang-Ho Moon, Sung-Tak Jou, Kyo-Beum Lee
Ajou University, Korea

19P2-12 A New SVPWM Strategy for Input Switched Multilevel Converter
Xiong Li, U. R. Prasanna, Akin Bilal, Kaushik Rajashekara
The University of Texas at Dallas, USA

19P2-13 ESD Reliability Influence of a 60 V Power LDMOS by the FOD-Based (& Dotted-OD) Drain
Shen-Li Chen, Min-Hua Lee
National United University, Taiwan

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 Gaing[1], Kuan-Yi Kuo[2], Jia-Sheng Hu[2], Min-Fu Hsieh[3], Ming-Hsiao Tsai[3]
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[1], Toshiyuki Ajima[1], Hideki Miyazaki[2]
1) Hitachi, Ltd., Japan, 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[1], U. R. Prasanna[1], K. Rajashekara[1], H. Kubo[2]
1) University of Texas at Dallas, USA, 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 Kato[1], Satoru Ishigma[1], Youichiro Nakajima[1], Haruki Arai[1], Tetsuya Ueda[1], Tetsuki Iwata, Yoichi Ito[1], Kazumi Sugao[2]
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 Choi[1], Min-Ho Sin[1], Dong-Rak Kim[1], Chung Yuen Won[1], Yong Chae Jung[2]
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 Haga[1], Toshihiro Shimao[1], Seiji Kondo[1], Koji Kato[2], Youichi Itoh[2], Kenji Arimatsu[3], Katsuhiro Matsuda[3]
1) Nagaoka 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 Barater[1], Giampaolo Buticchi[1], Carlo Concari[1], Giovanni Franceschini[1], Emre Gurpinar[2], Dipankar De[2], Alberto Castellazzi[2]
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 Lee[1], Chian-Song Chiu[2], Tse-Wei Chiu[2]
1) National Taishung 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 Zhang[1], Kazuya Ogura[1], Kazunobu Oi[2]
1) Meiden Singapore Pte Ltd, Singapore, 2) Meidensha Corporation, Japan

19P6-5 Optimal Idling Control Strategy for Three-Port Full-Bridge Converter
Yongjie Jiang[1], Fuxin Liu[1], Xinbo Ruan[1], Lipeng Wang[2]
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 Ren[1], Xing Zhang[1], Fusheng Wang[1], Yunwu Tu[2], Lingxiang Wang[2], Lirong Deng[2]
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

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 19P7 PV Systems I

Chairs: Hubert Razik ***(University Claude Bernard Lyon 1)***
Fujio Kurokawa ***(Nagasaki University)***

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[1], Guan-Chyun Hsieh[2], Jiaxin Hou[2]
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 19P8 Wind Power Systems I

Chairs: Chung-Chuan Hou ***(Chung Hua University)***
Shuji Katoh ***(Hitachi, Ltd.)***

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 **Nonlinear Pitch Control Design for Load Reduction on Wind Turbines**
Shuai Xiao, Geng Yang, Hua Geng
Tsinghua University, China

19P8-3 **Device Loading of Modular Multilevel Converter MMC in Wind Power Application**
L. Popova[1], J. Pyrhönen[1], K. Ma[2], F. Blaabjerg[2]
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[1,2], Saad Mekhilef[2], El Madjid Berkouk[3]
1) F. Abbas University, Algeria, 2) University of Malaya, Malaysia, 3) High Polytechnic National School, Algeria

Poster Session 19P9 Distribution Systems (Microgrid & Others I)

Chairs: Rolando Burgos ***(Virginia Polytechnic Institute and State University)***
Masahide Hojo ***(The University of Tokushima)***

19P9-1 A Reactive Power Sharing Method Based on Virtual Capacitor in Islanding Microgrid
Haizhen Xu[1], Xing Zhang[1], Fang Liu[1], Rongliang Shi[1], Changzhou Yu[1], Wei Zhao[2], Yong Yu[2], Wei Cao[2]
1) Hefei 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[1], Mat Nasir Kari[2], Mohd Johari Mohd Arif[2]
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[1], Na Shen[2], Geng Yang[1], Kazunori Morita[3], Kazuya Ogura[3], Weiyang Wu[2]
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, Taeck-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, Rongfeng Yang, Lizhi 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 LiFePO$\widehat{4}$ 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[1], Hironori Tsuruta[2], Hiroshi Oso[3]
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 Shibanuma[1], Mitsuo Shinbo[1], Hiroshi Abiko[1], Hideki Sonoda[1], Takahito Ishida[2], Yoshinori Chiba[2]
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[1], Wu Mingli[1], Wang Hui[1], Vassilios Georgios Agelidis[2]
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 Yu[1], Xiankai Liu[1], Yuzhuo Zhang[2], Yuan Cao[2], Weigang Ma[3], Xinhong Hei[3], Zhenhui Huang[4], Dawang Jiang[4]
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 Moballegh, Sachin Madhusoodhanan, Subhashish Bhattacharya
North Carolina State University, USA

Poster Session 19P12 Technology for EV/HEV Applications

Chairs: Chung-Yuen Won *(Sungkyunkwan University)*
Hiroshi Fujimoto *(The University of Tokyo)*

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 Li[1], Chao-Kai Wen[1], Jung-Chieh Chen[2], Jen-Hao Teng[1], Pangan Ting[3]
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 Tamura[1], Yasuo Noto[2], Toshiyuki Ajima[1], Jun-ichi Itoh[3]
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 Imakiire[1], Masayuki Hikita[1], Kichiro Yamamoto[2], Ryo Yonemori[2]
1) Kyusyu Institute of Technology, Japan, 2) Kagoshima University, Japan

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

Chairs: Ashoka K. S. Bhat *(University of Victoria)*
Yusuke Hayashi *(Osaka University)*

19P13-1 Dynamic and Steady-State Behavior of a Paralleling Three-Phase AC-to-DC Converter with Reduced DC Bus Capacitor
Uthen Kamnarn[1], Yutthana Kanthaphayao[2], Viboon Chunkag[3]
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

19P13-3 Power Supply for a Wireless Sensor Network: Airliner Flight Test Case Study
P. Durand Estebe[1], V. Boitier[1], M. Bafleur[1], J-M. Dilhac[1], S. Berhouet[2]
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

19P14-2 A Bachelor-Student Project: Buck-Boost Operation of an Integrated H-Bridge for Variable-Speed Energy Storage Systems Using Measurement Coils in the Stator of a DC-Machine
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 Ishibashi[1], Hisao Fukumoto[1], Tatsuya Furukawa[1], Hideaki Itoh[1], Masashi Ohchi[2]
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 Hira[1], Tatsuya Furukawa[1], Seichiro Yakabe[1], Hisao Fukumoto[1], Hideaki Itoh[1], Masashi Ohchi[2]
1) Saga University, Japan, 2) Chiba Institute of Technology, Japan

Monday, May 19: 14:00 - 16:05

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 Matsuoka[1], Keiji Wada[2], Mizuki Nakahara[2], Kazuto Takao[3], Kyungmin Sung[4], Hiromichi Ohashi[5], Shinichi Nishizawa[5]
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 Akagi[1], Tatsuya Yamagishi[1], Nadia M. L. Tan[2], Shin-ich Kinouchi[3], Yuji Miyazaki[3], Masao Koyama[3]
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 Tripathi [1], Krishna Mainali[1], Dhaval Patel[1], Arun Kadavelugu[1], Samir Hazra[1], Subhashish Bhattacharya[1], Kamalesh Hatua[2]
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 Zeljkovic[1], Tomas Reiter[1], Dieter Gerling[2]
1) Infineon Technologies AG, Germany, 2) University of Federal Defense Munich, Germany

19B1-2 **A Two Stage DC/DC Converter with Wide Input Range for EV**
14:25 Peng Wen, Changsheng Hu, Haitao Yang, Longlong Zhang, Cheng Deng, Yashun Li, Dehong Xu
Zhejiang University, China

19B1-3 **Intermediate and Light Load Efficiency Improvement of a High Power Density Bidirectional DC-DC**
14:50 **Converter in Hybrid Electric Vehicles with MR Fluid-Gap Inductor**
Furqan Ahmed, Su-Han Kim, Honnyong Cha, Dong-Hun Kim, Heung-Geun Kim
Kyungpook National University, Korea

19B1-4 **Regenerative Control of Bi-directional DC-DC Converter Controlling Variable DC-link for FCEV**
15:15 Il-Kuen Won[1], An-Yeol Ko[1], Do-Yun Kim[1], Chung-Yuen Won[1], Young-Ryul Kim[2]
1) Sungkyunkwan University, Korea, 2) Anyang University, Korea

19B1-5 **Large Driving Range Increase of Series Chopper Based Power Train Using Motor Test Bench**
15:40 Yu Hosoyamada[1], Masashi Takeda[1], Naoki Motoi[2], Atsuo Kawamura[1]
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**
Invited Paper Fei Lin, Zhongping Yang, T. Q. Zheng
14:00 *Beijing Jiaotong University, China*

19C1-2 **Efforts for Power Electronics Education in a Start-Up Company**
Invited Paper Fumiya Hattori[1], Jun Imaoka[2], Manabu Ishitobi[3], Shinichiroh Nagai[4], Masayoshi Yamamoto[2]
14:25 *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**
Invited Paper Toshiaki Takino, Tetsuro Iwakami
14:50 *East Japan Railway Company, Japan*

19C1-4 **Successful Online Education-GeckoCIRCUITS as Open-Source Simulation Platform**
Invited Paper Andreas Müsing[1], Johann W. Kolar[2]
15:15 *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 -**
Invited Paper Shinichi Yamagata, Yoshinori Oda, Masanobu Tanai, Kyungmin Sung
15:40 *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**
Invited Paper Yan Zhang, Jinjun Liu, Xiaolong Ma, Junjie Feng
14:00 *Xi'an Jiaotong University, China*

19D1-2 **Real-Time Simulation of Wind Turbine Converter-Grid Systems**
Invited Paper Shahil Shah, Ignacio Vieto, Nian Heng, Jian Sun
14:25 *Rensselaer Polytechnic Institute, USA*

19D1-3 **Technologies for Mitigating Fluctuation Caused by Renewable Energy Sources**
Invited Paper Shuji Katoh, Shinya Ohara, Tomomichi Itoh
14:50 *Hitachi, Ltd., Japan*

19D1-4 **Reliability-Oriented Energy Storage Sizing in Wind Power Systems**
Invited Paper Zian Qin[1], Marco Liserre[2], Frede Blaabjerg[1], Poh Chiang Loh[1]
15:15 *1) Aalborg University, Denmark, 2) Christian-Albrechts-Universität zu Kiel, Germany*

19D1-5 **A Multi-Level Virtual Conductor as a Backbone of a DC Power Routing System**
Invited Paper Husam A. Ramadan, Yasutaka Imamura, Konosuke Kawachi, Sihun Yang, Masahito Shoyama
15:40 *Kyushu University, Japan*

Room E

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 D. Leuenberger, J. Biela
14:00 *ETH Zurich, Switzerland*

19E1-2 **Loss Reduction of Laminated Core Inductor Used in On-board Charger for EVs**
Invited Paper Takahiro Tera[1], Hiroshi Taki[1], Toshihisa Shimizu[2]
14:25 *1) Denso Corporation, Japan, 2) Tokyo Metropolitan University, Japan*

19E1-3 **Feasible Evaluations of Coupled Multilayer Chip Inductor for POL Converter**
Invited Paper Jun Imaoka[1], Shota Kimura[1], Yuki Itoh[1], Masayoshi Yamamoto[1], Michiaki Suzuki[2], Kenji Kawano[2]
14:50 *1) Shimane University, Japan, 2) Taiyo Yuden Co., Ltd., Japan*

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

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

Room F

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 Toshiki Suzuki[1], Masaru Hasegawa[1], Mutuwo Tomita[2], Shinji Doki[3]
14:00 *1) Chubu University, Japan, 2) Gifu National College of Technology, Japan, 3) Nagoya University, Japan*

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

19F1-3 **Study of Low Speed Sensorless Drives for SPMSM by Controlling Elliptical Inductance**
Invited Paper Sari Maekawa[1], Toshifumi Hinata[1], Nobuyuki Suzuki[1], Hisao Kubota[2]
14:50 *1) Toshiba Corporation, Japan, 2) Meiji University, Japan*

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 Dongouk Kim[1], Yong-Cheol Kwon[1], Seung-Ki Sul[1], Jang-Hwan Kim[2], Rae-Sung Yu[2]
15:15 *1) Seoul National University, Korea, 2) Samsung Electronics Co., Ltd., Korea*

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

Room G

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 Byung Moon Han, Jong Kyou Jeong
14:00 *Myongji University, Korea*

19G1-2 **Power-Cell Switching-Cycle Capacitor Voltage Control for the Modular Multilevel Converters**
Invited Paper Jun Wang, Rolando Burgos, Dushan Boroyevich, Bo Wen
14:25 *Virginia Polytechnic Institute and State University, USA*

19G1-3 **A Comparison of Modular Multilevel Energy Conversion Processes: DC/AC versus DC/DC**
Invited Paper Gregory J. Kish, Peter W. Lehn
14:50 *University of Toronto, Canada*

19G1-4 **A Novel Topology of Wind Power Plant Suitable for DC Power Transmission Systems**
Invited Paper Shoji Nishikata, Fujio Tatsuta, Katsumi Suzuki
15:15 *Tokyo Denki University, Japan*

19G1-5 **An Impedance-Based Approach to HVDC System Stability Analysis and Control Development**
Invited Paper Hanchao Liu, Shahil Shah, Jian Sun
15:40 *Rensselaer Polytechnic Institute, USA*

Room H

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

Chairs: Christof Zwyssig *(Celeroton AG)*
Masahide Ooshima *(Tokyo University of Science, Suwa)*

19H1-1 **Topology Evaluation of Slotless Bearingless Motors with Toroidal Windings**
Invited Paper Daniel Steinert[1], Thomas Nussbaumer[2], Johann W. Kolar[1]
14:00 *1) ETH Zurich, Switzerland, 2) Levitronix GmbH, Switzerland*

19H1-2 **Winding Arrangement in Single-Drive Bearingless Motor with Radial Gap**
Invited Paper Hiroya Sugimoto[1], Seiyu Tanaka[1], Akira Chiba[1], M. A. Rahman[2]
14:25 *1) Tokyo Institute of Technology, Japan, 2) Memorial University of Newfoundland, Canada*

19H1-3 **Development of a One-Axis Actively Regulated Bearingless Motor with a Repulsive Type Passive Magnetic Bearing**
Invited Paper Junichi Asama[1], Daisuke Watanabe[1], Takaaki Oiwa[1], Akira Chiba[2]
14:50 *1) Shizuoka University, Japan, 2) Tokyo Institute of Technology, Japan*

19H1-4 **Control Characteristics of 8/10 and 12/14 Bearingless Switched Reluctance Motor**
Invited Paper Zhenyao Xu, Dong-Hee Lee, Jin-Woo Ahn
15:15 *Kyungsung University, Korea*

19H1-5 **Basic Characteristic of a Two-Unit Outer Rotor Type Bearingless Motor with Consequent Pole Permanent Magnet Structure**
Invited Paper Masatsugu Takemoto
15:40 *Hokkaido University, Japan*

Room I

Oral Session 19I1 Matrix Converters

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

19I1-1 **Voltage Ripple Elimination in Inductor-Less AC-to-AC Converters for Multi-Pole Permanent Magnet Synchronous Generators**
14:00 Koutaro Tanaka, Hideaki Fujita
Tokyo Institute of Technology, Japan

19I1-2 **A New SVM Method to Reduce Common-Mode Voltage in Direct Matrix Converter**
14:25 Huu-Nhan Nguyen, Hong-Hee Lee
University of Ulsan, Korea

19I1-3 **Experimental Verification of High Frequency Link DC-AC Converter Using Pulse Density Modulation at Secondary Matrix Converter**
14:50 Jun-ichi Itoh, Ryo Oshima, Hiroki Takahashi
Nagaoka University of Technology, Japan

19I1-4 **Loss Analysis and Design Method for High Efficiency Matrix Converter**
15:15 Kazuhiro Koiwa, Goh Teck Chiang, Jun-ichi Itoh
Nagaoka University of Technology, Japan

19I1-5 **Capacitor Clamped Multi-Level Matrix Converter**
15:40 Siddharth Raju, Ned Mohan
University of Minnesota, USA

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 Uwe Drofenik, Francisco Canales
14:00 *ABB Corporate Research, Switzerland*

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

19J1-3 **The Application of Electronic Frequency Converter to the Shinkansen Railyard Power Supply**
Invited Paper Toshimasa Shimizu[1], Ken Kunomura[1], Masahiko Kai[1], Mitsuru Onishi[1], Hiroshi Masuzawa[1], Hiroki Miyajima[2], Midori Otsuki[2], Yoshinori Tsuruma[3]
14:50 *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 Takashi Suzuki[1], Hitoshi Hayashiya[1], Takashi Yamanoi[2], Keiji Kawahara[2]
15:15 *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 Masato Teshima, Hirotaka Takahashi
15:40 *Hitachi, Ltd., Japan*

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 David O. Boillat, Johann W. Kolar
8:30 *ETH Zurich, Switzerland*

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

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

20A1-4 **Evaluation of Isolated Three-Phase AC-DC Converter Using Modular Multilevel Converter Topology**
Invited Paper Toshiki Nakanishi, Jun-ichi Itoh
9:45 *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[1], Sung W. Lee[2], Eun S. Lee[1], Seog Y. Jeong[1], Beom W. Gu[1], Chun T. Rim[1]
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 Sugiura, Yuji 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

20C1-4 **Fast Analytical Model of Switched Reluctance Machine**
9:45 Senad Smaka, Semsudin Masic, Mirsad Cosovic
University of Sarajevo, Bosnia and Herzegovina

Room D

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**
8:30 **Converters**
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**
9:20 **Conversion Element**
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**
9:45 **Supply -Applications to Chopper and Half-Bridge Inverter and Their Operation Characteristics-**
Toshihiko Noguchi, Munehiro Murata
Shizuoka University, Japan

Room E

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 Abe[1], Toshiyuki Zaitsu[2], Junichi Yamamoto[2], Tamotsu Ninomiya[1]
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**
8:55 **Medium Voltage PMSG Wind Turbines**
Jayoon Kang[1], Daesu Han[1], Yongsug Suh[1], Byoungchang Jung[2], Jeongjoong Kim[2], Jonghyung Park[2], Youngjoon Choi[2]
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

Room F

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**
8:30 **Power Source System for Mobile Devices**
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**
8:55 **Control Technique**
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**
8:30 **Motor Model**
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 Yamaguchi[1], Yugo Tadano[1], Nobukazu Hoshi[2]
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**
8:55 **Grid Conditions**
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 Komatsu[1], Antonio Ricardo Giaretta[1], Rubens Domingos de Miranda[1], José Antonio Jardini[1], Ronaldo Pedro Casolari[2], Ricardo Leon Vasquez-Arnez[2], Toshiaki Hojo[3], Eden Luiz Carvalho Jr.[3], Paulo Koiti Maezono[3]
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 Law[1], Mohamed S. A. Dahidah[2]
1) The University of Nottingham Malaysia Campus, Malaysia, 2) Newcastle University, UK

Room I

Oral Session (Organized) 20I1 Converter Components -Sensor, Measurement and Inductor

Chairs: Francis Philip Dawson *(University of Toronto)*
Masayoshi Yamamoto *(Shimane University)*

20I1-1 **Novel Principle for Flux Sensing in the Application of a DC + AC Current Sensor**
Invited Paper
8:30 L. Schrittwieser[1], M. Mauerer[1], D. Bortis[1,2], G. Ortiz[1,2], J. W. Kolar[1]
1) ETH Zurich, Switzerland, 2) Enertronics GmbH, Switzerland

20I1-2 **Utilizing Voltage Measurement of FET Switch for MPPT of DC Energy Source**
Invited Paper
8:55 Noriyuki Kimura, Koji Niijima, Toshimitsu Morizane, Hideki Omori
Osaka Institute of Technology, Japan

20I1-3 **High Frequency Transformer Based on a Coupled Inductor Topology with Dielectric Isolation**
Invited Paper
9:20 Adrian Z. Amanci, Francis P. Dawson, Harry E. Ruda
University of Toronto, Canada

20I1-4 **Concept and Experimental Evaluation of a Novel DC-100MHz Wireless Oscilloscope**
Invited Paper
9:45 Yanick Lobsiger[1,2], Gabriel Ortiz[1,2], Dominik Bortis[1,2], Johann W. Kolar[1]
1) ETH Zurich, Switzerland, 2) Enertronics GmbH, Switzerland

Room J

Oral Session 20J1 Railway Applications

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

20J1-1 **Introduction and Effectiveness of STATCOM to the Independent Power System of JR East**
8:30 Masataro Omi[1], Ryo Kotegawa[1], Masato Ando[1], Takeshi Masui[2], Yasuhisa Horita[3]
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, Takafumi Koseki
The University of Tokyo, Japan

Tuesday, May 20: 10:40 - 12:20

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**
Invited Paper
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**
Invited Paper
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**
Invited Paper
11:55 Isamu Hasegawa[1], Shota Urushibata[1], Takeshi Kondo[1], Kuniaki Hirao[1], Takashi Kodama[1], Hui Zhang[2]
1) Meidensha Corporation, Japan, 2) Meiden Singapore, Singapore

Room B

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 Tokumasu[1], Hiroshi Taki[1], Kazuhiro Shirakawa[1], Keiji Wada[2]
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**
11:30 **Isolation Stage**
Michail Vasiladiotis[1], Behrooz Bahrani[2], Niklaus Burger[1], Alfred Rufer[1]
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**
11:55 **EV and HEV Application**
Dongok Moon, Junsung Park, Sewan Choi
Seoul National University of Science and Technology, Korea

Room C

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 Aoyama[1,2], Toshihiko Noguchi[1]
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 Severson[1], Robert Nilssen[2], Tore Undeland[2], Ned Mohan[1]
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 Wang[1], Yu-Ti Hao[2]
1) National Taipei University of Technology, Taiwan, 2) National Cheng Kung University, Taiwan

Room D

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 Zhang[1], Siu-Chung Wong[1], Chi K. Tse[1], Qianhong Chen[2]
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**
Invited Paper **Power Distribution**
11:05 Yushi Miura, Satoshi Ojika, Toshifumi Ise
Osaka University, Japan

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

20D2-4 **Two-Switch Voltage Equalizer Based on Half-Bridge Converter with Multi-Stacked Current Doublers for**
Invited Paper **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[1], Jen-Hao Teng[1], Yung-Ching Huang[2], Dong-Jing Lee[2]
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**
11:05 **Power Generation**
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 Messo, 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 W. Jiang[1], F. Y. Yu[1], Z. Y. Lin[2], G. F. Wu[1], H. Chen[1], S. Hashimoto[3]
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[1], Yong Ding[1], Shiting Weng[1], Liuchen Chang[2]
1) Hefei 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[1], Takashi Takeda[1], Kazuto Yukita[1], Yasuyuki Goto[1], Katsuhiro Ichiyanagi[1], Hiroshi Morita[2]
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**
11:55 **Wind Power Converter**
Gen Chen[1], Jianwen Zhang[1], Miao Zhu[1], Ningyi Dai[2], Xu Cai[1]
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**
10:40 **Flux Observer**
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[1], Itaru Ando[1], Kiyoshi Ohishi[2], Masataka Matsuhashi[2]
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

Room H

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**
11:05 **in Inverter-Based Distributed Generators**
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**
11:30 **Reference Frame**
Salvatore D'Arco[1], Giuseppe Guidi[1], Jon Are Suul[1,2]
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**
11:55 **Single-Phase Inverter**
Yuko Hirase[1], Osamu Noro[1], Eiji Yoshimura[1], Hidehiko Nakagawa[1], Kenichi Sakimoto[2], Yuji Shindo[2]
1) Kawasaki Technology Co., Ltd., Japan, 2) Kawasaki Heavy Industries, Ltd., Japan

Room I

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 Hayashi[1], Hajime Toyoda[1], Toshifumi Ise[1], Akira Matsumoto[2]
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 Katsuki[1], Kohei Shibahara[2], Tomohiko Abe[2], Tomohiko Ikeda[2], Tatsuya Nakamura[2], Tatsuya Misuki[2], Shigetaka Maeyama[3]
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**
11:55 **Unbalanced Loads**
Zhao-Qin Guo, Sanjib Kumar Panda, I. V. Prasanna
National University of Singapore, Singapore

Room J

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**
10:40 **in a Low-Speed Range**
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. Zhu[1], Y. Jia[1], U. R. Prasanna[1], K. Rajashekara[1], H. Kubo[2]
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**
11:30 **Loss**
Hajime Kubo, Yasuhiro Yamamoto
Meidensha Corporation, Japan

20J2-4 **Sliding Mode PWM for Effective Current Control in Switched Reluctance Machine Drives**
11:55 Iakovos Manolas[1], Georgios Papafotiou[1], Stefanos N. Manias[2]
1) ABB AB, Corporate Research, Sweden, 2) ABB, Drives and Controls, Switzerland, 3) National Technical University of Athens, Greece

Tuesday, May 20: 13:20 - 15:25

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 Madhusoodhanan[1], Awneesh Tripathi[1], Dhaval Patel[1], Krishna Mainali[1], Arun Kadavelugu[1], Samir Hazra[1], Subhashish Bhattacharya[1], Kamalesh Hatua[2]
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, Hsin-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 Lee[1], Kyungsub Jung[1], Seunghoo Song[1], Yongsug Suh[1], Changwoo Kim[2], Hyoyol Yoo[2], Sunsoon Park[2]
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 Mizoguchi, 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 Fujimoto[1], Shingo Harada[1], Yuichi Goto[2], Daisuke Kawano[2]
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 Saito[1], Roberto Oboe[2], Seiichiro Katsura[1]
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 Shimono, Yasutaka Fujimoto
Yokohama National University, Japan

Room C

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 Gruber[1], Karlo Radman[1], Reto T. Schöb[2]
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 Mitterhofer[1], Branimir Mrak[1], Wolfgang Gruber[2]
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 Zwyssig[1], Thomas Baumgartner[1], Johann W. Kolar[2]
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 Araki[1], Ikki Shinozaki[1], Hirohito Funato[1], Satoshi Ogasawara[2], Daichi Murakami[2], Yukitsugu Hirota[3], Teruyoshi Mihara[3], Masayuki Mouri[3], Fumihiro Okazaki[3]
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 Huang[1], Shiu-Hui Lee[2], Ching-Guo Chen[1]
1) Chicony 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 Lee[1], Chong-Eun Kim[2], Jae-Hyun Kim[1], Cheol-O Yeon[1], Young-Do Kim[2], Gun-Woo Moon[1]
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-Hyum Kim[1], Chong-Eun Kim[2], Jae-Bum Lee[1], Young-Do Kim[2], Han-Shin Youn[1], Gun-Woo Moon[1]
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 Fujii *(Fuji Electric Co., Ltd.)*

20E3-1 **Power Conditioner for Stabilizing Power Disturbance Caused of Wind Turbine Generator System**
13:20 Yasunao Saga, Kansuke Fujii, 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 Chen[1], Jianwen Zhang[1], Miao Zhu[1], Ningyi Dai[2], Xu Cai[1]
1) Shanghai Jiao Tong University, China, 2) University 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

Chairs: Hong-Tzer Yang *(National Cheng Kung University)*
Fujio Kurokawa *(Nagasaki University)*

20F3-1 **Practical Study of a High Step-Down Converter**
Invited Paper
13:20
Masahito Jinno[1], Hong-Wei Su[1], Jiung-Lin Tsai[1], Hirofumi Matsuo[2]
1) I-Shou University, Taiwan, 2) Nagasaki University, Japan

20F3-2 **Generalized Modeling and Optimization of a Bidirectional Dual Active Bridge DC-DC Converter including Frequency Variation**
Invited Paper
13:45
Felix Jauch, Jürgen Biela
ETH Zurich, Switzerland

20F3-3 **Balanced Discharging of Power Bank with Buck-Boost Battery Power Modules**
Invited Paper
14:10
Chin-Sien Moo[1], Tsung-Hsi Wu[1], Chih-Hao Hou[1], Yao-Ching Hsieh[2]
1) National Sun Yat-sen University, Taiwan, 2) National Dong Hwa University, Taiwan

20F3-4 **Y-Source Impedance-Network-Based Isolated Boost DC/DC Converter**
Invited Paper
14:35
Yam P. Siwakoti[1], Graham E. Town[1], Poh Chiang Loh[2], Frede Blaabjerg[2]
1) Macquarie University, Australia, 2) Aalborg University, Denmark

20F3-5 **Multi-Phase DC-DC Converter with Ripple-less Operation for Thermo-Electric Generator**
Invited Paper
15:00
Noriyuki Kimura, Koji Niijima, Toshimitsu Morizane, Hideki Omori
Osaka Institute of Technology, Japan

Room G

Oral Session 20G3 PMSM Position Sensorless Controls

Chairs: Yoshitaka Iwaji *(Hitachi, Ltd.)*
Akira Chiba *(Tokyo Institute of Technology)*

20G3-1 **Position Sensorless Start-Up Method of Surface Permanent Magnet Synchronous Motor Using Nonlinear Rotor Position Observer**
13:20
Tsuyoshi Hanamoto[1], Hiroaki Yamada[1], Yoshihiro Okuyama[2]
1) Kyushu Institute of Technology, Japan, 2) Shimadzu Corporation, Japan

20G3-2 **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

20G3-3 **Ellipse-Trajectory-Oriented Vector Control for Energy Efficient/Wide-Speed-Range Drives of Sensorless PMSM**
14:10
Shinji Shinnaka[1], Yuki Amano[2]
1) Kanagawa University, Japan, 2) Kokusan Denki Co., Ltd., Japan

20G3-4 **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

20G3-5 **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 Xu Cai[1], Zheng Li[2]
13:20 *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**
Invited Paper **- Japanese Island System Case -**
13:45 Jumpei Baba
The University of Tokyo, Japan

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

20H3-4 **Moving towards the Smart Grid: the Norwegian Case**
Invited Paper Olav B. Fosso[1], Marta Molinas[1], Kjell Sand[1], Grete H. Coldevin[2]
14:35 *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 Takenori Kobayashi
15:00 *Toshiba Corporation, Japan*

Room I

Oral Session (Organized) 20I3 Technological Innovation in Motors for EV/HEV by Japanese Electric Companies

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

20I3-1 **EV and HEV Motor Development in TOSHIBA**
Invited Paper Masanori Arata[1], Yoshihiro Kurihara[1], Daisuke Misu[1], Masakatsu Matsubara[2]
13:20 *1) Toshiba Corporation, Japan, 2) Toshiba Industrial Products and Systems Corporation, Japan*

20I3-2 **Motor Stator with Thick Rectangular Wire Lap Winding for HEVs**
Invited Paper Takashi Ishigami, Yuichiro Tanaka, Hiroshi Homma
13:45 *Hitachi, Ltd., Japan*

20I3-3 **Comparison Study of Various Motors for EVs and the Potentiality of a Ferrite Magnet Motor**
Invited Paper Daiki Matsuhashi, Keisuke Matsuo, Takashi Okitsu, Tadashi Ashikaga, Takayuki Mizuno
14:10 *Meidensha Corporation, Japan*

20I3-4 **Optimal Field Excitation Control of a Claw Pole Motor for Hybrid Electric Vehicle**
Invited Paper M. Azuma, M. Hazeyama, M. Morita, Y. Kuroda, A. Daikoku, M. Inoue
14:35 *Mitsubishi Electric Corporation, Japan*

20I3-5 **A Wide Speed Range High Efficiency EV Drive System Using Winding Changeover Technique and SiC Devices**
Invited Paper Yushi Takatsuka, Hidenori Hara, Kenji Yamada, Akihiko Maemura, Tsuneo Kume
15:00 *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 Arda Tüysüz, Roman Bosshard, Johann W. Kolar
13:20 *ETH Zurich, Switzerland*

20J3-2 **Wide-Band Gap Devices in PV Systems - Opportunities and Challenges**
Invited Paper C. Sintamarean, E. Eni, F. Blaabjerg, R. Teodorescu, H. Wang
13:45 *Aalborg University, Denmark*

20J3-3 **Power Electronics Equipments Applying Novel SiC Power Semiconductor Modules**
Invited Paper Kazuaki Mino, Ryuji Yamada, Hiroshi Kimura, Yasushi Matsumoto
14:10 *Fuji Electric Co., Ltd., Japan*

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

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

Tuesday, May 20: 15:55 - 18:00

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 Kinya Nakatsu[1,2], Ryuichi Saito[3]
15:55 *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 Sari Maekawa[1], Junichi Tsuda[1], Atsuhiko Kuzumaki[1], Shuhei Matsumoto[1], Hiroshi Mochikawa[1], Hisao Kubota[2]
16:20 *1) Toshiba Corporation, Japan, 2) Meiji University, Japan*

20A4-3 **System Integration of GaN Technology**
Invited Paper J. A. Ferreira[1], J. Popovic[1], J. D. van Wyk[2], F. Pansier[3]
16:45 *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 Yugo Kashihara, Jun-ichi Itoh
17:10 *Nagaoka University of Technology, Japan*

20A4-5 **A Large Capacity 3-Level IEGT Inverter**
17:35 Daisuke Yoshizawa, Makoto Mukunoki, Kenichiro Omote, Makoto Hayashi, Takashi Ishida
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

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 Takashi Yoshioka, Yosei Hirano, Kiyoshi Ohishi, Toshimasa Miyazaki, Yuki Yokokura
15:55 *Nagaoka University of Technology, Japan*

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

20B4-3 **A Robotic Cane for Walking Assistance**
Invited Paper Kyohei Shimizu[1], Issam Smadi[2], Yasutaka Fujimoto[1]
16:45 *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 Satoshi Komada[1], Santiago Turpin[2], Kento Hashimoto[1], Daisuke Yashiro[1], Junji Hirai[1]
17:10 *1) Mie University, Japan, 2) Ford, Spain*

20B4-5 **Contact State Recognition Based on Haptic Signal Processing for Robotic Tool Use**
Invited Paper Ryohei Matsuzaki, Jun Okuma, Sho Sakaino, Toshiaki Tsuji
17:35 *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 Kiyoshi Wajima[1], Yasuhiro Marukawa[2], Hiroaki Toda[3], Chio Ishihara[4], Takashi Kosaka[5]
15:55 *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 Gyeong-Jae Park[1], Hochang Jung[3], Yong-Jae Kim[2], Sang-Yong Jung[1]
16:20 *1) Sungkyunkwan University, Korea, 2) Korea Automotive Technology Institute, Korea, 3) Chosun University, Korea*

20C4-3 **Recent Technical Trends in PMSM**
Invited Paper Shigeo Morimoto[1], Yoshinari Asano[2], Takashi Kosaka[3], Yuji Enomoto[4]
16:45 *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 Yoshiaki Kano
17:10 *Toyota National College of Technology, Japan*

20C4-5 **Recent Technical Trends in Variable Flux Motors**
Invited Paper Akio Toba[1], Akihiro Daikoku[2], Noriyoshi Nishiyama[3], Yuichi Yoshikawa[3], Yosuke Kawazoe[4]
17:35 *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**
16:20 **Three-Wire Systems**
Ryosuke Amma, Hideaki Fujita
Tokyo Institute of Technology, Japan

20D4-3 **Design of Grid Connected PWM Converters Considering Topology and PWM Methods for**
16:45 **Low-Voltage Renewable Energy Applications**
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. Wu[1], C.-H. Chang[2], L.-C. Lin[2]
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 **Expectations of Next-Generation Power Devices for Home and Consumer Appliances**
Invited Paper Akihiko Kanouda, Hiroyuki Shoji, Takae Shimada, Toshikazu Okubo
15:55 *Hitachi, Ltd., Japan*

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

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

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

20E4-5 **Recent Advances and Future Prospects on GaN-Based Power Devices**
Invited Paper Tetsuzo Ueda
17:35 *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 **Scaling and Balancing of Multi-Cell Converters**
Invited Paper Matthias Kasper, Dominik Bortis, Johann W. Kolar
15:55 *ETH Zurich, Switzerland*

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

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

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

20F4-5 **A Novel Synchronous Rectifier Method for a LLC Resonant Converter with Voltage-Doubler Rectifier**
Invited Paper Koji Murata, Fujio Kurokawa
17:35 *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 **Latest Developments in Increasing the Power Density of Traction Drives**
Invited Paper Mark-M. Bakran[1], Andreas März[1], Bernd Laska[2], Eberhard Krafft[2], Olaf Korner[2], Andreas Nagel[2]
15:55 *1) University of Bayreuth, Germany, 2) Siemens AG, Germany*

20G4-2 **Catenary and Storage Battery Hybrid System for Electric Railcar Series EV-E301**
Invited Paper Y. Kono, N. Shiraki, H. Yokoyama, R. Furuta
16:20 *East Japan Railway Company, Japan*

20G4-3 **Technology for Energy-Saving Railway Operation through Power-Limiting Brakes**
Invited Paper **---A Case Study at an Urban Railway---**
16:45 Takafumi Koseki[1], Shoichiro Watanabe[1], Yasuhiro Hamazaki[2], Keiichiro Kondo[3], Tomonori Hasegawa[4], Takeshi Mizuma[4]
1) The University of Tokyo, Japan, 2) Shin-Keisei Electric Railway Co., Ltd., Japan, 3) Chiba University, Japan 4) National Traffic Safety and Environment Laboratory, Japan

20G4-4 **An Overview on Braking Energy Regeneration Technologies in Chinese Urban Railway Transportation**
Invited Paper Zhongping Yang, Huan Xia, Bin Wang, Fei Lin
17:10 *Beijing Jiaotong University, China*

20G4-5 **Traction Inverter That Applies Compact 3.3 kV/1200 A SiC Hybrid Module**
Invited Paper Katsumi Ishikawa, Kazutoshi Ogawa, Seigo Yukutake, Norifumi Kameshiro, Yasuhiko Kono
17:35 *Hitachi, Ltd., Japan*

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 K. J. Tseng[1], Guomin Luo[2]
15:55 *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 Masahide Hojo, Tomoya Nishioka, Kenji Yamanaka
16:20 *The University of Tokushima, Japan*

20H4-3 **Performance Evaluation for Grid Impedance Based Islanding Detection Method**
Invited Paper Ning Liu[1], A. S. Aljankawey[2], C. P. Diduch[2], L. Chang[2], Meiqin Mao[1], Pegah Yazdkhasti[2], Jianhui Su[1]
16:45 *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**
Invited Paper **Spectrum Time Domain Reflectometry**
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 R. Bosshard[1], J. W. Kolar[1], B. Wunsch[2]
17:35 *1) ETH Zurich, Switzerland, 2) ABB Switzerland Ltd., Switzerland*

Room I

Oral Session (Organized) 20I4 Simulation and Modeling of Power Electronics and Automotive Systems

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

20I4-1 **Standard Models for Smart Grid Simulations**
Invited Paper Taku Noda[1], Shinji Kato[2], Tomohiro Nagashima[1], Yoichi Sekiba[3], Takayuki Sekisue[4], Hirokazu Tokuda[5], Yuichiro Kabasawa[6], Masaaki Kounoto[7]
15:55 *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*

20I4-2 **Model Development for Motor Drive System Simulations**
Invited Paper
16:20
Hiroki Ishikawa[1], Nobuhiro Umeda[2], Noriyuki Kimura[3], Masahiro Ikeda[4], Takashi Abe[5], Toshiji Kato[6], Yutaka Kubota[7], Koichi Shigematsu[8], Junichi Shimomura[9], Yukinori Inoue[9], Yusuke Kohno[10]
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

20I4-3 **Practical Simulation Examples of Automotive and Power Supply Systems**
Invited Paper
16:45
Takashi Abe[1], Kentaro Fukushima[2], Takayuki Sekisue[3], Koichi Shigematsu[4], Junichi Ichihara[5], Toshiji Kato[6], Hiroki Ishikawa[7], Yusuke Kouno[8], Masaaki Konoto[9], Ryoji Saito[10], Yasuyuki Nishida[11]
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

20I4-4 **Admittance Matrices of Voltage Source Converters for Distributed Generators**
Invited Paper
17:10
K. L. Lian, T. D. Huang
National Taiwan University of Science and Technology, Taiwan

20I4-5 **FPGA-Based Simulation of Power Electronics Using Iterative Methods**
Invited Paper
17:35
Huiguo Zhang[1], Jian Sun[2]
1) Changshu Institute of Technology, China, 2) Rensselaer Polytechnic Institute, USA

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**
Invited Paper
15:55
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**
Invited Paper
16:20
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**
Invited Paper
16:45
Seiya Abe[1], Akira Hidaka[2], Jungo Rikitake[2], Satoshi Matsumoto[2], Tamotsu Ninomiya[1]
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**
Invited Paper
17:10
Yoichi Ishizuka[1], Kiminori Tanaka[1], Ryota Shibahara[1], Seiya Abe[2], Tamotsu Ninomiya[2]
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**
Invited Paper
17:35
Hiroshi Fuketa, Yasuhiro Shinozuka, Koichi Ishida, Makoto Takamiya, Takayasu Sakurai
The University of Tokyo, Japan

Room A

Oral Session 21A1 DC-DC Converters I

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

21A1-1 **DCM Analysis of a Single SiC Switch Based ZVZCS Tapped Boost Converter**
8:30 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**
8:55 T. Suntio[1], J. Viinamäki[1], J. Jokipii[1], T. Messo[1], M. Sitbon[2], A. Kuperman[2]
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**
9:20 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**
9:45 Shun Nagata[1], Mika Takasaki[1], Yutaka Furukawa[2], Toshiro Hirose[3], Yoichi Ishizuka[3]
1) Nagasaki University, Japan, 2) Koga System Works, Japan, 3) Nishimu Electoronics 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**
8:30 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**
8:55 Kohei Aoyama[1], Naoki Motoi[2], Yukinori Tsuruta[1], Atsuo Kawamura[1]
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**
9:20 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**
9:45 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**
8:30 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**
8:55 Takeshi Horiguchi[1], Shin-ichi Kinouchi[1], Yasushi Nakayama[1], Takeshi Oi[1], Hiroaki Urushibata[2], Shoji Okamoto[3], Shinji Tominaga[3], Hirofumi Akagi[3]
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**
9:20 Naoki Sakurai[1], Masashi Yura[2], Takuma Hakutou[2]
1) Hitachi, Ltd., Japan, 2) Hitachi Automotive Systems, Ltd., Japan

21C1-4 **A New Level Up Shifter for HVICs with High Noise Tolerance**
9:45 Masashi Akahane, Akihiro Jonishi, Masaharu Yamaji, Hiroshi Kanno, Takahide Tanaka, Haruhiko Nishio, Hitoshi Sumida
Fuji Electric Co., Ltd., Japan

Room D

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 Tsukakoshi[1]
1) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan, 2) Toshiba International Corporation, USA

Room E

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**
8:30 **Low-Power Operation in Hybrid PV/Storage Systems**
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**
9:45 **Interface**
Khairy Sayed[1], Soon-Kurl Kwon[2], Katsumi Nishida[3], Mutsuo Nakaoka[2,4]
1) Sohag University, Egypt, 2) Kyungnam University, Korea, 3) Ube National College of Technology, Japan, 4) Yamaguchi University, Japan

Room F

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[1], Eckart Hoene[2], Stefan Hoffmann[2], Klaus-Dieter Lang[2]
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**
9:20 **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**
9:45 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 Jeong[1], Thanh Hai Nguyen[1], Dong-Choon Lee[1], Jang-Mok Kim[2]
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 Mingorancia de Carvalho, Naji Rajai Nasri Ama, Wilson Komatsu, Fernando Ortiz Martinz, 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 Kanematsu[1], Takayuki Miyajima[1], Hiroshi Fujimoto[1], Yoichi Hori[1], Toshio Enomoto[2], Masahiko Kondou[2], Hiroshi Komiya[2], Kantaro Yoshimoto[2], Takayuki Miyakawa[2]
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**
8:55 **Independent Vector Control**
Seon-Hwan Hwang[1], Deok-Je Bang[2], Ji-Won Kim[2]
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**
9:20 **Ampere and Reduced Source Current Ripple**
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. Tajima[1], T. Kosaka[1], N. Matsui[1], K. Tonogi[2], N. Minoshima[2], T. Yoshida[2]
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**
Invited Paper Atsushi Matsumoto[1], Masaru Hasegawa[2], Shinji Doki[1]
8:30 *1) Nagoya University, Japan, 2) Chubu University, Japan*

21I1-2 **Motor Drive System Using Nonlinear Mathematical Model for Permanent Magnet Synchronous Motors**
Invited Paper
8:55 Yoshitaka Iwaji, Junnosuke Nakatsugawa, Toshifumi Sakai, Shigehisa Aoyagi, Hirokazu Nagura
Hitachi, Ltd., Japan

21I1-3 **Sensorless-Oriented Design of IPMSM**
Invited Paper
9:20 Yoshiaki Kano
Toyota National College of Technology, Japan

21I1-4 **Noise Reduction Method by Injected Frequency Control for Position Sensorless Control of Permanent Magnet**
9:45 **Synchronous Motor**
Shun Taniguchi, Kazuya Yasui, Kazuaki Yuki
Toshiba Corporation, Japan

Room J

Oral Session 21J1 Motion Control and Robotics I

Chairs: 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 Ikeda[1], Tsuyoshi Hanamoto[2]
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

21J1-4 **Identification of Two-Mass Mechanical Systems Using Torque Excitation: Design and Experimental Evaluation**
9:45 Seppo E. Saarakkala, Marko Hinkkanen
Aalto University, Finland

Wednesday, May 21: 10:40 - 12:20

Room A

Oral Session 21A2 DC-DC Converters II

Chairs: 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**
11:30 **Converter**
Mizuki Nakahara, Keiji Wada
Tokyo Metropolitan University, Japan

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

Room B

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 Chun-An Cheng, Chien-Hsuan Chang, Hung-Liang Cheng, Tsung-Yuan Chung
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

21B2-3 **A Novel Bridgeless Boost Half-Bridge ZVS-PWM Single-Stage Utility Frequency AC-High Frequency**
11:30 **AC Resonant Converter for Domestic Induction Heaters**
Tomokazu Mishima[1], Yuki Nakagawa[1], Mutsuo Nakaoka[2]
1) Kobe University, Japan, 2) Kyungnum University, Korea

21B2-4 **Application of Virtual Validation System for Inverter Heat Pump System**
11:55 Masaki Kanamori[1], Koji Noda[1], Takahisa Endo[1], Nobuyuki Suzuki[2]
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**
10:40 **V_{ce} and V_f voltage during Converter Operation**
Angel Ruiz de Vega[1], Pramod Ghimire[1], Kristian Bonderup Pedersen[1], Ionut Trintis[1], Szymon Beczckowski[1], Stig Munk-Nielsen[1], Bjørn Rannestad[2], Paul Thøgersen[2]
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 Kluge[1], Lutz Goehler[2], Henry Gueldner[1], Thomas Trompa[3], David Mory[3], Karl-Heinz Segsa[4]
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 K. Takahashi, S. Yoshida, S. Noguchi, H. Kuribayashi, N. Nashida, Y. Kobayashi, H. Kobayashi, K. Mochizuki, Y. Ikeda, O. Ikawa
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 Kim[1], Bo-Hyung Cho[1], Hangseok Choi[2]
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

21D2-4 **Analysis and Design of a Push-Pull Single-Stage Flyback Power Factor Corrector**
11:55 Yu-Kang Lo[1], Huang-Jen Chiu[1], Yu-Chen Liu[1], Chung-Yi Lin[2], Shih-Jen Cheng[2], CS Yang[2]
1) National Taiwan University of Science and Technology, Taiwan, 2) Flextronics Power, Taiwan

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 Yongsoon Park[1], Seung-Ki Sul[1], Ki-Nam Hong[2]
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**
11:05 **without Communication**
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 Huang[1], Frede Blaabjerg[1], Poh Chiang Loh[1], Weimin Wu[2]
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**
11:55 **with Low Leakage Current**
Ricardo Souza Figueredo, Kelly Caroline Mingorancia de Carvalho, Lourenço Matakas 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**
10:40 **in DC-Fed Motor Drive Systems**
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 Nakamura[1], Toshifumi Ise[2]
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 Zhuang[1], Ryosuke Terabe[1], Shinya Hibino[1], Takayuki Ozaki[2], Masaya Harakawa[1], Tetsuaki Nagano[1]
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 Terao[1], Yasuhiro Shishida[1], Yoshinori Tsuruma[1], Tomotsugu Ishizuka[1], Fumio Aoyama[1], Teruo Yoshino[1], Yutaka Kato[2], Jean Bélanger[3]
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**
Invited Paper **Wireless Communication Networks**
10:40 Alexis Kwasinski[1], Andres Kwasinski[2]
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**
Invited Paper Kyungbae Lim[1], Jaeho Choi[1], Juyoung Jang[2], Jaesig Kim[2], Junghum Lee[2]
11:05 *1) Chungbuk National University, Korea, 2) POSCO Energy Co., Ltd., Korea*

21G2-3 **130MVA-STATCOM for Transient Stability Improvement**
Invited Paper
11:30
Takao Imanishi[1], Yoshinobu Nagatomo[1], Shinya Iwasaki[1], Kenji Masaki[2], Toshiyuki Fujii[2], Jun Ieda[3]
1) The Kansai Electric Power Co., Inc., Japan, 2) Mitsubishi Electric Corporation, Japan, 3) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

21G2-4 **Improved Droop Controller for Microgrid Inverter Considering the Line Impedance Mismatching**
Invited Paper
11:55
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)*
Tadanao Zanma *(Chiba University)*

21H2-1 **Suppression Control Method for Iron Loss of MATRIX Motor under Flux Weakening Utilizing Individual Winding Current Control**
10:40
Hiroki Hijikata[1], Kan Akatsu[1], Yoshihiro Miyama[2], Hideaki Arita[2], Akihiro Daikoku[2]
1) Shibaura Institute of Technology, Japan, 2) Mitsubishi Electric Corporation, Japan

21H2-2 **Performance Analysis of a New Concentrated-Winding Interior Permanent Magnet Synchronous Machine under Field Oriented Control**
11:05
D. Nguyen[1], R. Dutta[1], J. Fletcher[1], F. Rahman[1], Howard Lovatt[2]
1) The University of New South Wales, Australia, 2) Commonwealth Scientific and Industrial Research Organisation, Australia

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

21H2-4 **A DTC-PWM Control Scheme of PMSM Based on 12-Sectors Division and Speed Information**
11:55
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 **Control of Power Flow between the Wind Generator and Network**
Invited Paper
10:40
Péter Stumpf, István Nagy, István Vajk
Budapest University of Technology and Economics, Hungary

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

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

21I2-4 **Cascaded Multilevel Converter Based Bidirectional Inductive Power Transfer (BIPT) System**
Invited Paper
11:55
Bac Xuan Nguyen[1], D. M. Vilathgamuwa[1], Gilbert Foo[1], Andrew Ong[1], Prasad K. Sampath[1], Udaya K. Madawala[2]
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 **Undersampling Control of a Bidirectional Cascaded Buck+Boost Dc-Dc Converter**
10:40
Martin Rosekeit[1], Philipp Joebges[1], Markus Lelie[1,2], Dirk Uwe Sauer[1,2], Rik W. De Doncker[1]
1) RWTH Aachen University, Germany, 2) JARA-Energy, Germany

21J2-2 **Sub-Microsecond Response Digital Controller for POL**
11:05 Hirotaka Nonaka[1], Yoichi Ishizuka[1], Kenji Mii[1], Fumiaki Takenami[1], Daisuke Kanemoto[2]
1) Nagasaki University, Japan, 2) The University of Yamanashi, Japan

21J2-3 **Gain Controlled High Efficiency Power Factor Correction Circuit**
11:30 Yu Yonezawa[1], Hiroshi Nakao[1], Tomotake Sasaki[1], Yoshinobu Matsui[1], Yoshiyasu Nakashima[1], Junji Kaneko[1], Hiroshi Shimamori[2], Yukio Yoshino[2], Hisato Hosoyama[3], Atsushi Manabe[3], Shun Motizuki[4], Shigeharu Yamashita[4]
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**
11:55 Kai-Hui Chen, Tsorng-Juu Liang
National Cheng Kung University, Taiwan

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

Room Poster 1, 2 and 3

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 Lin[1], Yu-Kang Lo[2], Huang-Jen Chiu[2], Chao-Fu Wang[2], Chien-Yu Lin[2]
1) National Taitung 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 Nho[1], Jae-Hun Jung[1], Hak-Soo Kim[1], In-Dong Kim[1], Heung-Geun Kim[2], Tae-Won Chun[3]
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

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 Shamseh[1], Atsuo Kawamura[1], Itsuo Yuzurihara[2], Atsushi Takayanagi[2]
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 Nguyen[1], Tam Khanh Tu Nguyen[1], Hong-Hee Lee[2]
1) Hochiminh City University of Technology, Vietnam, 2) University of Ulsan, Korea

21P2-7 η-ρ Pareto Optimization of 3-Phase 3-Level T-Type AC-DC-AC Converter Comprising Si and SiC Hybrid Power Stage
Hirofumi Uemura[1], Florian Krismer[1], Yasuhiro Okuma[2], Johann W. Kolar[1]
1) ETH Zurich, Switzerland, 2) Fuji Electric Co., Ltd., Japan

Poster Session 21P3 Power Devices and System Integration

Chairs: Sami Pettersson *(ABB Switzerland Ltd.)*
Masaru Nagao *(Toyota Motor Corporation)*

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, Ziwei 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 Ghimire[1], Angel Ruiz de Vega[1], Szymon Beczkowski[1], Stig Munk-Nielsen[1], Bjørn Rannestad[2]
Paul Bach Thøgersen[2]
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 Hokazono, 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. Vogt[1], A. Peters[1], N. Fröhleke[1], J. Böcker[1], S. Kempen[2]
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

21P4-7 Considerations for the Propagation Path of Conducted Noise in Air Conditioners
Tsuyoshi Tokiwa[1], Masaki Kanamori[1], Takahisa Endo[1], Mikiya Iida[2], Satoshi Ogasawara[3], Yizhanyi Tang[3]
1) Toshiba Carrier Corporation, Japan, 2) Toshiba Corporation, Japan, 3) Hokkaido University, Japan

21P4-8 Iron Loss Evaluation of Iron Powder Core Suitable for Inductor Used in Power Converters
Tomohiro Mori[1], Kazunori Igarashi[1], Kinji Kanagawa[1], Nobuyuki Yamashita[1], Toshihisa Shimizu[2], Yosio Bizen[2]
1) Mitsubishi Materials Corporation, Japan, 2) Tokyo Metropolitan University, Japan

21P4-9 Optimized Tuning Method of Stationary Frame Proportional Resonant Current Controllers
Fernando Ortiz Martinz, Kelly Caroline Mingorancia de Carvalho, Naji Rajai Nasri Ama, Wilson Komatsu, Lourenço Matakas Junior
Polytechnic School of the University of São Paulo, Brazil

21P4-10 Instantaneous Power Theory Applied to Power Conditioning Under Distorted Mains Voltages: a MATLAB/Simulink Approach
Petre-Marian Nicolae, Ileana-Diana Nicolae, Lucian-Dinuţ Popa, Marian-Ştefan Nicolae
University of Craiova, Romania

21P4-11 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

Poster Session 21P5 Electric Machines, Actuators and Sensors II

Chairs: Shigeo Morimoto *(Osaka Prefecture University)*
Shoji Shimomura *(Shibaura Institute of Technology)*

21P5-1 Efficiency Improvement of a Self-Start Type Permanent Magnet Synchronous Motor
H. Saikusa, S. Arikawa, T. Higuchi, Y. Yokoi, T. Abe
Nagasaki University, Japan

21P5-2 Consideration of Optimal Number of Poles and Frequency for High-Efficiency Permanent Magnet Motor
Daisuke Misu[1], Makoto Matsushita[1], Katsutoku Takeuchi[1], Koji Oishi[2], Mitsuhiro Kawamura[2]
1) Toshiba Corporation, Japan, 2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

21P5-3 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

21P5-4 Characteristics of a Half-Wave Rectified Brushless Synchronous Generator
Yuki Hirakawa, Tsuyoshi Higuchi, Yuichi Yokoi, Takashi Abe
Nagasaki University, Japan

21P5-5 Modeling of Wound Rotor Synchronous Machines Considering Harmonics, Geometric Saliencies and Saturation Induced Saliencies
Alexander Rambetius, Sven Luthardt, Bernhard Piepenbreier
University of Erlangen-Nuremberg, Germany

21P5-6 Design and Comparison of High Frequency Transformers Using Foil and Round Windings
Kartik V. Iyer, William P. Robbins, Ned Mohan
University of Minnesota, USA

21P5-7 A Method to Calculate the Performance of Linear Induction Motors Using Simple Two-Phase Model
Hideaki Hirahara[1], Shu Yamamoto[2], Takahiro Ara[2], Toshihisa Shimizu[1]
1) Tokyo Metropolitan University, Japan, 2) Polytechnic University, Japan

21P5-8 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

21P5-9 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

21P5-10 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 Delibery Systems
Tatsuya Furukawa[1], Shoichiro Muta[1], Hisao Fukumoto[1], Hideaki Itoh[1], Masashi Ohchi[2]
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 Nimura[1], Shinji Doki[1], Masami Fujitsuna[2]
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 Yamamoto[1], Hisashi Takahashi[1], Nobumasa Ushiro[2], Koki Shirasawa[2]
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 Wang[1], Yan Li[2], Jianwen Zhang[1], Xu Cai[1], Zhengzhi Han[1]
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 Kubo[1], Hisao Kubota[1], Takayuki Moroi[1], Kouki Matsuse[1], Kaushik Rajashekara[2]
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 Kuo[1], Shih-Jen Cheng[2], Yu-Kang Lo[1], Huang-Jen Chiu[1], Chung-Yi Lin[2], CS Yang[2]
1) National Taiwan University of Science and Technology, Taiwan, 2) Flextronics Power, Taiwan

21P8-2 Improvement in Efficiency of LED Lighting System
K. I. Hwu[1], W. Z. Jiang[1], Jenn-Jong Shieh[2]
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. Basari[1], Sosuke Awaji[1], Yunshun Zhang[1], Song Wang[1], Seiji Hashimoto[1], Shunji Kumagai[2], Makoto Kasai[2], Kenji Suto[2], Wei Jiang[3], Shuren Wang[3]
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 Kalogera, 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 Chattopadhyay[1], Subhashish Bhattacharya[1], Nicole C. Foureaux[2], Sidelmo M. Silva[2], Braz Cardoso F.[2], Helder de Paula[2], Igor A. Pires[2], Porfirio C. Cortizio[2], Lênin Moraes[2], José A. de S. Brito[3]
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 Chen[1], Yu-Shan Cheng[1], Shun-Chung Wang[2], Jia-Wei Huang[3], Yi-Hua Liu[1]
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. Razik[1], C. Maret[2], Y. Zitouni[1]
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 Fukumoto[1], Tatsuya Furukawa[1], Hideaki Itoh[1], Masashi Ohchi[2]
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 Kon[1,2], Tatsuji Yamada[1,2]
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 Diniz[1], Igor A. Pires[2], Gleisson J. França[2], Braz J. Cardoso[2]
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 Mingorancia de 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 Win[1], Yoshihiro Hisada[1], Toshihiko Tanaka[1], Eiji Hiraki[2], Masayuki Okamoto[3], Seong Ryong Lee[4]
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 Beres[1], Xiongfei Wang[1], Frede Blaabjerg[1], Marco Liserre[2], Claus Leth Bak[1]
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 Tseng[1], Yu-Chen Liu[1], Yu-Kang Lo[1], Huang-Jen Chiu[1], Yun-Chu Chiu[2]
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 Fukuoka[1], Yuichi Iga[1], Hideki Omori[1], Tosimitu Morizane[1], Noriyuki Kimura[1], Mutuo Nakaoka[2]
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, Tsorng-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. Lee[1], Bo H. Choi[1], Jun P. Cheon[1], Bong C. Kim[2], Chun T. Rim[1]
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 Pan[1], Chen-Feng Chuang[1], Chia-Chi Chu[1], Hao-Chien Cheng[2]
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[1], Masahito Shoyama[1], Yu Yonezawa[2], Yoshiyasu Nakashima[2]
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

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 **Disturbance Observer Based on Rocket I/O Protocol**
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**
15:35 **Inverters**
Yuttana Kumsuwan, Watcharin Srirattanawichaikul
Chiang Mai University, Thailand

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 Bianda, Francisco Canales
ABB Switzerland Ltd., Switzerland

21C3-3 **Development of Ultrahigh Voltage SiC Power Devices**
15:10 Kenji Fukuda[1], Dai Okamoto[1], Shinsuke Harada[1], Yasunori Tanaka[1], Yoshiyuki Yonezawa[1], Tadayoshi Deguchi[1], Shuji Katakami[1,2], Hitoshi Ishimori[1], Shinji Takasu[1], Manabu Arai[1,2], Kensuke Takenaka[1], Hiroyuki Fujisawa[1], Manabu Takei[1,2], Kazushi Matsumoto[1], Naoyuki Ohse[1], Mina Ryo[1], Chiharu Ota[4], Kazuto Takao[4], Makoto Mizukami[4], Tomohisa Kato[1], Toru Izumi[5], Toshihiko Hayashi[5], Koji Nakayama[5], Katsunori Asano[5], Hajime Okumura[1], Tsunenobu Kimoto[6]
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**
15:35 **Applications**
Samir Hazra[1], Ankan De[1], Subhashish Bhattacharya[1], Lin Cheng[2], John Palmour[2], Marcelo Schupbach[2], Brett Hull[2], Scott Allen[2]
1) North Carolina State University, USA, 2) Cree, Inc., USA

Room D

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 Yan[1], Hui Zhang[1], Kazuya Ogura[1], Shota Urushibata[2]
1) Meiden Singapore, Singapore, 2) Meidensha Corporation, Japan

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

21D3-3 **Dynamic Voltage Balancing Algorithm for Modular Multilevel Converter with Three-Level Flying Capacitor**
15:10 **Submodules**
Apparao Dekka[1], Bin Wu[1], Navid R. Zargari[2]
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

Room E

Oral Session 21E3 PV Systems IV

Chairs: Toru Sai ***(Toyko 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 Iyer[1], Yunwei Li[2], Bin Wu[1], B. N. Singh[3]
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 Zhang[1], Xiangdong Sun[1], Yanru Zhong[1], Mikihiko Matsui[2], Lie Guo[1]
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 Marzouk[1], Sébastien Fournier-Bidoz[2], Jessica Yablecki[2], Kenneth McLean[2], Olivier Trescases[1]
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 Yoshida[1], Hirokazu Suzuki[2]
1) Hiroshima Institute of Technology, Japan, 2) The University of Tokyo, Japan

Room F

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**
Invited Paper Masayuki Morimoto, Mamiko Inamori
14:20 *Tokai University, Japan*

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

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

21F3-4 **Consideration of 10kW In-Wheel Type Axial-Gap Motor Using Ferrite Permanent Magnets**
Invited Paper Kodai Sone[1], Masatsugu Takemoto[1], Satoshi Ogasawara[1], Kenichi Takezaki[2], Wataru Hino[2]
15:35 *1) Hokkaido University, Japan, 2) Dynax Corporation, Japan*

Room G

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. Hong[1], Soo-Cheol. Shin[1], Hee-Jun. Lee[1], Taeck-Kie. Lee[2], Chung-Yeun Won[1]
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 Wang[1], Xiongfei Wang[2], Yanjun Tian[2], Zhe Chen[2], Yongdong Tan[1]
1) Southwest Jiaotong University, China, 2) Aalborg University, Denmark

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**
15:35 **Converter Systems with Constant Power Loads in DC Microgrids**
Mingfei Wu, Dylan D. C. Lu
The University of Sydney, Australia

Room H

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**
14:20 **Predictive Control**
Hirotsugu 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 Zanma, 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 Uddin[1], Saad Mekhilef[1], Marco Rivera[2], Jose Rodriguez[3]
1) University of Malaya, Malaysia, 2) Universidad de Talca, Chile, 3) Universidad Técnica Federico Santa María, Chile

Room I

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**
Invited Paper Aleksandar Radić, S. M. Ahssanuzzaman, Behzad Mahdavikhah, Aleksandar Prodić
14:20 *University of Toronto, Canada*

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

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

21I3-4 **HFL PV Micro-Inverter with Front-End Current-Fed Converter and Half-Wave Cycloconverter**
Invited Paper D. R. Nayanasiri, D. M. Vilathgamuwa, D. L. Maskell
15:35 *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 Katsuki[1], Kosuke Morita[2], Kazufumi Masutomo[2], Tatsuya Mizuki[2], Kohei Shibahara[2], Shigetaka Maeyama[3]
1) Nagasaki University, Japan, 2) Kyushu Institute of Technology, Japan, 3) TDK Corporation, Japan

Wednesday, May 21: 16:30 - 18:35

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 Hariya[1], Ken Matsuura[2], Hiroshige Yanagi[2], Satoshi Tomioka[2], Yoichi Ishizuka[1], Tamotsu Ninomiya[3]
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 Pidaparthy[1], Byungcho Choi[1], Jinhaeng Jang[2]
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 Domoto[1], Yoichi Ishizuka[1], Seiya Abe[2], Tamotsu Ninomiya[2]
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 Hassanpoor[1], Jürgen Häfner[2], Björn Jacobson[3],
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 Tang[1], Bin Wu[2], Venkata Yaramasu[2], Weirong Chen[1], Hussain S. Athab[2]
1) Southwest Jiaotong University, China, 2) Ryerson University, Canada

Room C

Oral Session 21C4 SiC Devices & Related Assembly Technology

Chairs: Stone Cheng *(National Chiao Tung University)*
Tsuyoshi 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 Colmenares[1], Dimosthenis Peftitsis[1], Hans-Peter Nee[1], Jacek Rabkowski[2]
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 Li[1], Emre Gurpinar[1], Saul Lopez-Arevalo[1], Alberto Castellazzi[1], Liam Mills[2]
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 Kadavelugu[1], Subhashish Bhattacharya[1], Sei-Hyung Ryu[2], Edward Van Brunt[2], Dave Grider[2], Scott Leslie[3]
1) North Carolina State University, USA, 2) Cree, Inc., USA, 3) Powerex, Inc., USA

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 Çiftçi[1,2], Feyzullah Ertürk[1], Ahmet M. Hava[1]
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**
16:55 **Triple-Star Bridge Cells (MMCC-TSBC)**
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 Konstantinou[1], Rosheila Darus[1], Josep Pou[1,2], Salvador Ceballos[3], Vassilios G. Agelidis[1]
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 Darus[1,2], Georgios Konstantinou[1], Josep Pou[1,3], Salvador Ceballos[4], Vassilios G. Agelidis[1]
1) The University of New South Wales, Australia, 2) Universiti Teknologi MARA, Malaysia,
3) Technical University of Catalonia, Spain, 4) TECNALIA, Spain

Room E

Oral Session 21E4 PV Systems V

Chairs: Lourenco Matakas Junior *(University of São Paulo)*
Yoshiaki Yoshida *(Hiroshima Institute of Technology)*

21E4-1 **A Single-Phase Power Conditioner with a Buck-Boost-Type Power Decoupling Circuit**
16:30 Shota Yamaguchi, Toshihisa Shimizu
Tokyo Metropolitan University, Japan

21E4-2 **A Novel Asymmetrical FLC-Based MPPT Technique for Photovoltaic Generation System**
16:55 Yi-Hsun Chiu[1], Yu-Shan Cheng[1], Yi-Hua Liu[1], Shun-Chung Wang[2], Zong-Zhen Yang[3]
1) National Taiwan University of Science and Technology, Taiwan, 2) Lunghwa University of Science and Technology, Taiwan, 3) Industrial Technology Research Institute, Taiwan

21E4-3 **A Novel Current Link Distributed MPPT PV System - Overall System Prototyping and Evaluation -**
17:20 Mikihiko Matsui[1], Toru Sai[1], Akira Kitamura[1], Xiang-Dong Sun[2], Byung-Gyu Yu[3]
1) Tokyo Polytechnic University, Japan, 2) Xi'an University of Technology, China, 3) Kongju National University, Korea

21E4-4 **Power Flow Control and MPPT Parameter Selection for Residential Grid-Connected PV Systems with Battery Storage**
17:45 Chokchai Chuenwattanapraniti
Burapha University, Thailand

21E4-5 **A Maximum Power Point Tracking Method with Ripple Current Orientation**
18:10 Chin-Sien Moo, Gwo-Bin Wu
National Sun Yat-sen University, Taiwan

Room F

Oral Session 21F4 Permanent Magnet Synchronous Motors

Chairs: Faz Muhammed Rahman *(The University of New South Wales)*
Takashi Kosaka *(Nagoya Institute of Tecnology)*

21F4-1 **Output Characteristics of a Surface Permanent Magnet-Type Vernier Motor - Comparison of Test Results and Calculation -**
16:30 Yasuhiro Kataoka[1], Masakazu Takayama[1], Yoshihisa Anazawa[1], Yoshitarou Matsushima[2]
1) Akita Prefectural University, Japan, 2) Shizuoka University, Japan

21F4-2 **Topology Optimization for Skew of SPMSM by Using Multi-Step Parallel GA**
16:55 Wataru Kitagawa, Takaharu Takeshita
Nagoya Institute of Technology, Japan

21F4-3 **Loss Minimization Design Using Magnetic Equivalent Circuit for a Permanent Magnet Synchronous Motor**
17:20 Daisuke Sato, Jun-ichi Itoh
Nagaoka University of Technology, Japan

21F4-4 **The Proposal of a New Motor Which Has a High Winding Factor and a High Slot Fill Factor**
17:45 Shinji Makita[1], Yasuhide Ito[2], Tomohiro Aoyama[2], Shinji Doki[3]
1) Denso Corporation, Japan, 2) Asmo Co., Ltd, Japan, 3) Nagoya University, Japan

21F4-5 **Variable Leakage Flux Interior Permanent Magnet Synchronous Machine for Improving Efficiency on Duty Cycle**
18:10 Masanao Minowa[1], Hiroki Hijikata[1], Kan Akatsu[1], Takashi Kato[2]
1) Shibaura Institute of Technology, Japan, 2) Nissan Motor Co., Ltd, Japan

Room G

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

Chairs: Giuseppe Guidi *(Sintef Energy Research)*
Masahide Hojo *(The University of Tokushima)*

21G4-1 **History and Trends of Converter Technology for DC and AC Transmission in Japan**
Invited Paper Teruo Yoshino
16:30 *Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan*

21G4-2 **Accurate Output Power Control of Converters for Microgrids Based on Local Measurement and Unified Control**
Invited Paper
16:55 Meiqin Mao[1], Zheng Dong[1], Yong Ding[1], Liuchen Chang[2]
1) Hefei University of Technology, China, 2) University of New Brunswick, Canada

21G4-3 **Impedance-Based Analysis of Active Frequency Drift Islanding Detection Method for Grid-Tied Inverter System**
Invited Paper
17:20 Bo Wen[1], Dushan Boroyevich[1], Rolando Burgos[1], Zhiyu Shen[1], Paolo Mattavelli[2]
1) Virginia Polytechnic Institute and State University, USA, 2) University of Padova, Italy

21G4-4 **Development of 200-Mvar Class Thyristor Switched Capacitor Supporting Fault Ride-Through**
Invited Paper
17:45 Asuka Ohtake, Fei Zhang, Takafumi Fujimoto, Naoyuki Nakayama
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

21G4-5 **Detailed Analysis and Design of a Three-Phase Phase-Modular Isolated Matrix-Type PFC Rectifier**
Invited Paper
18:10 Patricio Cortes[1], Lukas Fässler[1], Dominik Bortis[1], Johann W. Kolar[1], Marcelo Silva[2]
1) ETH Zurich, Switzerland, 2) Universidad Politécnica de Madrid, Spain

Room H

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 Kotera, Toshiji Kato
Doshisha University, Japan

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

Room I

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[1], Akihiko Kanoda[1], Naoya Takahashi[2]
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[1], Chu-Shen Chang[1], Chin-Sien Moo[1], Hau-Chen Yen[2]
1) National Sun Yat-sen University, Taiwan, 2) Far East University, Taiwan

21I4-5 **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**
18:10
Taekyun Kim, Minsoo Jang, Vassilios G. Agelidis
The University of New South Wales, Australia

Room J

Oral Session (Organized) 21J4 Power Supply Technologies for Information and Communication Systems II

Chairs: Jinjun Liu *(Xi'an Jiaotong University)*
Akihiko Katsuki *(Nagasaki University)*

21J4-1 **Tolerance Analysis of a Constant-On Time Current-Mode Voltage Regulator with Adaptive Voltage Position Feature**
Invited Paper
16:30
Chih Wei Chen[1], Dan Chen[1], Shin Shiung Wang[2]
1) National Taiwan University, Taiwan, 2) Richtek Technology Corporation, Taiwan

21J4-2 **FPGA-Based Digital-Controlled Power Converter Designed with Universal Input Meeting 80 Plus Platinum Efficiency Code and Standby Power Code for Sever Power Applications**
Invited Paper
16:55
Yen-Shin Lai[1], Kung-Min Ho[2]
1) National Taipei University of Technology, Taiwan, 2) AcBel Polytech Inc., Taiwan

21J4-3 **Static and Dynamic Analyses of Digital Peak Current Mode DC-DC Converter**
Invited Paper
17:20
Kazuhiro Kajiwara, Fujio Kurokawa, Yuichiro Shibata
Nagasaki University, Japan

21J4-4 **Extended Discrete Control of Class E Amplifier in Order to Achieve Nominal Operation**
Invited Paper
17:45
Tadashi Suetsugu, Xiuqin Wei, Shotaro Kuga
Fukuoka University, Japan

21J4-5 **Adaptive Power Efficiency Control by Computer Power Consumption Prediction Using Performance Counters**
Invited Paper
18:10
Shinichi Kawaguchi, Toshiaki Yachi
Tokyo University of Science, Japan