

Conference Information

- **Date & Venue**

Date: May 15-19, 2022

Venue: Himeji City Culture and Convention Center (Arcrea HIMEJI)
143-2, Kamiyacho, Himeji City, Hyogo 670-0836 Japan

- **Official Language**

The official language of the conference is English.

All presentations including discussions shall be made in English.

For on-site participants

- **Registration**

The Registration Desk is in the Foyer of Grand Hall (2F) and open during the following hours:

Open Hours:	May 15 (Sun.)	13:00-19:30
	May 16 (Mon.)	7:30-18:15
	May 17 (Tue.)	8:30-18:40
	May 18 (Wed.)	8:30-18:05
	May 19 (Thu.)	8:30-18:00

- **Cloak**

Cloak is located in the Foyer of Grand Hall (2F) and open during the following hours:

Open Hours:	May 15 (Sun.)	13:00-19:30
	May 16 (Mon.)	7:30-18:15
	May 17 (Tue.)	8:30-18:40
	May 18 (Wed.)	8:30-18:05
	May 19 (Thu.)	8:30-18:10

- **Secretariat**

The secretariat office is at Room 404/405 (4F) during conference period.

- **Badges**

All the participants including accompanying persons are asked to wear their name badges to enter the session rooms and to take part in social programs. Please wear your name badge at all the time during the conference period.

- **Lunch**

Lunch is served for all participants with Lunch Ticket.

Place & Time:	Exhibition Hall & Outdoor Exhibition Space	
	May 16 (Mon.)	13:10-
	May 17 (Tue.)	13:15-
	May 18 (Wed.)	12:35-
	May 19 (Thu.)	13:05-

- **Coffee Break**

Exhibition Hall & 4F Lobby.

- **Internet Connections**

Wi-Fi access will be available in the Exhibition Hall during the conference.

Wi-Fi Access: SSID: ipec2022
WEP key: himeji

- **Message Board**

Any program changes or urgent announcements from the secretariat and person to person messages will be posted on the Message Board located near the Registration Desk. Please check the board occasionally.

For on-line participants

- **Access to on-line Session Room (Zoom) & platform**

On-line Conference will be held using Zoom and InfoVaya Virtual Platform.

Regarding enter the InfoVaya Virtual Platform and ZOOM access, please refer to On-line Participants Guide

https://www.ipec2022.org/files/IPEC2022_Participants_Guide.pdf?220513

- **Photography and Recording**

Photography / Recording in the sessions is strictly prohibited. Taking photos / screenshots of presentation materials without any approval from authors is also prohibited.

Sponsored Meetings

Women in Engineering May 17 (Tue.) 8:00-9:00 Special Conference Room (4F)

Social Programs

1. Welcome Reception

Date & Time: Sunday, May 15, 18:00-19:30

Venue: the Foyer of Grand Hall (2F), Himeji City Culture and Convention Center (Arcrea HIMEJI)

Dress Code: Casual

Fee: Free of charge

All registered participants and their accompanying persons are invited to attend free of charge. A light meal and drinks will be served.

2. Banquet

Date & Time: Wednesday, May 18, 18:40-21:30

Venue: Banquet room "Belvedere", 3F, Hotel Monterey Himeji

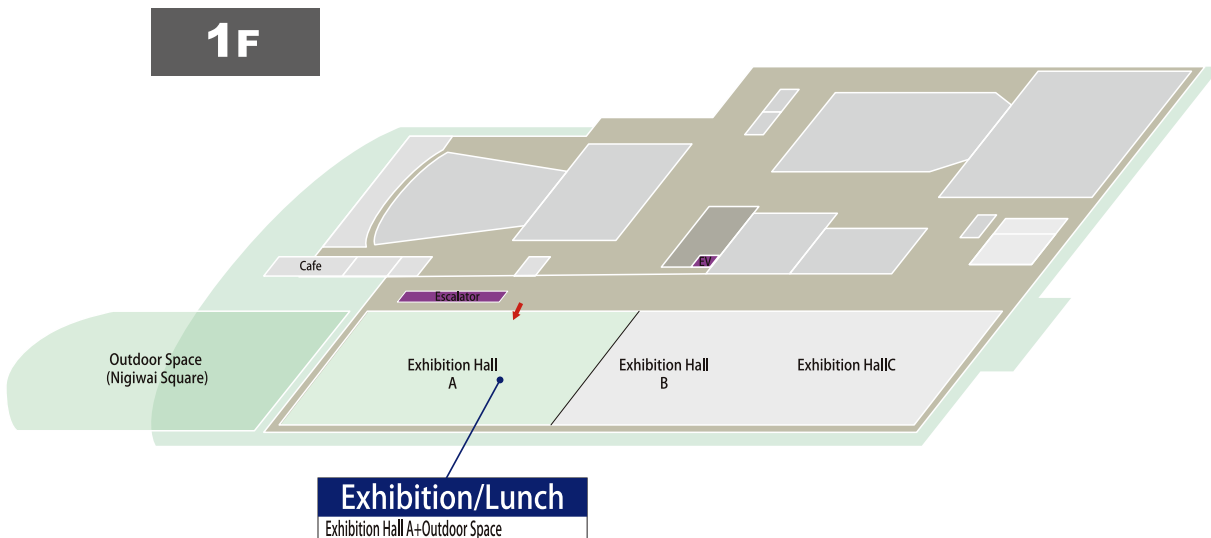
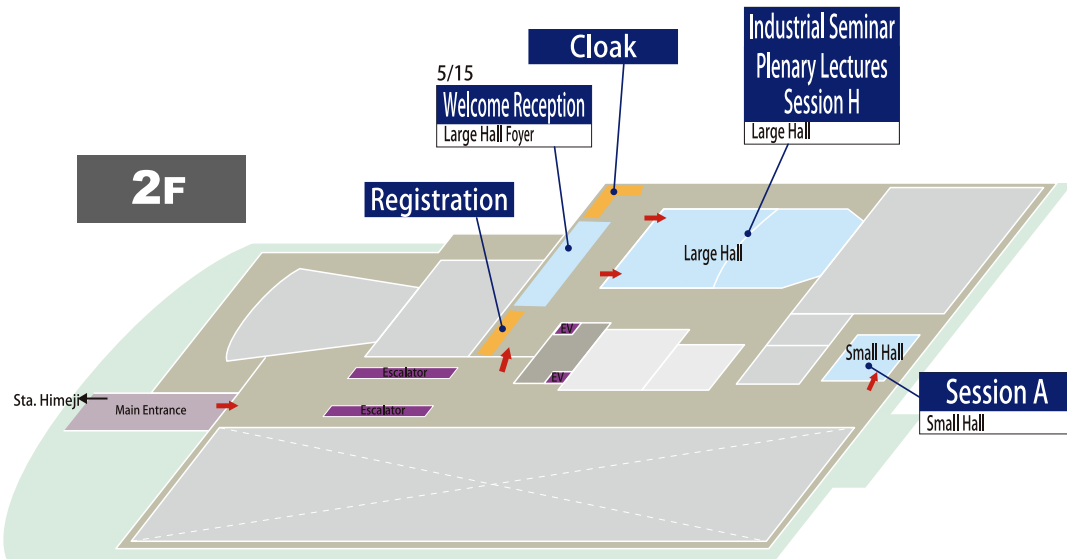
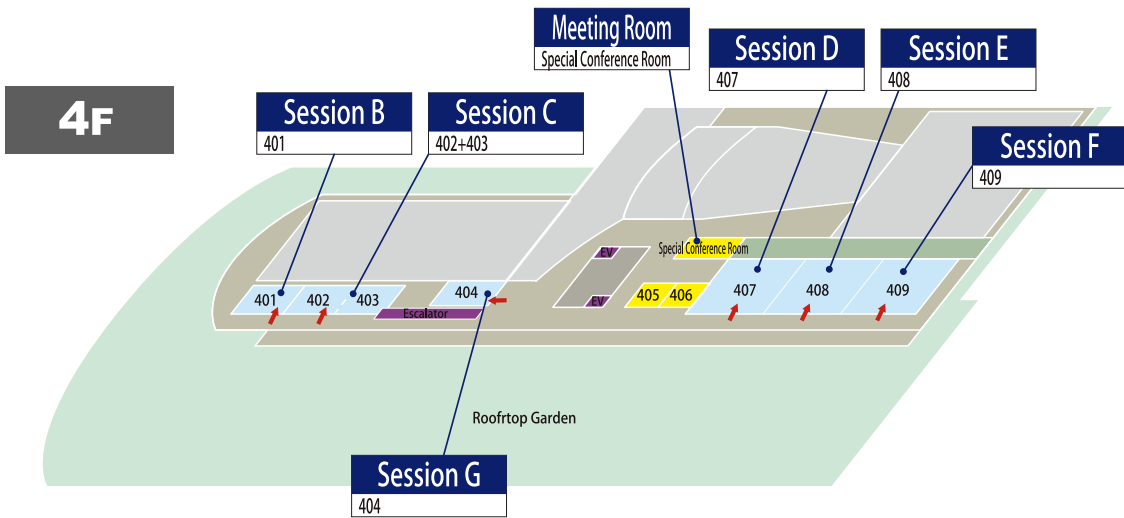
Dress Code: Informal

Fee: JPY 5,000

A full course meal and entertainment will be provided, and the award ceremony will also be held during the Banquet.

Participants are required to purchase extra tickets in advance. If you don't have one but wish to attend, please contact the Registration Desk on-site.

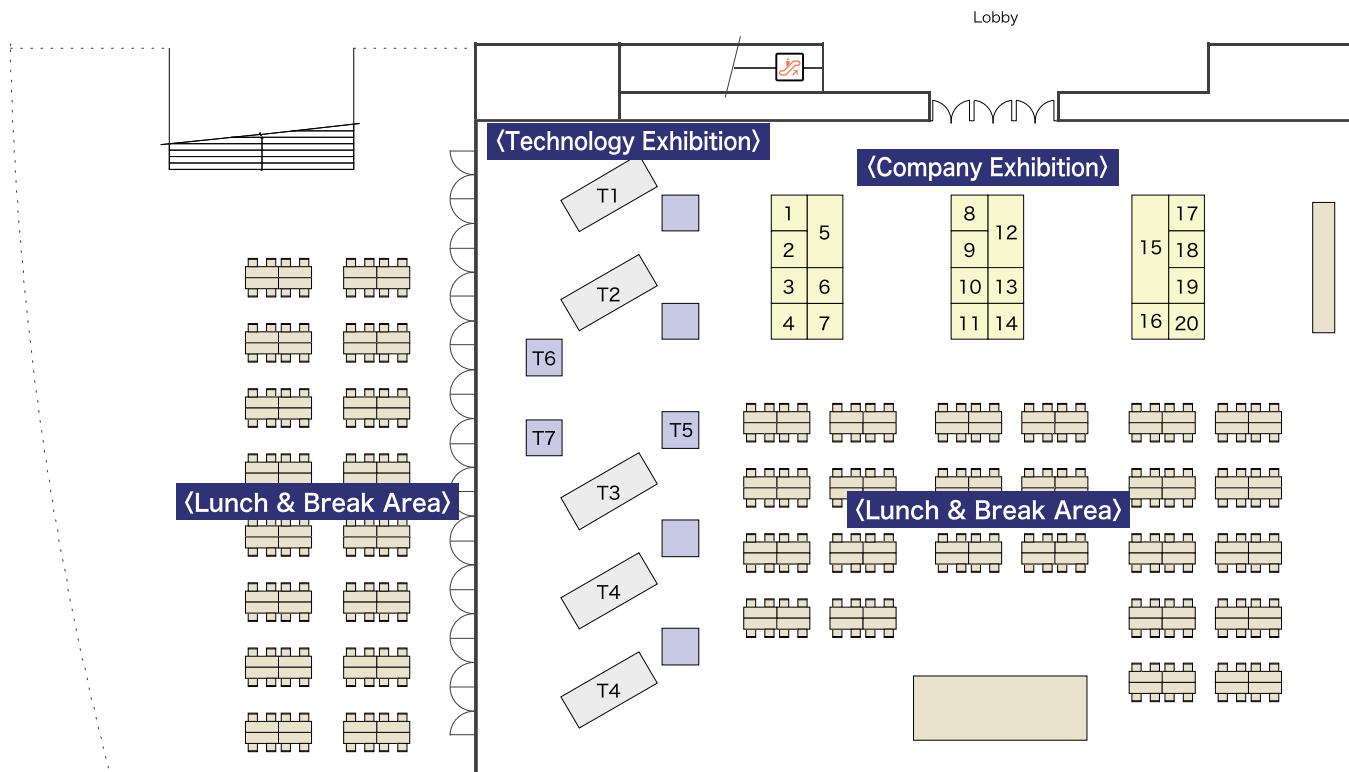
Floor Plan



Exhibitors

Open Hours: May 16 (Mon.) 12:00-18:00
 May 17 (Tue.) 10:00-18:00
 May 18 (Wed.) 10:00-17:30
 May 19 (Thu.) 10:00-14:30

Venue: Exhibition Hall A



<Technology Exhibition>

T1	Toyota MIRAI (Himeji City)
T2	MITSUBISHI ELECTRIC Corporation
T3	Honda motor Co., Ltd.
T4	Nissan Motor Co., Ltd.
T5	Hitachi, Ltd.
T6	DENSO Corporation
T7	Meidensha Corporation

<Company Exhibition>

1	Myway Plus Corporation	11	LTEC Corporation
2	Mersen Japan K.K.	12	TDK-Lambda Corporation
3	TAIYO KOGYO CO., LTD.	13	DSP Technology Co., Ltd.
4	MITSUBISHI ELECTRIC CORPORATION HIMEJI WORKS	14	PUES Corporation
5	HIOKI E.E. Corporation	15	NICHICON CORPORATION
6	LEM JAPAN K.K.	16	NEAT Co., Ltd.
7	Plexim GmbH	17	Speedgoat GmbH
8	Tektronix Japan	18	SANSHA ELECTRIC MFG. CO., LTD.
9	Headspring Inc.	19	TEXIO TECHNOLOGY CORPORATION
10	SUMITOMO BAKELITE CO., LTD.	20	Nihon Synopsys G.K.

Industrial Seminar

Industrial Seminar - Open to the public..... Large Hall (2F)

Sunday, May 15 14:00 – 17:30

Chair: Noriko Kawakami, TMEIC

14:00 **Naoto Fujishima**

Development Division, Semiconductors Business Group, Fuji Electric Co., Ltd.
"Technical Trend of Power Semiconductor Devices"



Naoto Fujishima

14:28 **Issei Takeuchi**

Abstech Co., Ltd.
"System Abstraction Based on Element Description Method"



Issei Takeuchi

Chair: Seiichiro Katsura, Keio University

14:56 **Chieko Umeno**

Toshiba Mitsubishi-Electric Industrial Systems Corporation
"Power Electronics Technology Contributing to Realization of Sustainable Society"



Chieko Umeno

15:40 **Ryohei Kitayoshi**

YASKAWA Electric Corporation
"Vibration Suppression of Two Inertia System Using an Equivalent Rigid-body Observer"



Ryohei Kitayoshi

Chair: Kantaro Yoshimoto, Tokyo Denki University

16:08 **Akihiro Shibuya**

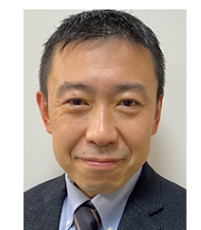
Alliance PED, Powertrain and EV Engineering Division, Nissan Motor Co., Ltd.
"e-POWER technology in Nissan's electrification strategy"



Akihiro Shibuya

16:36 **Masaya Inoue**

Mitsubishi Electric Corporation
"Development of a 48V Integrated Starter Generator for Mild Hybrid Vehicle"



Masaya Inoue

Plenary Sessions

Plenary Session Large Hall (2F)

Monday, May 16 9:00 - 10:45

Chair: Prof. Keiichiro Kondo (Vice co-chair, Steering Committee)

9:00 **Prof. Seung Ki Sul**

Seoul National University, Korea

“Realistic Simulation of Traction Motors in the Power Train of Electric Vehicle”



Prof. Seung Ki Sul

Chair: Prof. Kan Akatsu (Chair, Steering Committee)

9:35 **Prof. Zhengming Zhao**

Tsinghua University, China

“Discrete State Event-Driven Modeling and Simulation for Power Electronic Systems”



Prof. Zhengming Zhao

Chair: Prof. Hiroshi Fujimoto (Vice Co-chair, Program Committee)

10:10 **Dr. Takahiro Mizoguchi**

Motion Lib, Inc., Japan

“Academic research results in use; a case in real-haptics”



Dr. Takahiro Mizoguchi

Tuesday, May 17 16:55 - 18:40

Chair: Prof. Keiichiro Kondo (Vice Co-chair, Steering Committee)

16:55 **Prof. Chris Gerada**

University of Nottingham, UK

“Advanced Electrical Machines and Drives for Net Zero Transport”



Prof. Chris Gerada

Chair: Prof. Hiroshi Fujimoto (Vice Co-chair, Program Committee)

17:30 **Prof. Wen-Hua Chen**

Loughborough University, UK

“Nonlinear Disturbance Observer Design and Disturbance Observer-Based Control”



Prof. Wen-Hua Chen

Chair: Prof. Kan Akatsu (Chair, Steering Committee)

18:05 **Prof. Rik W. De Doncker**

Director E.ON Energy Research Center & Research Campus FEN, RWTH Aachen University

“Power Electronics – a key enabling technology for the European Green Deal”



Prof. Rik W. De Doncker

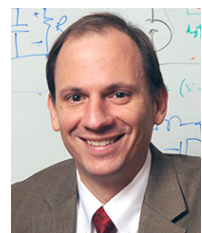
Wednesday, May 18 9:00 - 10:10

Chair: Prof. Keiji Wada (Vice Co-chair, Steering Committee)

9:00 **Prof. David Perreault**

Massachusetts Institute of Technology, USA

“Opportunities, Progress and Challenges in Piezoelectric-Based Power Electronics”



Prof. David Perreault

Chair: Prof. Keiji Wada (Vice Co-chair, Steering Committee)

9:35 **Prof. Tsorng-Juu Liang**

National Cheng-Kung University, Taiwan

“Implementation and Applications of Grid-forming Inverter with SiC for Power Grid Conditioning”



Prof. Tsorng-Juu Liang

Introduction to MEXT Program Innovative Power Electronics Technologies

Monday, May 16 11:05 – 13:10Large Hall (Room H)

Session Chairs : Toshihisa Shimizu(Tokyo Metropolitan University, Japan)

Masahiro Yamaguchi(Tohoku University, Japan)

Ko Matsumoto(Nagoya University, Japan)

Talk1 Tatsuo Oomori

Mitsubishi Electric Corporation, Japan

Overview of MEXT-Program “Innovative Power-Electronics Technologies (INNOPEL)”

Talk2 Yoshikazu Takahashi¹, Yoshitaka Iwaji², Shuji Katoh¹, Tetsuo Endoh¹

1) Tohoku University, Japan, 2) Ibaraki University, Japan

Integrated Power Electronics Technology for Decarbonized Society

Talk3 Yukihiro Sato, Hiroo Sekiya, Daisuke Miyagi, Hideo Saotome, Kenji Natori, Hiroyasu Kobayashi, Makoto Chiba

Chiba University, Japan

Development of high-switching-frequency power converters with GaN power devices:
From elemental technology to system design

Talk4 Satoshi Okamoto

Tohoku University, Japan

Ultra-low loss magnetic materials for innovative power electronics

Talk5 Tsutomu Mizuno¹, Toshiro Sato¹, Kousuke Miyaji¹, Makoto Sonehara¹, Mitsuhide Sato¹, Tsuyoshi Funaki², Takaaki Ibuchi², Shuhei Fukunaga²

1) Shinshu University, Japan, 2) Osaka University, Japan

Development of transformers and inductors for high-frequency power conversion using magnetic anisotropic soft magnetic materials

Talk6-1 Hiroki Habazaki¹, Hidenori Okuszaki², Kazunori Hasegawa³, Shunzo Suematsu⁴

1) Hokkaido University, Japan, 2) Yamanashi University, Japan, 3) Kyushu Institute of Technology, Japan, 4)Nippon Chemi-Con Corporation, Japan

Toward the development of novel capacitors for next-generation power electronics systems

Talk6-2 Hiroki Taniguchi¹, Manabu Hagiwara²

1) Nagoya University, Japan, 2) Keio University, Japan

Toward the development of novel capacitors for next-generation power electronics systems

Talk7 Hiroshi Amano, Jun Suda

Nagoya University, Japan

Present Status and Future Prospects of GaN Vertical Power Devices

Technical Sessions

Monday, May 16: 11:05-13:10

Room A

Session 16A1 Power and Energy Circuits and Systems for Communications (OS)

Chairs: Hiroo Sekiya (*Chiba University, Japan*)

Junrui Liang (*ShanghaiTech University, China*)

16A1-1 A Self-powered Extensible SECE Rectifier For Piezoelectric Energy Harvesting

Invited Paper Jiacong Qiu, Junrui Liang
ShanghaiTech University, China

16A1-2 Proposal for the Optimum Switching Frequency Search Method Based on Transmission Side Information of Wireless Power Transfer Circuit

Invited Paper Taichi Mishima, Yuki Ito, Shingo Nagaoka, Takeshi Uematsu
OMRON Corporation, Japan

16A1-3 Energy Storage System with Intelligent Hot-plug Switch (IHS) Combined Use of Different Types of Batteries

Invited Paper Kazuo Takehara^{1,2}, Fumiaki Nakao¹, Kimihiro Nishijima², Eiji Sakai²
1) *NEXT-e Solutions Inc., Japan*, 2) *Sojo University, Japan*

16A1-4 Performance Characteristics of 1500V Two Series Connection Type Converter

Invited Paper Kazuhiro Kajiwara¹, Yuji Ohta², Ryuya Daimon¹, Akio Segami², Fujio Kurokawa¹
1) *Nagasaki Institute of Applied Science, Japan*, 2) *Isahaya Electronics Corporation, Japan*

16A1-5 Optimized Energy Allocation Method Based on Capital Asset Pricing Model for Multi-use of Battery Energy Storage System

Invited Paper Kazufumi Yuasa¹, Yoshiharu Takeuchi², Tadatashi Babasaki², Ichiro Omura¹
1) *Kyushu Institute of Technology, Japan*, 2) *NTT Facilities, Inc., Japan*

Room B

Session 16B1 Power Electronics and Motor Drives for Automobiles (OS)

Chairs: Kantaro Yoshimoto (*Tokyo Denki University, Japan*)

Masatoshi Uno (*Ibaraki University, Japan*)

16B1-1 Magnetic Form applying a C-Shaped Magnet for Hybrid Electric Vehicles

Shingo Soma, Yoshihisa Kubota, Tatsuya Ohzu
Honda motor Co., Ltd., Japan

16B1-2 Technology trends of automotive semiconductors for CASE application

Invited Paper Hiroomi Eguchi
MIRISE Technologies Corporation, Japan

16B1-3 Control method of a dual inverter system for EV with one battery

Invited Paper Tomonori Kimura¹, Takahiro Yamada¹, Ryoya Kazaoka², Toshihiko Noguchi³
1) *MIRISE Technologies Corporation, Japan*, 2) *DENSO CORPORATION, Japan*, 3) *Shizuoka University, Japan*

16B1-4 Impact of Magnet Temperature Distribution on Output Capability of PMSM and its Estimation Methodology

Invited Paper Kensuke Sasaki¹, Atsushi Okada¹, Takashi Kato¹, Kan Akatsu²
1) *Nissan Motor Co., Ltd, Japan*, 2) *Yokohama National University, Japan*

Session 16C1 Power Electronics for Enhancing Motion Control Systems (OS)

Chairs: Kenji Natori (*Chiba University, Japan*)

Yuki Yokokura (*Nagaoka University of Technology, Japan*)

16C1-1 Direct Torsion Torque Control of Geared SPMSM for Quick Backforward-Drivability

Invited Paper Yuki Yokokura, Kiyoshi Ohishi
Nagaoka University of Technology, Japan

16C1-2 Effect of Harmonic Current Suppression on Iron Loss of IPMSM Using Repetitive Perfect Tracking Control

Invited Paper Yuhiro Inagaki¹, Masahiro Mae¹, Osamu Shimizu¹, Sakahisa Nagai¹, Hiroshi Fujimoto¹, Takayuki Miyajima², Yoshiki Yasuda², Akio Yamagiwa²
1) *The University of Tokyo, Japan*, 2) *DAIKIN Industries, Ltd., Japan*

16C1-3 A Study of 10MHz Multi-Sampling Deadbeat Control for PMSM Drive System using USPM Controller

Invited Paper Daisuke Hiroe, Zhang Xiaohan, Ryosuke Suzuki, Kazuki Nakamura, Kotaro Sato, Kantaro Yoshimoto, Tomoki Yokoyama
Tokyo Denki University, Japan

16C1-4 PI Current Control Method for Realizing Deadbeat Characteristics

Invited Paper Shota Kuroda, Kenji Natori, Yukihiro Sato
Chiba University, Japan

16C1-5 Circuit Architecture and Design of A Megahertz Wireless Power Transfer System for Drones

Invited Paper Yaoxia Shao¹, Ruihan Ma¹, Huan Zhang¹, Ming Liu², Chengbin Ma¹
1) *University of Michigan-Shanghai Jiao Tong University Joint Institute, China*, 2) *Shanghai Jiao Tong University, China*

Session 16D1 Control and Analysis of Converters I

Chairs: Ikuya Sato (*Fuji Electric Co., Ltd., Japan*)

Rolando Burgos (*Virginia Polytechnic Institute and State University, USA*)

16D1-1 Capacitor-Voltage-Balancing Control for an Isolated Secondary-Resonant AC-DC Modular Matrix Converter

Kohei Budo, Takaharu Takeshita
Nagoya Institute of Technology, Japan

16D1-2 Statistical Performance Verification of the FS-MPC Algorithm Applied to the Matrix Converter

Mateja Novak¹, Iwona Grobelna², Ulrik Nyman¹, Pawel Szczesniak², Frede Blaabjerg¹
1) *Aalborg University, Denmark*, 2) *University of Zielona Gora, Poland*

16D1-3 A Unified PWM Strategy to Reduce Minimum Switching Number for Matrix Converters

Pailboon Kiatsookkanatorn¹, Somboon Sangwongwanich²
1) *Rajamangala University of Technology Suvarnabhumi, Thailand*, 2) *Chulalongkorn University, Thailand*

16D1-4 Adjustable Carrier Phase Shift Operation of Switching Cycle Control for Modular Multilevel Converters

Jayesh Kumar Motwani, Boran Fan, Slavko Mocevic, Jianghui Yu, Yu Rong, Dushan Boroyevich, Dong Dong, Rolando Burgos
Virginia Tech, USA

16D1-5 A New Control Method to Realize Wide Output Voltage Range for Three Phase AC/DC Converter Based on Matrix Converter

Kazuma Tomida¹, Kenji Natori¹, Jin Xu², Noboru Shimosato², Yukihiro Sato¹
1) *Chiba University, Japan*, 2) *Myway Plus Corporation, Japan*

Session 16E1 Grid Forming Converters I

Chairs: Yuko Hirase (*Toyo University, Japan*)

Chen Zhang (*Shanghai Jiaotong University, China*)

- 16E1-1 Improved Adaptive Inertia and Damping Coefficient Control Strategy of VSG Based on Optimal Damping Ratio**
Qingyi Wang^{1,2,3}, Dan Zhou^{1,2,3}, Shuai Yin^{1,2,3}, Yudi Lei^{1,2,3}, Tao He^{1,2,3}
1) *China University of Geosciences, China*, 2) *Hubei Key Laboratory of Advanced Control and Intelligent Automation for Complex Systems, China*, 3) *Ministry of Education, China*
- 16E1-2 A Study on Emulated Inertia Control of Grid-Connected Inverter-Based Power Supply Sources for Mass Integration of Renewable Energy Resources**
Hirofumi Uemura¹, Sachio Takano¹, Atsushi Harada¹, Takahiro Matsuura², Satoshi Miyazaki², Hiromu Hamada², Teru Miyazaki²
1) *Fuji Electric Co., Ltd., Japan*, 2) *Tokyo Electric Power Company Holdings, Inc., Japan*
- 16E1-3 Uninterrupted Switching based on VSG Control between Grid-connected and Stand-alone Operation of Single-Phase Grid-Tied Inverter**
Kodai Nishikawa, Keisuke Kusaka, Jun-ichi Itoh
Nagaoka University of Technology, Japan
- 16E1-4 The Effects of Virtual Inertia Control on Power Converters in Nonideal Grid Conditions**
Yang Haoxin¹, Tang Yi¹, Zhang Lei²
1) *Nanyang Technological University, Singapore* 2) *Chengdu Technological University, China*
- 16E1-5 Influence of DC Network Impedance and Control Parameters on Stability of Grid-tied Converters with LCL Filter Analyzing from DC Side**
Ravi Kumar Gaddala, Siddavatam Ravi Prakash Reddy, Mriganka Ghosh Majumder, Kaushik Rajashekara, Lobo da Fonseca Jean Marcos
University of Houston, USA

Session 16F1 Reliability and Diagnostics of Power Converters I

Chairs: Takushi Jimichi (*Mitsubishi Electric Corporation, Japan*)

Lee Chia-Tse (*Delta Electronics Inc., Taiwan*)

- 16F1-1 Identification Method for Various Failure Modes with Shared Kelvin and Power Wires Configuration in IGBT Power Modules**
Qiang Wu¹, Yu Chen¹, Haoze Luo¹, Jian Zhang¹, Wuhua Li¹, Xiangning He¹, Naoto Fujishima², Haruhiko Nishio², Hitoshi Sumida²
1) *Zhejiang University, China*, 2) *Fuji Electric Co., Ltd., Japan*
- 16F1-2 Failure Mechanism Investigation of Die-Attach Solder Based on the Birth and Death Technology**
Zhiliang Xu, Qianxia Ke, Xinglai Ge, Huimin Wang, Zongyuan Dai
Southwest Jiaotong University, China
- 16F1-3 Mission-Profile Based Reliability Analysis Scheme of IGBT Modules for Traction Rectifier**
Qianxia Ke, Zhiliang Xu, Xinglai Ge, Qingli Deng, Huiming Wang, Linlin Zhang, Jin Li
Southwest Jiaotong University, China
- 16F1-4 Reliable design of SiC MOSFET power modules: experimental characterization for aging prediction**
Shuhei Fukunaga¹, Alberto Castellazzi², Tsuyoshi Funaki¹
1) *Osaka University, Japan*, 2) *Kyoto University of Advanced Science, Japan*
- 16F1-5 Continuous Operation of High-Power Half-Bridge with 12 Paralleled GaN Power Devices**
Takashi Sawada¹, Hiroshi Tadano², Koji Shiozaki², Takanori Isobe³
1) *Naturanix Co., Ltd., Japan*, 2) *Nagoya University, Japan*, 3) *University of Tsukuba, Japan*

Session 16G1 Wireless Power Transfer I

Chairs: Mami Mizutani (*Toshiba Infrastructure Systems & Solutions Corporation, Japan*)

Yijie Wang (*Harbin Institute of Technology, China*)

- 16G1-1 A Novel Driving Scheme for Inductive Power Transfer Systems Using Decoupled Transmitter Coils**
Kai Zhao, Minfan Fu, Guangdong Ning, Rong He, Hengzhao Yang, Haoyu Wang
ShanghaiTech University, China
- 16G1-2 Effect of Angle Offset of the Power Receiving Coil in Underwater Wireless Power Transfer Using a Cone Spiral Coil**
Suguru Mototani, Ryo Yamamoto, Kae Doki, Akihiro Torii
Aichi Institute of Technology, Japan
- 16G1-3 Analysis and Design of a Wide Air Gap IPT System with Multi-Load CV Characteristics Based on Cylindrical Solenoid Coupler**
Yijie Wang, Zhimin Liu, Peng Gu, Dianguo Xu
Harbin Institute of Technology, China
- 16G1-4 Feasibility Study on Wireless Power Transfer for AUV with Novel Pressure-Resistant Ceramic Materials**
Haibing Wen, Jiayuan Li, Lei Yang, Xiangqian Tong
Xi'an University of Technology, China
- 16G1-5 Stability Analysis of Flying-capacitor Linear Amplifier for Wireless Power Transfer system**
Rintaro Kusui, Keisuke Kusaka, Jun-ichi Itoh
Nagaoka University of Technology, Japan

Monday, May 16: 14:10-16:15

Session 16A2 Data Driven Methods in Power Electronics Systems: Applications in Analysis and Stability (OS)

Chairs: Marta Molinas (*Norwegian University of Science and Technology, Norway*)

Chen Zhang (*Shanghai Jiao Tong University, China*)

- 16A2-1 Impedance Model Identification of DFIG-Based Wind Turbine Based on Neural Network**
Invited Paper Zhong Wang, Jing Lyu, Xu Cai
Shanghai Jiao Tong University, China
- 16A2-2 Instability Mode Recognition of Grid-Tied Voltage Source Converters with Nonstationary Signal Analysis**
Invited Paper Yu Zhang¹, Sjur Føyen², Chen Zhang¹, Marta Molinas², Olav Bjarte Fosso², Xu Cai¹
1) *Shanghai Jiao Tong University, China*, 2) *Norwegian University of Science and Technology, Norway*
- 16A2-3 Impedance-Based Stability Analysis of Systems with the Dominant Presence of Distributed Power Sources**
Invited Paper Kazuki Ohuchi¹, Yuko Hirase¹, Marta Molinas²
1) *Toyo University, Japan*, 2) *Norwegian University of Science and Technology, Norway*
- 16A2-4 Impedance scanning with chirps for single-phase converters**
Invited Paper Sjur Foyen¹, Chen Zhang², Marta Molinas², Olav Fosso¹, Takanori Isobe³
1) *Norwegian University of Science and Technology, Norway*, 2) *Shanghai Jiao Tong University, China*, 3) *University of Tsukuba, Japan*
- 16A2-5 Mechanism and Suppression Control of Wideband Oscillations in MMC-HVDC Connected Offshore Wind Farms**
Invited Paper Jing Lyu, Hongfei Lin, Yiming Rao, Xu Cai
Shanghai Jiao Tong University, China

Session 16B2 Achievements and Findings from Vehicle Grid Integration Project and Research (OS)

Chairs: Masatoshi Uno (*Ibaraki University, Japan*)
Kensuke Sasaki (*Nissan Motor Co., Ltd., Japan*)

16B2-1 Frequency Adjustment with Integrated Control of EVs and Storage Batteries

Invited Paper Takehiko Ashiya¹, Ayumu Izuhara¹, Koji Kudo²
1) *Kansai Transmission and Distribution, Inc., Japan*, 2) *NEC Corporation, Japan*

16B2-2 Charging infrastructure - how to contribute to the power grid -

Invited Paper Makoto Yoshida¹, Osamu Maruta¹, Tomoko Blech Yamabe², Mika Zaurin Casanova²
1) *CHAdeMO Association, Japan*, 2) *CHAdeMO Association, France*

16B2-3 Frequency Control for AC Microgrid Using Onboard DC/DC Converter of Electric Vehicles

Invited Paper Tatsuhito Nakajima¹, Yutaka Ota², Takuya Ishikawa³, Kazumasa Ide³
1) *Tokyo City University, Japan*, 2) *Osaka University, Japan*, 3) *Hitachi Power Solutions Co., Ltd., Japan*

16B2-4 Evaluation of Electric Vehicles (EVs) Impact on Electric Grid

Invited Paper Inam Ullah Nutkani, Jing Cheng Lee
RMIT University, Australia

Session 16C2 Sensing and Actuation for Human Assistive Systems (OS)

Chairs: Naoki Motoi (*Kobe University, Japan*)
Tomoyuki Shimono (*Yokohama National University, Japan*)

16C2-1 Safe High Stiffness Impedance Control for Series Elastic Actuators using Collocated Position Feedback

Invited Paper Razvan Andrei Budau Petrea, Roberto Oboe, Giulia Michieletto
University Of Padova, Italy

16C2-2 Study on Disturbance Response of a Magnetic Lead Screw Actuator

Invited Paper Akira Heya¹, Yoshihiro Nakata², Tetsuya Abe¹, Katsuhiro Hirata¹
1) *Osaka University, Japan*, 2) *The University of Electro-Communications, Japan*

16C2-3 Modeling and Analysis of a Magnetic Geared Linear Motor

Invited Paper Nguyen Duc Khuong¹, Tomoyuki Shimono^{1,2}
1) *Yokohama National University, Japan*, 2) *Kanagawa Institute of Industrial Science and Technology, Japan*

16C2-4 Study on Displaying Images to Prevent VR Sickness as Maintaining Rich-Presence

Invited Paper Satoshi Okuno, Sota Shimizu
Shibaura Institute of Technology, Japan

16C2-5 Path Planning Method Considering Blind Spots Based on ROS Navigation Stack and Dynamic Window Approach for Wheeled Mobile Robot

Invited Paper Masato Kobayashi, Naoki Motoi
Kobe University, Japan

Session 16D2 IoT Technologies for Realizing Smart Facilities (OS)

Chairs: Shinobu Ishigami (*Tohoku Gakuin University, Japan*)
Nobuyuki Yamaguchi (*Tokyo University of Science, Japan*)

16D2-1 Selective Allocation Management System of Environmental Value and Electric Power Consumption

Invited Paper Hiroki Oshima, Keishi Ooshima, Yoshihiro Machida, Masashi Amano, Takayuki Suzuki, Hiroshi Mine, Ko Takahashi, Kazuya Syojiki, Masahiro Aoki
Hitachi, Ltd., Japan

16D2-2 Simulation of Energy Management Considering Remote Work of Office Buildings With Storage Batteries in the Case of Disaster

Invited Paper Kazuhiro Yuasa¹, Sota Kinoshita¹, Nobuyuki Yamaguchi¹, Fuyuki Sato², Shinichiro Ohtani²
1) *Tokyo University of Science, Japan*, 2) *Mitsubishi Electric Corporation, Japan*

16D2-3 SUSTIE Core Engine: Efficient IoT Platform for Smart Facility Solutions

Invited Paper Jin Kawasaki, Yoshitaka Otaki, Keita Saito, Hiroki Kawano
Mitsubishi Electric Corporation, Japan

16D2-4 Proposal of the theoretical conversion factor for the interpolation of measured radiated emission levels

Invited Paper Shinobu Ishigami¹, Tatsuru Itsukaichi¹, Ken Kawamata¹, Yasutoshi Yoshioka²
1) *Tohoku Gakuin University, Japan*, 2) *Fuji Electric Europe GmbH, Germany*

16D2-5 Unsupervised Fault Detection for Refrigeration Showcase Systems with Kernel Principal Component Analysis based Multivariate Statistical Process Control using Feature Selection with Maximal Information Coefficient

Kiyo Arai¹, Yoshikazu Fukuyama², Kenya Murakami¹, Tetsuro Matsui¹
1) *Fuji Electric Co., Ltd., Japan*, 2) *Meiji University, Japan*

Room E

Session 16E2 Control and Analysis of Converters II

Chairs: Hidemine Obara (*National Yokohama University, Japan*)

Kantoaro Yoshimoto (*Tokyo Denki University, Japan*)

16E2-1 Harmonic Calculation of Parallel Interleaved Voltage-Source Converters in Digital Systems

Haozhe Wang, Jie Ye, Baojin Li, Songtao Huang, Jinbang Xu, Anwen Shen
Huazhong University of Science and Technology, China

16E2-2 A New Trapezoidal Modulation Technique to Reduce Acoustic Noise

Hideki Ayano¹, Takumi Nakagaki¹, Yushi Araki², Tatsuki Kashihara², Koji Kobayashi²
1) *National Institute of Technology, Japan*, 2) *SANDEN CORPORATION, Japan*

16E2-3 Frequency-Doubler Half-Bridge Modulation For Reduced Junction Temperatures in the Low-Gain Operation of the Isolated Full-Bridge Converter

Philipp Rehlaender, Shobhit Sharma, Frank Schafmeister, Joachim Böcker
Paderborn University, Germany

16E2-4 Verification of 1MHz Multisampling Disturbance Compensation Deadbeat Control for Megawatt-Level Grid-Tied Multi-level Inverter using Controller Hardware-in-the-Loop

Ryoko Kato¹, Kazuki Nakamura¹, Kaya Kawashima¹, Kohsuke Seki², Kenta Yamabe², Kantaro Yoshimoto¹, Tomoki Yokoyama¹
1) *Tokyo Denki University, Japan*, 2) *Tohiba Mitsubishi-Electric Industrial Systems Corporation, Japan*

16E2-5 A Data Modulation Strategy Based on LLC Resonant Converter

Lingyu Li, Sheng Liu, Jinghui Chen, Jiande Wu, Xiangning He
Zhejiang University, China

Room F

Session 16F2 Non-isolated DC-DC Converters

Chairs: Masataka Ishihara (*Okayama University, Japan*)

Yao-Ching Hsieh (*National Sun Yat-sen University, Taiwan*)

16F2-1 Performance of Three-phase Inverter Using Multiple Bidirectional Choppers for 1.5-kV PV Systems Capable of Wide MPPT Range

Linyue Qiao, Makoto Hagiwara
Tokyo Institute of Technology, Japan

16F2-2 Internal Reference Compensation Technique for Constant On-time Buck Converter with Ceramic Capacitor

Pang-Jung Liu¹, Chi-Hung Wang¹, Mao-Hui Kuo², Xin-Wei Huang¹
1) *National Taipei University of Technology, Taiwan*, 2) *Richtek Technology Corporation, Taiwan*

16F2-3 Charge Equalization with Differential Current Allocation for Series-connected Batteries

Liang-Chien Lin¹, Cheng-Xiu Xie¹, Tzu-Hsiang Weng², You-Chun Huang², Yao-Ching Hsieh², Chin-Sien Moo²
1) *Delta Electronics Inc., Taiwan*, 2) *National Sun Yat-sen University, Taiwan*

16F2-4 Boost Derived Full-Bridge ZCS Resonant Converter Using Inductive Output Filter

Somboon Sooksatra, Wanchai Subsingha
Rangsit University Pathumthani, Thailand

Session 16G2 PMSM Sensorless Drives

Chairs: Takayuki Miyajima (*Daikin Industries, Ltd., Japan*)

Kichiro Yamamoto (*Kagoshima University, Japan*)

- 16G2-1 Performance Evaluation of Startup and Driving Strategy at Overall Speed with Extended ElectroMotive Force for Position Sensorless Permanent Magnet Synchronous Motor**
Rongjiao Hao, Takamasa Kozakura, Shinji Doki
Nagoya University, Japan
- 16G2-2 Compensation of Zero Current Clamping Phenomenon of Sensorless IPMSM Drives with Ultrasonic Signal Injection**
Hisao Kubota, Naoya Hayashi
Meiji University, Japan
- 16G2-3 Sensorless PMSM Harmonic Suppression Strategy Based on PLL with Embedded Double Quasi-Proportional-Resonant Controllers**
Bo Wang, Pengcheng Du, Yong Yu, Dianguo Xu
Harbin Institute of Technology, China
- 16G2-4 Harmonic Reduction Method Using Minor Sampling Process for Signal Injection Position Sensorless Technique**
Yuki Ito, Yoshitaka Iwaji
Ibaraki University, Japan
- 16G2-5 Parameter Estimation for Sensorless Position Control of PMSM Drives with Long Cable in Subsea Applications**
Virendra Singh, Mriganka Ghosh Majumder, Kaushik Rajashekara, Ravi Prakash Reddy Siddavatam
University of Houston, USA

Session 16H2 Special machines

Chairs: Makoto Ito (*Hitachi, Ltd., Japan*)

Jihad Furqani (*Bandung Institute of Technology, Indonesia*)

- 16H2-1 Three-Phase Air-Core Rotary Transformer with Halbach AC Windings for Wound-Field Motors**
Masahiro Aoyama
Shizuoka University, Japan
- 16H2-2 Design of Slotless Single-Drive Bearingless Permanent Magnet Motor for High-Speed Applications**
Junichi Asama
Shizuoka University, Japan
- 16H2-3 Estimation of Magnetic Suspension Loss in a 30000 r/Min One-Axis Actively Positioned Single-Drive Bearingless Motor**
Theeraphong Srichiangsa¹, Hiroya Sugimoto², Yusuke Fujii¹, Kyohei Kiyota¹, Akira Chiba¹
1) *Tokyo Institute of Technology, Japan*, 2) *Tokyo Denki University, Japan*
- 16H2-4 Development of Direct Cooling Stator Structure Using High Thermal Conductive Epoxy Molding Compounds**
Shinya Yamamoto, Atsunori Nishikawa, Takahiro Harada, Wataru Kosaka
SUMITOMO BAKELITE CO., LTD., Japan
- 16H2-5 PM Magnetic Levitation Train Using Hybrid Electromagnetic- and Electrodynamic-Suspension System**
Shun Inoue, Yasutaka Fujimoto
Yokohama National University, Japan

Room A

Session 16A3 Grid Forming Converters II

Chairs: Shinichi Imai (*Takaoka Toko Co., Ltd., Japan*)

Frede Blaabjerg (*Aalborg University, Denmark*)

- 16A3-1 Stability Analysis of Grid-Following and Grid-Forming Converters Based on State-Space Model**
Xian Gao, Dao Zhou, Amjad Anvari-Moghaddam, Frede Blaabjerg
Aalborg University, Denmark
- 16A3-2 Impact of Circular Current Limiters on Transient Stability of Grid-Forming Converters**
Bo Fan, Xiongfei Wang
Aalborg University, Denmark
- 16A3-3 Impact of DC-Link Voltage Control on Transient Stability of PLL-Synchronized Voltage-Source Converters**
Teng Liu¹, Xiongfei Wang¹, Fangcheng Liu²
1) *Aalborg University, Denmark*, 2) *Huawei Digital Power Technologies Company Ltd., China*
- 16A3-4 Design-Oriented Analysis of Grid-Forming Control with Hybrid Synchronization**
Hong Gong, Xiongfei Wang
Aalborg University, Denmark

Room B

Session 16B3 Thermal Management

Chairs: Koji Orikawa (*Hokkaido University, Japan*)

Jonas Huber (*ETH Zurich, Switzerland*)

- 16B3-1 On-line Junction Temperature Estimation Method of Power Device with Deterioration Based on On-state Voltage Measurement**
Hayato Higa¹, Takanori Hayashi¹, Masashi Takiguchi¹, Shota Urushibata¹, Yugo Tadano¹
1) *Meidensha Corporation, Japan*
- 16B3-2 Estimation of Both Junction Temperature and Load Current of IGBTs from Output Voltage of Gate Driver**
Hiromu Yamasaki, Katsuhiro Hata, Makoto Takamiya
The University of Tokyo, Japan
- 16B3-3 Junction Temperature Estimation for IGBT Modules Through Knee Voltage**
Xing Wei, Bo Yao, Yingzhou Peng, Huai Wang
Aalborg University, Denmark
- 16B3-4 Temperature Sensorless Thermal Management Strategy for Interleaving Power Converters**
Zehui Li, Mingde Zhou, Haoyu Wang
ShanghaiTech University, China

Room C

Session 16C3 GaN Device Application

Chairs: Katsuya Nomura (*Kwansei Gakuin University, Japan*)

Jens Friebe (*Leibniz University Hannover, Germany*)

- 16C3-1 Efficiency Improving Strategies on GaN-based LLC Converter with Non-uniform Air Gap Transformer**
Ching-Guo Chen¹, Shiu-Hui Lee², Wen-Nan Huang¹, Chih-Ming Yu¹, Hsiang-Chi Meng¹
1) *Potens Semiconductor Corp., Taiwan*, 2) *National Taipei University of Technology, Taiwan*
- 16C3-2 Multi-Mode Control with GaN High Operating Frequency Four-Switch Step-Up/Down Converter**
Jiann-Fuh Chen, Zih-Yue Chen, Chen-Ming Zhang
National Cheng Kung University, Taiwan

16C3-3 Parasitic Effects from Cooling of GaN Power Transistors - Impact on Switching Losses and Common-Mode Currents

Pelle Weiler, Bart Bokmans, Erik Lemmen, Bas Vermulst, Korneel Wijnands
Eindhoven University of Technology, The Netherlands

16C3-4 GaN-based High Frequency NIBB dc-dc Converter with Feedback Control Using FPGA

Ravi Nath Tripathi, Alberto Castellazzi
Kyoto University of Advanced Science (KUAS), Japan

Room D

Session 16D3 Industrial Instrumentation and Control I

Chairs: Yasutaka Fujimoto (*Yokohama National University, Japan*)

Naoki Motoi (*Kobe University, Japan*)

16D3-1 Accurate Ion Energy Control in Plasma Processing by Switched-Mode Power Converter

Qihao Yu, Erik Lemmen, Korneel Wijnands, Bas Vermulst
Eindhoven University of Technology, The Netherlands

16D3-2 Optimization Approaches for the Signal Processing of Hybrid Current Sensors

Philipp Ziegler, Michael Bura, Jörg Haarer, Philipp Marx, David Hirning, Jörg Roth-Stielow
University of Stuttgart, Germany

16D3-3 Design and Control of Single-Phase Controlled VSCs with Saturable Inductor-Based LCL Filters

Ziya Özkan, Dao Zhou, Frede Blaabjerg
Aalborg University, Denmark

16D3-4 A VSD-Embedded Machine Learning Misalignment and Unbalance Diagnosis Methodology

Saïd Talbi¹, Alain Dutrey²
1) Médiante Système for STIE, France, 2) Schneider Toshiba Inverter Europe, France

Room E

Session 16E3 DC-DC Converters I

Chairs: Kantaro Yoshimoto (*Tokyo Denki University, Japan*)

Yu-Chen Liu (*National Ilan University, Taiwan*)

16E3-1 Multi-stage charging strategy with constant resonant current of LCC resonant circuit

Mengjie Qin, Aizhen Ye, Fan Zhang, Wenjie Chen, Xu Yang, Yao Xiao
Xi'an Jiaotong University, China

16E3-2 Analysis and Comparison of Isolated Converter based Step-Down Partial Power Processing Configurations

Chao Liu, Zhe Zhang, Ziwei Ouyang, Michael A. E. Andersen, Tiberiu-Gabriel Zsurzsan
Technical University of Denmark, Denmark

16E3-3 1.5-MHz High-Performance 380-V/12-V LLC Resonant Converter

Yun-Yen Chen¹, Yu-Chen Liu², Chen Chen¹, Kai-De Chen¹, Yong-Long Syu¹, Wen-Hao Xue¹, Huang-Jen Chiu¹
1) National Taiwan University of Science and Technology, Taiwan, 2) National Ilan University, Taiwan

16E3-4 Secondary-Side Resonating LLC Converter for Reducing Transformer Voltage in High Power Applications

Hayato Nakamura¹, Kazuhiro Umetani¹, Masataka Ishihara¹, Eiji Hiraki¹
Okayama University, Japan

Room F

Session 16F3 Control and Analysis of Modular Multi-level Converters

Chairs: Hirofumi Uemura (*Fuji Electric Co., Ltd., Japan*)

Georgios Konstantinou (*The University of New South Wales, Australia*)

16F3-1 Impedance Shaping Effects of Circulating Current Controllers in Modular Multilevel Converters

Ye Zhu¹, Josep Pou², Georgios Konstantinou¹
1) University of New South Wales, Australia, 2) Nanyang Technological University, Singapore

- 16F3-2 Non-Linear Model Predictive Control for Modular Multilevel Converters**
 Saad Hamayoon¹, Morten Hovd¹, Jon Are Suul^{1,2}
 1) Norwegian University of Science and Technology, Norway, 2) SINTEF Energy Research, Norway
- 16F3-3 A Study of 1MHz Multi-Sampling SVPWM Method for Low Carrier Three Phase Modular Multilevel Converter**
 Kotaro Sato, Kazuki Nakamura, Sakyo Takeuchi, Tomoki Yokoyama
 Tokyo Denki University, Japan

Room G

Session 16G3 Special Motor Drives

Chairs: Takahiro Suzuki (Hitachi Ltd., Japan)
Ufot Ekong (TMEIC, Japan)

- 16G3-1 Predictive Control of Sensorless Flux-Switching Motor Drive Systems with DC-Field Excitation**
 Tian-Hua Liu, Yu-Hao Xu
 National Taiwan University of Science and Technology, Taiwan
- 16G3-2 Stability Improvement Method of Position Sensorless Control for Single Inverter Dual Parallel IPMSMs Drive System by Using Signal Injection**
 Cheonsu Park, Shinji Doki
 Nagoya University, Japan
- 16G3-3 Characteristic Evaluation of Linear Switched Reluctance Motor with High-temperature Superconducting Excitation Windings for Application to Ropeless Linear Elevator**
 Tadashi Hirayama, Shuma Kawabata
 Kagoshima University, Japan
- 16G3-4 Reduction of Common Mode Disturbances in Parallel Modules of Integrated Modular Motor Drives**
 Philipp Marx, Jan Assenheimer, Philipp Ziegler, Jörg Haarer, Jörg Roth-Stielow
 University of Stuttgart, Germany

Room H

Session 16H3 Motor design & control

Chairs: Yu Hasegawa (Hitachi Ltd., Japan)
Wolfgang Gruber (Johannes Kepler University Linz, Austria)

- 16H3-1 Multiobjective Particle Swarm Optimization Design of Permanent Magnet Machine for Torque Density Improvement and Torque Ripple Suppression**
 Jiaxuan Huang¹, Yi Sui¹, Zuosheng Yin¹, Guopeng Liu¹, Ping Zheng¹, Yongjian Li²
 1) Harbin Institute of Technology, China, 2) Hebei University of Technology, China
- 16H3-2 Anti-Demagnetization Design of IPMSM Using an Automatic Design System Combining Coarse-Mesh FEM and GA**
 Yutaro Mambo¹, Masayuki Sanada², Shigeo Morimoto², Yukinori Inoue²
 1) Osaka Prefecture University, Japan, 2) Osaka Metropolitan University, Japan
- 16H3-3 Fitting Method of Experimentally Measured 3D Loss and Torque Maps to design Optimal Trajectories for IPMSM**
 Kaoru Inoue, Yusuke Naito, Toshiji Kato
 Doshisha University, Japan
- 16H3-4 Stable Equilibrium Rotor Positions for a Three-Phase Switched Reluctance Machine**
 Georg Tobias Götz, Philipp Tillmann, Anne von Hoegen, Rik W. De Doncker
 RWTH Aachen University, Germany

Room A

Session 17A1 Emerging Technology for Cutting Edge Wide Band Gap Semiconductor Device (OS)

Chairs: Tsuyoshi Funaki (*Osaka University, Japan*)
Yan Zhang (*Xi'an Jiaotong University, China*)

17A1-1 Development of α -Ga₂O₃ Power Devices

Invited Paper Takashi Shinohe
FLOSFIA INC., Japan

17A1-2 Gallium Oxide Power Device Technologies

Invited Paper Masataka Higashiwaki
National Institute of Information and Communications Technology, Japan

17A1-3 GaN-based Solutions for Cost-effective Direct and Indirect Time-of-Flight Lidar Transmitters Are Changing the Way We Live

Invited Paper Alex Lidow, John Glaser
Efficient Power Conversion Corporation, USA

17A1-4 R&D Bridging over Device and System Engineers Through the Electric-Mileage Estimation of a Motor System

Invited Paper Ken Nakahara, Hirokatsu Umegami, Toshikazu Harada, Takukazu Otsuka, Atsushi Yamaguchi
ROHM Co., Ltd., Japan

17A1-5 Reliability and robustness of SiC power devices –how to ensure the quality level established in the silicon world

Invited Paper Peter Friedrichs
Infineon, Germany

Room B

Session 17B1 Motor Drive Technologies for Industrial Applications (OS)

Chairs: Shizunori Hamada (*Meidensha Corporation, Japan*)
Ikuya Sato, (*Fuji Electric Co., Ltd., Japan*)

17B1-1 Improved Power Density of Large-capacity Drives for Steel Plants

Invited Paper Katsuhiko Fukuma, Haruyuki Yamaguchi, Ufot Ufot Ekong, Masahiko Tsukakoshi
1) Toshiba-Mitsubishi-Electric Industrial Systems Corporation, Japan

17B1-2 High-Precision Torque Control of IPMSM Considering Magnetic Saturation and Magnet Temperature Variation

Invited Paper Yoshiyasu Takase, Yasumasa Hamabe, Hengbin Rui, Shinya Morimoto, Koji Higashikawa
YASKAWA ELECTRIC CORPORATION, Japan

17B1-3 Electrolytic Capacitor-less Inverter Technology for Miniaturization of Air Conditioning System

Invited Paper Tatsuki Inoue, Hiroataka Doi, Takayuki Miyajima
Daikin Industries, LTD., Japan

17B1-4 Improvement of system efficiency by variable switching frequency control for converter

Invited Paper Koji Tsukii¹, Masahiro Tamura¹, Wataru Hatsuse², Yasuo Notohara²
1) Johnson Controls-Hitachi Air Conditioning, Inc., Japan, 2) Hitachi Ltd., Japan

17B1-5 Torque Enhancement of Surface Permanent Magnet Motors utilizing Reluctance Torque for High-speed Motors with Bonded Magnets

Invited Paper Koji Yamaguchi, Tomoya Yamamoto, Naoki Omura, Takehiro Jikumaru
IHI Corporation, Japan

Session 17C1 Advanced Power Conversion and Control for Railways (OS)

Chairs: Takafumi Koseki (*The University of Tokyo, Japan*)

Hiroyasu Kobayashi (*Chiba University, Japan*)

- 17C1-1 Position Sensorless Control of Synchronous Reluctance Machines based on Fundamental Saliency Method for Railway Traction**
Invited Paper
Tetsuya Kojima¹, Toshiki Suzuki¹, Kota Teramoto¹, Tetsuo Sugahara¹, Tatsuro Takahashi², Takuya Saito²
1) Mitsubishi Electric Corporation, Japan, 2) Tokyo Metro Co., Ltd., Japan
- 17C1-2 Wheel Slip Control Technologies on Japanese Railways**
Invited Paper
Shingo Makishima¹, Keiichiro Kondo², Hiroki Shimoyama³, Daiki Sato⁴, Satoru Takahashi¹, Takafumi Koseki⁵
1) Toyo Denki Seizo K. K., Japan, 2) Waseda University, Japan, 3) Central Japan Railway Company, Japan, 4) Tokyo Denki University, Japan, 5) The University of Tokyo, Japan
- 17C1-3 Integration of Onboard Batteries and Supercapacitors Based on the Multi-Source Inverter for Light Rail Vehicles**
Invited Paper
Emanuele Fedele, Antonio Di Pasquale, Diego Iannuzzi, Mario Pagano
Universita di Napoli "Federico II", Italy
- 17C1-4 Study on Interconnecting Operation Control of Electronic Frequency Converters Realizing the Replacement of All Rotary Frequency Changers in Nishisagami Substation in the Tokaido Shinkansen**
Invited Paper
Toshimasa Shimizu¹, Ken Kunomura¹, Hiroki Miyajima², Takumi Nagai²
1) Central Japan Railway Company, Japan, 2) Toshiba Infrastructure Systems & Solutions Corporation, Japan
- 17C1-5 Outstanding Technical Features of Traction System in N700S Shinkansen New Generation Standardized High Speed Train**
Invited Paper
Kenji Sato, Hirokazu Kato, Takafumi Fukushima
Central Japan Railway Company, Japan

Session 17D1 Industrial Instrumentation and Control II

Chairs: Seiichiro Katsura (*Keio University, Japan*)

Rae-Young Kim (*Hanyang University, Korea*)

- 17D1-1 Data-Driven Analysis of Distributed Generator-Based Power Systems Using Koopman Mode Decomposition**
Yuko Hirase, Yuki Ohara, Takeaki Yamazaki
Toyo University, Japan
- 17D1-2 Model Predictive Control with Reduced Computation for N-cell Cascaded Flying Capacitor H-Bridge Converter in Solid-State Transformer**
Dong-Hwan Park, Rae-young Kim
Hanyang University, Korea
- 17D1-3 An Improved Finite Control Set Model Predictive Control for LC-filter VSI against Model LC Mismatch**
Van-Tien Le¹, Huu-Cong Vu², Hong-Hee Lee¹
1) University of Ulsan, Korea, 2) Hanoi University of Civil Engineering, Viet Nam
- 17D1-4 An Optimized Intelligent Technique for Bearing Fault Diagnosis using Motor Current Signal Analysis**
Jiang Xinjie¹, Hasmat Malik², Sanjib Kumar Panda¹
1) National University of Singapore, Singapore, 2) Berkeley Education Alliance for Research in Singapore (a research center of the University of California, USA), Singapore
- 17D1-5 Vibration Suppression Using Vibration Coordinate System Based on dq Transform with Specific Frequency**
Tatsuya Kani, Masato Koyama
Mie University, Japan

Room E

Session 17E1 Latest solution for EMI and EMC

Chairs: Tomoyuki Mannen (*Univseity of Tsukuba, Japan*)

Changsheng Hu (*Zhejiang University, China*)

- 17E1-1 **Evaluation of Factors Impacting Reflected Wave Phenomenon in WBG Based Motor Drives**
Kushan Choksi, Yuxuan Wu, Mustafeez-ul-Hassan, Fang Luo
Stony Brook University, USA
- 17E1-2 **Overmodulation Technique on Common Mode Voltage Reduction PWM Inverter using Saw-Wave Carrier Signal**
Tatsuki Kashihara, Yushi Araki, Hiroshi Yoshida, Koji Kobayashi
SANDEN CORPORATION, Japan
- 17E1-3 **Common Mode Noise Reduction of Two-Phase Interleaved Boost Converters with Integrated Magnetics Utilizing Balanced Technique**
Tomotaka Nagai¹, Mamoru Sasaki¹, Jun Imaoka¹, Masayoshi Yamamoto¹, Akira Nakano²
1) *Nagoya University, Japan*, 2) *ALPS ALPINE CO., LTD., Japan*
- 17E1-4 **An Investigation on the Relationship between CM Noise and Distribution of Parasitic Capacitance**
Mamoru Sasaki, Jun Imaoka, Masayoshi Yamamoto
Nagoya University, Japan

Room F

Session 17F1 Latest Applications of Power Converters from Industry

Chairs: Hirohito Funato (*Utsunomiya University, Japan*)

Yushi Koyama (*Toshiba Infrastructure Systems & Solutions Corporation, Japan*)

- 17F1-1 **Inter-cluster balancing of Solid-State Transformer Based on a Feedforward Negative-Sequence Power Control**
Tsuyoshi Nagano, Koroku Nishizawa, Laxman Maharjan, Toshihisa Tajyuta, Koji Maruyama
Fuji Electric Co., Ltd., Tokyo, Japan
- 17F1-2 **Design and Installation of STATCOM System for Wind and Photovoltaic Power Plant**
Takayuki Yachida, Ryota Okuyama, Naoki Morishima, Yusuke Ashizaki, Yohei Itaya
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
- 17F1-3 **Development of 500kW Class PCS for Hydrogen-powered Fuel Cell Applications**
Haiqing Li, Kohki Morisaki
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
- 17F1-4 **Proposal and Evaluation of High-Heat Insulation System for Spacecraft by Using WPT**
Sayuri Honda¹, Shuhei Shimada¹, Kosuke Tanaka¹, Kana Nakamura², Takehiro Imura³,
Katsuhiro Hata⁴ and Yoichi Hori³
1) *Japan Aerospace Exploration Agency, Japan*, 2) *University of Tsukuba, Japan*, 3) *Tokyo University of Science, Japan*, 4) *The University of Tokyo, Japan*

Room G

Session 17G1 Induction Motor Drives

Chairs: Hisao Kubota (*Meiji University, Japan*)

Kazuhiro Ohyama (*Fukukoka Institute of Technology, Japan*)

- 17G1-1 **Current Vector Control System Based on a New Discrete dq-Axis IM Model for High Speed Drive**
Takuma Takeuchi¹, Shinji Doki¹
Nagoya University, Japan
- 17G1-2 **FEA-Assisted Experimental Parameter Identification of Induction Motor**
Jiwon Yoo¹, Joon-Hee Lee², Seung-Ki Sul¹
1) *Seoul National University, Korea*, 2) *LG Electronics, Korea*
- 17G1-3 **Current Optimization for Low-Frequency Ride-Through in Speed-Sensorless Induction Motor Drives**
Cheng Luo, Ruhan Li, Kai Yang, Bo Wang, Yong Yu, Dianguo Xu
Huazhong University of Science and Technology, China

17G1-4 Improvement of Start-Up Performance at the Standstill Condition of Induction Motor Speed Sensorless Vector Control Using Adaptive Flux Observer

Erina Izumi¹, Masaki Nagataki¹, Keiichiro Kondo¹, Shunsuke Tobayashi², Hiromitsu Suzuki²

1) Waseda University, Japan, 2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan

17G1-5 A Method for Determining Equivalent Circuit Constant of Linear Induction Motors Using Locked Mover and Standstill Impedance Tests

Hideaki Hirahara, Mikito Inoue, Shu Yamamoto

Polytechnic University, Tokyo, Japan

Room H

Session 17H1 Reluctance machines

Chairs: Kyohei Kiyota (*Tokyo Institute of Technology, Japan*)

Fuat Kucuk (*Kyoto University of Advanced Science, Japan*)

17H1-1 Efficiency Improvement of Switched Reluctance Motor with three-dimensional Gap Structure

Jie Zhang, Kazuhiro Ohyama

Fukuoka Institute of Technology, Japan

17H1-2 An Innovative Mutually Coupled Switched Reluctance Motor for Torque Enhancement and Torque Ripple Mitigation

Dongshan Fu¹, Hongyu Si¹, Ping Zheng², Yue Liu¹, Xiaojie Wu¹, Yanliang Xu³, Weilin Zong¹

1) China University of Mining and Technology, China, 2) Harbin Institute of Technology, China, 3) Shandong University, China

17H1-3 Transverse-Flux-type Switched Reluctance Motor with Permanent Magnets applying Reverse Bias Magnetic Field

Ayumi Nagai, Kazuhide Mitsuya, Kanji Nakamura

Tohoku University, Japan

17H1-4 Modeling of a Modular Stator Segmented Rotor Switched Reluctance Motor for Circuit Simulation

Belle S. Sermeno, Ramon Florentino L. Santos, Lew Andrew R. Tria

University of the Philippines Diliman, Philippines

17H1-5 Examination of non-sinusoidal drive in Direct Current excited Reluctance motor

Akito Yamaguchi, Yudai Koishi, Hiroki Goto

Utsunomiya University, Japan

Tuesday, May 17: 11:35-13:15

Room A

Session 17A2 Reliability Improvement in Power Electronics Systems (OS)

Chairs: Kyo-Beum Lee (*Ajou University, Korea*)

Hitoshi Haga (*Nagaoka University of Technology, Japan*)

17A2-1 Zero-Sequence Current Control for Open-End Winding IPMSM Fed by Dual Inverter with a Common Source

Invited Paper Sung-Jin Jang, Jun-Ho Hwang, Hyung-Woo Lee, Kyo-Beum Lee

Ajou University, Korea

17A2-2 Analysis and Suppression of Zero-Sequence Circulating Current in Parallel Three-Level Inverters using Improved Interleaved DPWM

Invited Paper Jun-Hyeok Park, Hye-Won Choi, Kyo-Beum Lee

Ajou University, Korea

17A2-3 Fault Diagnosis and Tolerance for Open-circuit Faults in Multi-Level Inverters

Invited Paper Laith M. Halabi, Ibrahim Mohd Alsofyani, Kyo-Beum Lee

Ajou University, Korea

- 17A2-4 Modified Predictive Torque Control for Balancing Three-Level NPC Inverter-fed Permanent Magnet Synchronous Motor**
Invited Paper
Samer Saleh Hakami, Kyo-Beum Lee
Ajou University, Korea

Room B

Session 17B2 Multi-level converters I

Chairs: Makoto Hagiwara (*Tokyo Institute of Technology, Japan*)
Jiacheng Wang (*Simon Fraser University, Canada*)

- 17B2-1 A Five-Level Unity-Gain Active Neutral-Point-Clamped Inverter Designed Using Half-Bridges**
Sze Sing Lee¹, Yam P. Siwakoti², Reza Barzegarkhoo², Kyo-Beum Lee³
1) *Newcastle University in Singapore, Singapore*, 2) *University of Technology Sydney, Australia*, 3) *Ajou University, Korea*
- 17B2-2 An Interleaved Switched-Boost Common-Ground Five-Level Inverter**
Majid Farhangi¹, Reza Brazegarkhoo¹, Sze Sing Lee², Dylan Lu¹, Yam Siwakoti¹
1) *University of Technology Sydney, Australia*, 2) *Newcastle University in Singapore, Singapore*
- 17B2-3 A Novel Seven-Level Switched-Boost Common-Ground Inverter With Single-Stage Dynamic Voltage Boosting Gain**
Reza Barzegarkhoo¹, Majid Farhangi¹, Sze Sing Lee², Ricardo P. Aguilera¹, Yam P. Siwakoti¹
1) *University of Technology Sydney, Australia*, 2) *Newcastle University in Singapore, Singapore*
- 17B2-4 Operating Scheme of Six-Level Hybrid Inverters with Reduced Capacitor Count**
Jonathan Pribadi, Dong-Choon Lee
Yeungnam University, Korea

Room C

Session 17C2 DC-DC Converter for Industrial Applications

Chairs: Kazunobu Oi (*Meidensha Corporation, Japan*)
Weimin Wu (*Shanghai Maritime University, China*)

- 17C2-1 Decoupling Analysis and Modeling for Threeport Resonant Converter**
Yuqi Wei^{1,2}, Thiago Pereira², Marco Liserre², H. Alan Mantooth¹
1) *University of Arkansas, USA*, 2) *Kiel University, Germany*
- 17C2-2 Two-stage Battery Energy Storage Power Conversion System Based on Dual Active Bridge**
Liangyi Wang, Ning Gao, Weimin Wu
Shanghai Maritime University, China
- 17C2-3 Voltage Balancing Control of Bidirectional Input-Series Output-Series Dual Active Bridge DC/DC Converters without Auxiliary Circuits**
Kazunobu Oi^{1,2}, Hayato Higa¹, Kazunori Morita¹, Shota Urushibata¹, Yugo Tadano¹, Yukihiro Sato²
1) *MEIDENSHA CORPORATION, Japan*, 2) *Chiba University, Japan*
- 17C2-4 Vibration Power Generation System using a Piezoelectric Element With a Variable Resistance Control for Optimal Generated Power**
Naotaka Nakahigashi, Hiroaki Yamada
Yamaguchi University, Japan

Room D

Session 17D2 Human and Machine Control System

Chairs: Kaoru Mitsuhashi (*Polytechnic University, Japan*)
Hirooki Aoki (*Chitose Institute of Science and Technology, Japan*)

- 17D2-1 On selection of topics that users are interested in but are not familiar with**
Yuya Sakai, Mitsuharu Matsumoto
University of Electro-Communications, Japan

- 17D2-2 A Scheme for Spatial Resolution Improvement of Thermal Images for Objects with Different Emissivity**
Kazuyuki Hidaka, Katsuya Kondo, Shunya Sato
Tottori University, Japan
- 17D2-3 Automatic Data Extraction based on Semiconductor Datasheet for Design Automation of Power Converters**
Fanghao Tian, Diego Bernal Cobaleda, Wilmar Martinez
KU Leuven-Energyville, Belgium

Room E

Session 17E2 Control and Analysis of Inverters

Chairs: Shin-ichi Hamasaki (*Nagasaki University, Japan*)

Jung-Ik Ha (*Seoul National University, Korea*)

- 17E2-1 Influence of Dead-Time and Diode's Reverse Recovery on the Input Current Ripple of Three-phase Voltage Source Inverters**
Juris Arrozy, Darian V. Retianza, Henk Huisman, Jorge L. Duarte
Eindhoven University of Technology, The Netherlands
- 17E2-2 Common Mode Voltage Reduction and Neutral-Point Voltage Balance for Quasi-Z-Source Three-Level Neutral-Point-Clamped Inverters**
Wenjie Liu¹, Yongheng Yang², Weilin Li¹, Xiaobin Zhang¹, Oleksandr Husev³, Dmitri Vinnikov³
1) *Northwestern Polytechnical University, China*, 2) *Zhejiang University, China*, 3) *Tallinn University of Technology, Estonia*
- 17E2-3 Double-Carrier-Based PWM Theory for Independent Power Control of Dual-Input Three-level Inverters**
Monchai Ariyapuek¹, Surapong Suwankawin¹, Somboon Sangwongwanich¹, Ariya Sangwongwanich²
1) *Chulalongkorn University, Thailand*, 2) *Aalborg University, Denmark*
- 17E2-4 Voltage Modulation Method for T-type Three-Level Inverter with Reduced Conduction Loss in Low Voltage Modulation Region**
Cheolmin Hwang, Gyu Cheol Lim, Jonghun Choi, Jung-Ik Ha
Seoul National University, Korea

Room F

Session 17F2 Wireless Power Transfer II

Chairs: Keisuke Kusaka (*Nagaoka University of Technology, Japan*)

Yun Yang (*The University of Hong Kong, China*)

- 17F2-1 A General Primary-side Coupling Coefficient and Load Monitoring Method for Inductive Power Transfer Systems**
Kaiyuan Wang, Yun Yang
The Hong Kong Polytechnic University, China
- 17F2-2 Analysis of Scaling Characteristics for Inductive Power Transfer Coils**
Giuseppe Guidi¹, Jon Are Suul^{1,2}
1) *SINTEF Energy Research, Norway*, 2) *Norwegian University of Science and Technology, Norway*
- 17F2-3 Four-switch Class-PN Power Amplifier for High Power Handling Capability in Wireless Power Transfer**
Faheem Ahmad, Asger Bjorn Jorgensen, Stig Munk-Nielsen
Aalborg University, Denmark
- 17F2-4 A Primary-Side Gain-Scheduled Controller Based on Dynamic Coupling Estimation for Inductive Battery Charging Systems with Sub-resonant Frequency Control**
Jiayu Zhou¹, Giuseppe Guidi², Shuxin Chen³, Yi Tang³, Jon Are Suul^{1,2}
1) *Norwegian University of Science and Technology, Norway*, 2) *SINTEF Energy Research, Norway*, 3) *Nanyang Technological University, Singapore*

Session 17G2 Grid Forming Converters III

Chairs: Yoshinobu Ueda (*Meidensha Corporation, Japan*)
Yongsug Suh (*Jeonbuk National University, Korea*)

- 17G2-1 A Control Method of Reduced Reactive Power Ripple in Grid-connected Converters under Unbalanced Grid Conditions**
Jaehoon Choi, Yongsug suh
Jeonbuk National University, Koera
- 17G2-2 Global Impedance Identification of Inverter-Based Power Systems Using Grid-Forming-Inverter-Based Current Perturbation Injections at Single Node**
Weihua Zhou, Nabil Mohammedy, Behrooz Bahrniz
Monash University, Australia
- 17G2-3 Artificial Neural Network-based Intelligent Grid Impedance Identification Method for Grid-Connected Inverter**
Yuan Qiu, Yanbo Wang, Yanjun Tian, Zhe Chen
Aalborg University, Denmark
- 17G2-4 Augmentation of Generalized Multivariable Grid-Forming Control for Power Converters with Cascaded Controllers**
Meng Chen¹, Dao Zhou¹, Ali Tayyebi², Eduardo Prieto-Araujo³, Florian Dörfler², Frede Blaabjerg¹
1) *Aalborg University, Denmark*, 2) *Swiss Federal Institute of Technology (ETH) Zurich, Switzerland*, 3) *CITCEA-UPC, Technical University of Catalonia, Spain*

Session 17H2 PM machines I

Chairs: Katsutoku Takeuchi (*Toshiba Infrastructure Systems & Solutions, Japan*)
Kyohei Kiyota (*Tokyo Institute of Technology, Japan*)

- 17H2-1 Rotor Structure for Suppressing Irreversible Demagnetization of Magnets in Double-layered Interior Permanent Magnet Synchronous Motors**
Atsushi Nakata¹, Masayuki Sanada², Shigeo Morimoto², Yukinori Inoue²
1) *Osaka Prefecture University, Japan*, 2) *Osaka Metropolitan University, Japan*
- 17H2-2 Reduction of Magnetization Current in a Variable-Magnetization IPM Motor with Two Ushaped Arrangement for Electric Vehicles**
Wataru Suzuki, Kazuto Sakai
Toyo University, Japan
- 17H2-3 Prototype Tests of Segment-type Outer-Rotor PM motor**
Sho Sakurai, Yutaro Uchiyama, Kenji Nakamura
Tohoku University, Japan
- 17H2-4 Prototype Test Results of Inset-type Permanent Magnet Machine made of NANOMET® Laminated Core**
Yue Yu¹, Shozo Hiramoto², Kenji Nakamura¹
1) *Tohoku University, Japan*, 2) *Tohoku Magnet Institute Co., Ltd., Japan*

Room A

Session 17A3 High performance Isolated DC-DC Converters in Emerging Applications (OS)

Chairs: Kai Sun (*Tsinghua University, China*)

Jung-Ik Ha (*Seoul National University, Korea*)

17A3-1 A Modulation Method of Series-Resonant Dual-Active Half-Bridge Converter for ZVS and Minimum RMS

Invited Paper **current**

Jin-Su Hong, Sunghyuk Choi, Jung-Ik Ha
Seoul National University, Korea

17A3-2 Optimal Design of a Constant Frequency Series-Resonant DC/DC converter with Wide Voltage Gain Range for Single-Stage Isolated AC/DC Power Conversion

Invited Paper

Jie Liu¹, Yujie Cheng², Yihang Jia¹, Hongfei Wu¹

1) *Nanjing University of Aeronautics and Astronautics, China*, 2) *Nanjing Electronic Devices Institute, China*

17A3-3 Analysis of Partial Parallel Dual Active Bridge Converter with Additional Phase Shift Control

Invited Paper

Jiasheng Huang, Chang Wang, Zhe Zhang, Ziwei Ouyang, Gabriel Zsurzsan, Michael A.E. Andersen

Technical University of Denmark, Denmark

17A3-4 Efficiency Improvement of Current-Fed DAB Converter by Triangular Current Mode for Wide Voltage Applications

Invited Paper

Hiroki Watanabe, Akira Tamagawa, Jun-ichi Itoh
Nagaoka University of Technology, Japan

17A3-5 An Inner Phase Shift Control Scheme for the CLLC Converter

Invited Paper

Huan Chen, Kai Sun, Haixu Shi, Leheng Wang, Kai Zhang
Tsinghua University, China

Room B

Session 17B3 EMI Mitigation for Power Electronics Converters (OS)

Chairs: Dong Jiang (*Huazhong University of Science and Technology, China*)

Shuo Wang (*University of Florida, USA*)

17B3-1 EMI Analysis of Three-Phase Three-Level Flying Capacitors Diode Clamped DAB Converter

Invited Paper

Yuxuan Chen, Wenjie Chen, Jinlu Liu, Daoxin Tong, Xin Ma
Xi'an Jiaotong University, China

17B3-2 Common-Mode Voltage Mitigation for Three-Phase Hybrid NPC Inverter with Flying-Capacitor Leg

Invited Paper

Xuan Zhao, Dong Jiang, Wei Sun, Jialou Gao
Huazhong University of Science and Technology, China

17B3-3 Conducted EMI Reduction of Modular Multilevel Converter Based on Chaotic Nearest Level Modulation

Invited Paper

Zuoxing Wang¹, Hong Li¹, Zhaoyi Chu¹, Chongmo Zhang¹, Zhichang Yang², Tiancong Shao¹

1) *Beijing Jiaotong University, China*, 2) *Global Energy Interconnection Research Institute Co., Ltd., China*

17B3-4 Characterization and Design of Filter Inductors and Capacitors to Suppress the Radiated EMI in A Power Converter

Invited Paper

Yingjie Zhang, Shuo Wang
University of Florida, USA

17B3-5 A Low-cost Active Reflected Wave Canceller for MMC Motor Drive using SiC Devices

Invited Paper

Yu Zhang, Zhehui Guo, Hui Li, Fangzheng Peng
Florida State University, USA

Session 17C3 Energy Storage System for Railway Systems (OS)

Chairs: Shingo Makishima (*Toyo Denki Seizo K. K., Japan*)

Takafumi Koseki (*The University of Tokyo, Japan*)

17C3-1 Case study of four battery-powered methods to run electric trains on non-electrified lines

Invited Paper Masamichi Ogasawara
Railway Technical Research Institute, Japan

17C3-2 Contribution of Wayside Energy Storage Systems to Short Circuit Currents in DC Railway Traction Power Systems

Invited Paper Antonio Di Pasquale, Emanuele Fedele, Diego Iannuzzi, Mario Pagano
Università degli studi di Napoli Federico II, Italy

17C3-3 Overview of Power Electronics Applications for Fixed Installations of Urban Railway Power Supply for Regenerative Energy Utilization

Invited Paper Takashi Suzuki¹, Daisuke Kumagai¹, Ryo Takahashi¹, Yuuki Mizumoto¹, Hidenori Sato¹, Yuuki Iino¹, Shirou Sekijima², Masashi Nakahira¹, Hitoshi Hayashiya¹
1) *East Japan Railway Company, Japan*, 2) *Nippon Rietec Co., Ltd., Japan*

17C3-4 Traction Energy Storage Systems applied with SCiB™

Invited Paper Nobuhiko Satake¹, Masayuki Nogi¹, Koji Maki¹, Motokatsu Ogi¹, Manato Mori¹, Geronimo Anthony Ivan Capitin¹, Akira Tanaka²
1) *Toshiba Infrastructure Systems & Solutions Corporation, Japan*, 2) *Toshiba IT & Control Systems Corporation, Japan*

17C3-5 Method to Design Control System of Traction Inverter of DC-electrified Railway Vehicle for an Increase in Regenerative Brake Power

Invited Paper Hiroyasu Kobayashi¹, Natsuki Kawagoe¹, Keiichiro Kondo¹, Tetsuya Iwasaki², Akihiro Tsumura²
1) *Waseda University, Japan*, 2) *Odakyu Electric Railway Co., Ltd., Japan*

Session 17D3 Human Factor and Image Intelligent System (OS)

Chairs: Kaoru Mitsuhashi (*Polytechnic University, Japan*)

Takio Kurita (*Hiroshima University, Japan*)

17D3-1 Summary of Works on Image Classification with Noisy Labels

Invited Paper Yuichiro Nomura, Takio Kurita
Hiroshima University, Japan

17D3-2 Pixel Relationships-based Regularizer for Retinal Vessel Image Segmentation

Invited Paper Lukman Hakim, Takio Kurita
Hiroshima University, Japan

17D3-3 Investigation of Training Effects and Services by Skill Motion Training Games

Invited Paper Akira Tao¹, Osamu Ichikawa¹, Kaoru Mitsuhashi²
1) *Polytechnic University of Japan, Japan*, 2) *Teikyo University, Japan*

17D3-4 Suggestion of AR Presentation Tool for PC Operating Handicapped Users

Invited Paper Kaoru Mitsuhashi¹, Tomoaki Maruyama², Hiroshi Takeshita³
1) *Teikyo University, Japan*, 2) *National Institute of Technology (KOSEN), Japan*, 3) *Tsukuba University of Technology, Japan*

17D3-5 Interactive Media Art by Applying Depth Sensing

Invited Paper Hirooki Aoki
Chitose Institute of Science and Technology, Japan

Session 17E3 Parasitics Analysis and Design

Chairs: *Shuhei Fukunaga (Osaka University, Japan)*

Liu Jia (Xi'an Jiaotong University, China)

- 17E3-1 Analysis and Design of a High Power Density Full-Ceramic 900V DC-Link Capacitor for a 550 kVA Electric Vehicle Drive Inverter**
Davide Cittanti¹, Fausto Stella¹, Enrico Vico¹, Chaohui Liu², Jinliang Shen², Guidong Xiu², Radu Bojoi¹
1) Politecnico di Torino, Italy, 2) National New Energy Vehicle Technology Innovation Center, China
- 17E3-2 Robust HV Power pLDMOS Components for ESD Protection by the Drain-side Parasitic Schottky Diode and SCR Engineering**
Shen-Li Chen¹, Shi-Zhe Hong¹, Wei-Jung Chen²
1) National United University, Taiwan, 2) National Yang Ming Chiao Tung University, Taiwan
- 17E3-3 Design the Phase Output Bar for Improving Static Current Sharing Among Parallel IGBTs in High Power Stack Application**
Zheng-Feng Li¹, Nobuya Nishida², Hiroto Aoki³, Hisashi Shibata³, Chih-Hung Ma¹, Hsiang-Ming Liu¹, Ming-Shi Huang¹
1) National Taipei University of Technology, Taiwan, 2) Mitsubishi Electric Corporation, Japan, 3) TAMURA Corp., Japan
- 17E3-4 Passive components facing wideband gap devices' new thermal and electrical challenges**
Thomas Fouet¹, Simon Dario¹, Tomokazu Sakuraba², Herwig Süncksen³, Jean-François de Palma¹
1) Mersen, France, 2) Mersen, Japan, 3) Mersen, Germany
- 17E3-5 Analysis of Clearance Effect for Perforated Terminals Isolation of a Laminated Busbar to Parasitic Parameters**
Koji Mitsui, Keiji Wada
Tokyo Metropolitan University, Japan

Session 17F3 Power Supplies

Chairs: *Shohei Komeda (Tokyo University of Marine Science and Technology, Japan)*

Yu-Chen Liu (National Ilan University, Taiwan)

- 17F3-1 Analysis of Winding Coverage in Planar Transformers with Fractional Turns for High Frequency LLC Resonant Converters**
Yu-Chen Liu, Meng-Chi-Tsai, Phuc-Dinh Nguyen
National Ilan University, Taiwan
- 17F3-2 A Variable Switching Frequency Control Method for a Dual-Active-Bridge Single-Phase AC-DC Converter with an Active Energy Buffer**
Shohei Komeda¹, Shunsuke Takuma², Yoshiya Ohnuma²
1) Tokyo University of Marine Science and Technology, Japan, 2) Nagaoka Power Electronics Co., Ltd., Japan
- 17F3-3 A Butterfly Interleaving Multiphase Coupled Inductor Buck Converter for Datacenters with 99.3% Peak Efficiency**
Mingxiao Li^{1,2}, Yunfeng Liu¹, Ziwei Ouyang¹, Michael A. E. Andersen¹, Teng Long²
1) Technical University of Denmark, Denmark, 2) University of Cambridge, UK
- 17F3-4 High-Efficiency Asymmetrical Half-Bridge Converter with Series Capacitor Rectifier and Linear Voltage Gain**
Juhyun Bae, Jae-Sang Kim, Minsu Lee, Jeongchan Park, Gun-Woo Moon
Korea Advanced Institute of Science and Technology (KAIST), Korea
- 17F3-5 Proposal of Virtual Transformer-Based Back-To-Back Asynchronous Loss Measurement Using a Single Set of Measurement Instruments for One Inverter and Experimental Verification**
Atsuo Kawamura, Yoshiki Nasu, Yasuhiko Miguchi, Hadi Setiadi, Hidemine Obara
Yokohama National University, Japan

Session 17G3 Wind Power Generator and Related Control

Chairs: Ryosuke Saito (*Toshiba Infrastructure Systems & Solutions Corporation, Japan*)
Dongsheng Li (*Hitachi Ltd., Japan*)

- 17G3-1 Research on Control for Grid-connected Brushless Doubly-Fed Power Generation System under Different Quantities**
Debin Zhang, Jijun Ma, Shengjia Wang, Yuhui Ji, Kun Jiang, Chengzhi Qu
Shanghai Instituted of Space Power-Sources (SISP), China
- 17G3-2 Power Fluctuation Suppression by Current Balancing Control in Wind Power System Using Wound Rotor Induction Generator Under Unbalanced Grid Voltage**
Kichiro Yamamoto, Takahiro Matsumoto, Atsushi Shinohara
Kagoshima University, Japan
- 17G3-3 Sensorless Control of PMSG Wind Power Systems Based on ROGI-FLL**
Anh Tan Nguyen¹, Van Nam Nguyen², Dong-Choon Lee²
1) *Hanoi University of Science and Technology, Vietnam*, 2) *Yeungnam University, Korea*
- 17G3-4 Maximum Torque per Ampere Control of IPMSM Using Online Flux Linkage Plane Estimation Considering Cross Saturation**
Suzuka Sasayama¹, Yuki Shimizu², Shigeo Morimoto³, Yukinori Inoue³, Masayuki Sanada³
1) *Osaka Prefecture University, Japan*, 2) *Ritsumeikan University, Japan*, 3) *Osaka Metropolitan University, Japan*
- 17G3-5 Online Identification of Six-Phase IPMSM Parameters Using Prediction-Error Sensitivities to Model Parameters**
Aravinda Perera, Roy Nilsen
Norwegian University of Science and Technology, Norway

Session 17H3 PM machines II

Chairs: Yoshihiro Miyama (*Mitsubishi Electric Corporation, Japan*)
Yi Sui (*Harbin Institute of Technology, China*)

- 17H3-1 Imbalanced Force Suppression Due to Static Eccentricity by Using Triple Three-phase Winding Motor**
Kan Yang¹, Kan Akatsu¹, Kodai Okazaki², Yoshihiro Miyama²
1) *Yokohama National University, Japan*, 2) *Mitsubishi Electric Corporation, Japan*
- 17H3-2 A Comparison of Permanent-Magnet Vernier Motor and Interior Permanent-Magnet Motor for Hybrid Electric Vehicles**
Libing Cao¹, Yuefei Zuo¹, Shuangchun Xie¹, Chi Cuong Hoang², Boon Siew Han², Christopher H. T. Lee¹
1) *Nanyang Technological University, Singapore*, 2) *Schaeffler (Singapore) Pte. Ltd., Singapore*
- 17H3-3 A Permanent Magnet Synchronous Machine with Interior Halbach Arrays**
Yuting Gao¹, Takashi Kosaka¹, Yang Liu², You Zhou³
1) *Nagoya Institute of Technology, Japan*, 2) *Huazhong University of Science and Technology, China*, 3) *Nanyang Technological University, Singapore*
- 17H3-4 Performance Analysis of Flux-Modulating Consequent Pole Motors**
Hiroshi Mitsuda^{1,2}, Tadashi Fukami², Masato Koyama², Kazumasa Ito¹
1) *Mitsubishi Electric Corporation, Japan*, 2) *Kanazawa Institute of Technology, Japan*
- 17H3-5 Prototype Tests of Induction/Synchronous Magnetic Gears**
Yuma Mizuana¹, Kenji Nakamura¹, Yuma Suzuki², Yuichi Tachiya², Kingo Kuritani²
1) *Tohoku University, Japan*, 2) *Prospine Co., Ltd., Japan*

Room A

Session 18A1 Renewable Energy Integration by Next-generation Power Electronics Technology (OS)

Chairs: Kazunori Hasegawa (*Kyushu Institute of Technology, Japan*)

Kentaro Fukushima (*Central Research Institute of Electric Power Industry, Japan*)

18A1-1 Net-Zero Emissions Energy Systems in an Internet of Energy (IoE) Society

Invited Paper Hiroshi Asano^{1,5}, Daisuke Iioka², Osamu Kunitomo³, Yu Nagatomi⁴

1) Gifu University, Japan, 2) Chubu University, Japan, 3) Energy Public Group, Tokyo Gas Co., Ltd., Tokyo, Japan, 4) The Institute of Energy Economics, Japan, 5) CRIEPI, Japan

18A1-2 Analytical study on energy scenarios and targets for 2050 in Japan

Invited Paper Shigeru Bando¹, Kentaro Fukushima¹, Masaaki Takagi¹, Hiroshi Asano^{1,2}, Seiya Abe³, Daisuke Iioka⁴, Dai Orihara⁵

1) Central Research Institute of Electric Power Industry, Japan, 2) Gifu University, Japan, 3) Kyushu Institute of Technology, Japan, 4) Chubu University, Japan, 5) National Institute of Advanced Industrial Science and Technology, Japan

18A1-3 Study of the Current Potential of Power Converters -Applied Power Semiconductor Devices, Power Density and Losses-

Invited Paper

Seiya Abe¹, Kentaro Fukushima², Daisuke Iioka³, Dai Orihara⁴

1) Kyushu Institute of Technology, Japan, 2) Central Research Institute of Electric Power Industry, Japan, 3) Chubu University, Japan, 4) National Institute of Advanced Industrial Science and Technology, Japan

18A1-4 Universal Smart Power Module (USPM) for Carbon Neutral Society

Invited Paper Yoshikazu Takahashi¹, Yoshinari Ikeda², Hiroki Watanabe³, Jun-ichi Itoh³

1) Tohoku University, Japan, 2) Fuji Electric Co., Ltd, Japan, 3) Nagaoka University of Technology, Japan

18A1-5 Control Method for Single-Phase Active Filter Using Universal Smart Power Module (USPM)

Invited Paper

Mana Sakamoto, Hitoshi Haga

Nagaoka University of Technology, Japan

Room B

Session 18B1 Advanced Motor Drive Technology for Future (OS)

Chairs: Takahiro Suzuki (*Hitachi Ltd., Japan*)

Atsushi Matsumoto (*Chubu University, Japan*)

18B1-1 Evaluation of Stator Current Power Spectrum Before and After Equipment Maintenance for Anomaly Detection of Induction Machine

Invited Paper

Makoto Kaneamru, Ken Hirakida, Hiroshi Inoue, Toshihiko Miyauchi
Mitsubishi Electric Corporation, Japan

18B1-2 Experimental Evaluation of an AI Model Trained with Switching Pattern Based on Long-Horizon Model Predictive Control

Invited Paper

Tenjiro Hiwatari, Akira Satake, Sota Sano, Kenya Sugihara, Ryo Yamamoto
Mitsubishi Electric Corporation, Japan

18B1-3 Self-Tuning for each PMSM Controller using Big Data based ANN

Invited Paper

Sari Maekawa
SEIKEI University, Japan

18B1-4 Implementation of Vector Control System On Multi-Core Processor by Using Model-Based Parallelization Tool

Invited Paper

Jinsoo Kim¹, Shota Sagae¹, Masato Eda¹, Shinya Honda², Shinji Doki¹
1) Nagoya University, Japan, 2) Nanzan University, Japan

18B1-5 Motor-Current-Based Prediction of Bearing Degradation with Kalman Filter and Grease Lifetime Formula

Invited Paper

Akari Kubo, Kohji Maki
Hitachi Ltd., Japan

Session 18C1 Advanced motion control and its applications (OS)

Chairs: Yoshiyuki Urakawa (*Nippon Institute of Technology, Japan*)

 Takenori Atsumi (*Chiba Institute of Technology, Japan*)

18C1-1 Stochastic Learning Control Framework in the Integrated Frequency and Position Domain

Invited Paper Hanul Jung, Sehoon Oh
Daegu Gyeongbuk Institute of Science and Technology, Korea

18C1-2 Robotic Arm Trajectory Generation Based on Emotion and Kinematic Feature

Invited Paper Kaiwen Wu^{1,2,3}, Luefeng Chen^{1,2,3}, Kuanlin Wang^{1,2,3}, Min Wu^{1,2,3}, Witold Pedrycz⁴, Kaoru Hirota⁵
1) *China University of Geosciences, China*, 2) *Hubei Key Laboratory of Advanced Control and Intelligent Automation for Complex Systems, China*, 3) *Ministry of Education, China*, 4) *University of Alberta, Canada*, 5) *Tokyo Institute of Technology, Japan*

18C1-3 Loop-Shaping Technique for Quadruple-Stage-Actuator System in Hard Disk Drive

Invited Paper Takenori Atsumi¹, Shota Yabui²
1) *Chiba Institute of Technology, Japan*, 2) *Tokyo City University, Japan*

18C1-4 Application of Multilayer Kalman Filter to a Flexible Drive System

Invited Paper Krzysztof Szabat¹, Karol Wrobel¹, Seiichiro Katsura²
1) *Wroclaw University of Sciences and Technology, Poland*, 2) *Keio University, Japan*

18C1-5 Robust interference suppression of three phase structural uncertainty inverter system based on equivalent input interference method

Invited Paper Meng Ye^{1,2,3}, Min Ding^{1,2,3}, Danyun Li^{1,2,3}, Zhijian Fang^{1,2,3}, Qingyi Wang^{1,2,3}, Luefeng Chen^{1,2,3}
1) *China University of Geosciences, China*, 2) *Hubei Key Laboratory of Advanced Control and Intelligent Automation for Complex Systems, China*, 3) *Ministry of Education, China*

Session 18D1 Smart Facilities

Chairs: Takaharu Ishida (*Meisei University, Japan*)

 Yoshikazu Fukuyama (*Meiji University, Japan*)

18D1-1 Refrigerated Showcase Fault Detection by an Artificial Neural Network using Correntropy with Improved Adaptive Kernel Size Tuning

Masato Igarashi¹, Yoshikazu Fukuyama¹, Yuichi Shimasaki², Yuto Osada², Kenya Murakami², Tatsuya Iizaka², Adamo Santana², Tetsuro Matsui²
1) *Meiji University, Japan*, 2) *Fuji Electric Co., Ltd., Japan*

18D1-2 Improvement of the Accuracy of Photovoltaic Module Equivalent Circuit Model using Irradiance-dependent Variable Shunt Resistor

Kenji Arimatsu¹, Yoichi Sekiba², Hitoshi Haga³
1) *Tohoku Electric Power Co., Inc., Japan*, 2) *Denryoku Computing Center, Ltd., Japan*, 3) *Nagaoka University of Technology, Japan*

18D1-3 Novel Optimization Method Hybridized by MILP and PSO for Operation Planning in Microgrid System

Yu Tanahashi^{1,2}, Hiroshi Kobayashi¹, Yuta Nakamura², Mutsumi Aoki²
1) *TOENEC CORPORATION, Japan*, 2) *Nagoya Institute of Technology, Japan*

18D1-4 Data-Driven Hybrid Approach for Early Fault Detection of AHU using Electrical Signals

Hasmat Malik¹, Sanjib Kumar Panda², Kameshwar Poolla³, Costas J. Spanos³
1) *National University of Singapore, Singapore*, 2) *Berkeley Education Alliance for Research in Singapore (a research center of the University of California, Berkeley, USA), Singapore*, 3) *University of California, Berkeley, USA*

18D1-5 Work Element Estimation for Forklift Operation

Toshimasa Aso
Tokyo University of Marine Science and Technology, Japan

Session 18E1 DC-DC Converters II

Chairs: Kazuhiro Umetani (*Okayama University, Japan*)

Jun Imaoka (*Nagoya University, Japan*)

- 18E1-1 Integrated Coupled-Inductor Based Current and Voltage Balancing Technique for Parallel-Connected Triple-Active-Bridge Converters**
Seunghoon Lee, Honnyong Cha, Kisu Kim
Kyungpook National University, Korea
- 18E1-2 A Dual-Active-Bridge (DAB) Converter Based Bidirectional DC/DC Converter with Reduced Link Capacitance**
Dongmin Choi, Minsu Lee, Taewoo Kim, Dongmin Kim, Gun-Woo Moon
Korea Advanced Institute of Science and Technology (KAIST), Korea
- 18E1-3 Design and Characterization of a 500 kW 20 kHz Dual Active Bridge using 1.2 kV SiC MOSFETs**
Fabian Sommer¹, Nikolas Menger¹, Tobias Merz¹, Nils Soltau², Shiori Idaka², Marc Hiller¹
1) Karlsruhe Institute of Technology, Germany, 2) Mitsubishi Electric Europe B.V., Germany
- 18E1-4 Improvement of Efficiency in Bidirectional DC-DC Converter with Dual Active Bridge Using GaNHEMT**
Ryuji Yamada¹, Akihiro Hino¹, Keiji Wada²
1) Fuji Electric Co., Ltd., Japan, 2) Tokyo Metropolitan University, Japan
- 18E1-5 Low Temperature Investigation of a Cascode GaN based Resonant Bi-directional DC/DC Converter**
Yuqi Wei, Md Maksudul Hossain, H. Alan Mantooth
University of Arkansas, USA

Session 18F1 Railway Power Supply Systems

Chairs: Satoru Hatsukade (*Railway Technical Research Institute, Japan*)

Takashi Suzuki (*East Japan Railway Company, Japan*)

- 18F1-1 1000kW DC/DC Converter Development for DC Traction Stationary BESS Considering Various Operation Power Patterns**
Wataru Kawamura¹, Junya Konno¹, Akihiko Sumiya²
1) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan, 2) Toshiba Infrastructure Systems & Solutions Corporation, Japan
- 18F1-2 Developed energy saving control method for SESS**
Hirotaka Takahashi, Tsutomu Miyauchi, Motonari Suzuki
Hitachi,Ltd, Japan
- 18F1-3 Confirmation of Correlation between Hourly Electric Power and Instantaneous Maximum Power of Rectifiers for Railway**
Shota Ishizaki¹, Takashi Suzuki², Masashi Nakahira², Daisuke Kumagai², Hiroto Amata², Keiichiro Kondo³, Kota Sato³, Hitoshi Hayashiya²
1) Japan Railway Electric Design Co., Ltd., Japan, 2) East Japan Railway Company, Japan, 3) Waseda University, Japan
- 18F1-4 The converter restart sequence of electronic frequency converters for the Tokaido Shinkansen at a transient fault on the power receiving side**
Haruna Ohnishi¹, Koji Otsuka¹, Yuto Uchiyama¹, Katsuyasu Nakano¹, Masahiko Kai¹, Takumi Nagai², Naoya Tanigawa³
1) Central Japan Railway Company, Japan, 2) Toshiba Infrastructure Systems & Solutions Corporation, Japan, 3) Mitsubishi Electric Corporation, Japan

Session 18G1 Recent Technologies of Home and Consumer Appliances for Decarbonization (OS)

Chairs: Hideki Omori (*Kobe University, Japan*)

Yu-Chen Chang (*National Taiwan University of Science and Technology, Taiwan*)

18G1-1 Induction Heating Cookers: A Path Towards Decarbonization Using Energy Saving Cookers

Invited Paper Oscar Lucia, Hector Sarnago, Jesus Acero, Claudio Carretero, Jose M. Burdio
University of Zaragoza, Spain

18G1-2 Design and Implementation of a High-Power Modular WPT System

Invited Paper Wenxing Zhong, Chen Zhu, Dehong Xu, Changsheng Hu
Zhejiang University, China

18G1-3 Design and Implementation of a Single Phase Inverter in Residential Storage System

Invited Paper Ta-Wei Huang, Chang-Tsai Tsai, Yu-Chen Chang, Huang-Jen Chiu
National Taiwan University of Science and Technology, Taiwan

18G1-4 A Local VPP with EVs in Very Small Areas

Invited Paper Yoshimitchi Nakamura¹, Hideki Omori²
1) *Smart Energy Laboratory, Japan*, 2) *Kobe University, Japan*

18G1-5 V2X products and social implementation in Japan -future prospects from the point of "Global warming problem"

Invited Paper Shunjiro Yui, Hiroshi Seki, Katsuhiko Furuya, Hiroto Nakamura
Nichicon Co., Ltd., Japan

Session 18H1 Wireless power transfer for Automobiles

Chairs: Kantaro Yoshimoto (*Tokyo Denki University, Japan*)

Shingo Soma (*Honda R&D Co.,Ltd., Japan*)

18H1-1 Novel Dynamic Wireless Power Transfer System for Battery Electric Vehicles Using In-Tire and In-Wheel Repeater Coil

Hayato Sumiya^{1,2}, Eisuke Takahashi¹, Nobuhisa Yamaguchi¹, Keisuke Tani¹, Osamu Shimizu², Sakahisa Nagai², Hiroshi Fujimoto², Daisuke Gunji³, Isao Kuwayama⁴
1) *DENSO CORPORATION, Japan*, 2) *The University of Tokyo, Japan*, 3) *NSK Ltd., Japan*, 4) *Bridgestone Corporation, Japan*

18H1-2 Wireless recharging of EVs while driving and the effectiveness of novel storage battery

Shigeyuki Takagi¹, Suguru Kawamura¹, Akito Sasaki², Hideaki Hirabayashi²
1) *Tokyo University of Technology, Japan*, 2) *Toshiba Materials Co., Ltd., Japan*

18H1-3 Wireless EV Charging System Using PWM Controlled Variable Capacitor for Maximum Power Transfer under Severe Coil Misalignment

Ryo Matsumoto, Hiroshi Fujimoto
The University of Tokyo, Japan

18H1-4 Variable Frequency Control for Constant Current Constant Voltage Inductive Wireless EV Charging System

Thanet Sriprom¹, Anon Namin¹, Wuttikai Tammawan¹, Samart Yachiangkam¹, Suchart Janjornmanit¹, Uthen Kamnarn¹, Jutturit Thongpron¹, Chanyut Karnjanapiboon¹, Phatiphat Thounthong², Noureddine Takorabet³
1) *Rajamangala University of Technology Lanna (RMUTL), Thailand*, 2) *King Mongkut's University of Technology, Thailand*, 3) *Université de Lorraine, France*

Room A

Session 18A2 Advance Control for Power Converters (OS)

Chairs: Ching-Jan Chen (*National Taiwan University, Taiwan*)

Hiroki Watanabe (*Nagaoka University of Technology, Japan*)

18A2-1 An Arithmetic Series-Based Recursive Equation Used in the Approximation of the Sinusoidal Wave with Reduced Error

Invited Paper

Xiao-Ze Lin, Woei-Luen Chen
Senior Member IEEE

18A2-2 Design of an Interleaved Half-Bridge CLLC Resonant AC-AC Converter

Invited Paper

Kuo-Yuan Lo, Shin-Yue Chen, You-Xuan Guo
National Kaohsiung University of Science and Technology, Taiwan

18A2-3 An Optimal Frequency-Modulated Control for Bidirectional CLLC Resonant Converters

Invited Paper

Cheng-Yu Tang, Tzu-Hsuan Ho
National Taipei University of Technology, Taiwan

18A2-4 Online Grid Impedance Measurement Based on Virtual Reference Axis

Invited Paper

Meng-Chun Yang¹, Zhe-Yan Chen¹, Yaow-Ming Chen¹, Chih-Chao Hsu²
1) *National Taiwan University, Taiwan*, 2) *National Chung-Shan Institute of Science and Technology, Taiwan*

18A2-5 A 4-MHz Ultra-Fast Transient Response Capacitor Current Adaptive On-Time (CCAOT) Controlled Buck Converter with Passive Ramp Compensation

Invited Paper

Yu-Lin Chao, Chieh-Ju Tsai, Ching-Jan Chen
National Taiwan University, Taiwan

Room B

Session 18B2 Key Technologies Towards High-speed Electrical Machines (OS)

Chairs: Jing Ou (*Harbin Institute of Technology, China*)

Hongfei Lu (*Karlsruhe Institute of Technology, Germany*)

18B2-1 Analytical Computation of Inductance for High-Speed Spoke-Type Permanent Magnet Synchronous Motor

Invited Paper

Accounting for Saturation
Peixin Liang^{1,2}, Tianrong He^{1,2}, Lihao Liang^{1,2}, Dingxuan Yue¹, Ningfei Jiao^{1,2}, Weiguo Liu^{1,2},
1) *Northwestern Polytechnical University, China*, 2) *Shaanxi Key Laboratory of Small & Special Electrical Machine and Drive Technology, China*

18B2-2 Design of a high-speed synchronous reluctance motor made of dual-phase steel

Invited Paper

Jing Ou¹, Jingbo Lin¹, Feng Chai¹, Dianguo Xu¹, Martin Doppelbauer²
1) *Harbin Institute of Technology, China*, 2) *Karlsruhe Institute of Technology, Germany*

18B2-3 Mechanical Design of a High-Speed Permanent Magnet Assisted Electrically Excited Synchronous Machine as Traction Motor

Invited Paper

Hongfei Lu, Johannes Deutsch, Martin Doppelbauer
Karlsruhe Institute of Technology (KIT), Germany

18B2-4 Vibration characteristic analysis and comparison of high-speed switched reluctance motor with amorphous alloy core

Invited Paper

Feng Chai¹, Mengsen Hu¹, Zongyang Li², Lina Geng¹
1) *Harbin Institute of Technology, China*, 2) *Midea Welling Motor Technology (Shanghai) Co., Ltd., China*

Session 18C2 Renewable Energy Systems

Chairs: Masahide Hojo (*Tokushima University, Japan*)

Danang Wijaya (*Universitas Gadjah Mada, Indonesia*)

- 18C2-1 A Low-Cost Grid-Connected Photovoltaic Microinverter Based on Commutation of Thyristor**
Manlin Wang, Su Du
Central South University, Changsha, China
- 18C2-2 A Control System of PV Sources for DC Microgrid with Seamless Switching Operation between I-V Droop Control and MPPT Control**
Yasushi Eto, Yuichi Noge, Masahito Shoyama
Kyushu University, Japan
- 18C2-3 The Impact of Sun Tracking on the Reliability of Solar Inverters**
Ali Azizi¹, Saeed Peyghami¹, Seyed Fariborz Zarei², Frede Blaabjerg¹
1) *Aalborg University, Denmark*, 2) *Qom University of Technology, Iran*
- 18C2-4 Testing Requirements and Control Strategies of Next-Generation Grid Emulator: A Review**
Zejie Li, Pavani Ponnaganti, Fangzhou Zhao, Xiongfei Wang, Birgitte Bak-Jensen, Stig Munk-Nielsen, Frede Blaabjerg
Aalborg University, Denmark
- 18C2-5 Islanded Wind Farm Microgrid Stability Control Using Synchronverter Algorithm**
Mohd. Brado Frasetyo, Fransisco Danang Wijaya, Eka Firmansyah
Universitas Gadjah Mada, Indonesia

Session 18D2 Industrial Instrumentation and Control III

Chairs: Tomoyuki Shimono (*Yokohama National University, Japan*)

Masato Koyama (*Mie University, Japan*)

- 18D2-1 A Short-Distance Running Algorithm Based MPPT Control Strategy for PV Power Systems Under Partial Shading Conditions**
Sy Ngo^{1,2}, Chian-Song Chiu¹
1) *Chung Yuan Christian University, Taiwan*, 2) *Thu Dau Mot University, Vietnam*
- 18D2-2 Extrapolation of Band-Limited Frequency Responses for Out-of-Band Modal Synthesis**
Weihua Zhou, Jef Beerten
KU Leuven & EnergyVille, Belgium
- 18D2-3 Adaptive Protection Scheme with Passive Islanding Detection for AC Microgrids**
Yingjia Luo, Inam Ullah Nutkani, Lasantha Meegahapola
RMIT University, Australia
- 18D2-4 Average Consensus Problem in Multi-Agent System in an Environment with Obstacle**
Hiroki Kimura, A. Okuyama
Tokai University, Japan

Session 18E2 DC-DC Converters III

Chairs: Yusuke Hayashi (*Toshiba Corporation, Japan*)

Daniel Siemaszko (*Hitachi Energy, Switzerland*)

- 18E2-1 A New Secondary Clamp Diode for Phase-Shift Full-Bridge Converter**
Minsu Lee, Dongmin Choi, Juhyun Bae, Jongyoon Chae, Gun-Woo Moon
Korea Advanced Institute of Science and Technology (KAIST), Korea
- 18E2-2 Experimental Insights into the MW Range Dual Active Bridge with Silicon Carbide Devices**
Stefanie Heinig¹, Daniel Siemaszko¹, Remo Baumann¹, Noemi Hubatka¹, Martin Kläusler¹, Raul Ruiz¹, Ralph Burkart², ChunMing Yuan³
1) *Hitachi Energy, Switzerland*, 2) *Hitachi Energy Research, Switzerland*, 3) *Hitachi Energy Research, China*

- 18E2-3 MHz-Driving Snubberless Zero-Current Soft-Switching High Step-Up DC-DC Converter with Multi-Resonant Circuitry**
Tomokazu Mishima¹, Ryusei Miyazaki¹, Ching-Ming Laia²
1) Kobe University, Japan, 2) National Chung Hsing University, Taiwan
- 18E2-4 A Unified Modeling Approach for a Multi-Active Bridge Converter**
Vishwabandhu Uttam, Vishnu Mahadeva Iyer
Indian Institute of Science, India
- 18E2-5 A Novel Fault-Tolerant Control Strategy for Dual Active Bridge Converter under Open Circuit Fault**
Ning Wang¹, Yanbo Wang¹, Zhe Chen¹, Shilin Liu²
1) Aalborg University, Denmark, 2) Anhui Polytechnic University, China

Room F

Session 18F2 Power Electronics Technologies for Railways

Chairs: Ken Kunomura (*Central Japan Railway Company, Japan*)
Keiichiro Kondo (*Waseda University, Japan*)

- 18F2-1 Control and Performance of Capacitively-Isolated Bidirectional DC-DC Converter with Auxiliary Converters for Electric Railways**
Kana Matsumoto, Kazuaki Tesaki, Makoto Hagiwara
Tokyo Institute of Technology, Japan
- 18F2-2 Overview of CLLC Modulation Strategy**
Danni Yang, Yan Zhang, Xue Liu, Wanxing Wang, Jinjun Liu
Xi'an Jiaotong University, China
- 18F2-3 Impedance Modeling and Harmonic Stability Analysis of MMC-Based Railway Static Power Conditioner**
Pengkun Li, Yue Wang, Fengmo Li, Runtian Li, Bole Feng, Cheng Long
Xi'an Jiaotong University, China
- 18F2-4 Transient Stability of Grid-Forming Converters with Flexible DC-Link Voltage Control**
Liang Zhao¹, Zheming Jin², Xiongfei Wang¹
1) Aalborg University, Denmark, 2) Beijing Jiaotong University, China

Room G

Session 18G2 Devices and DC-DC Converter for Home Appliances

Chairs: Toshiyoki Zaitzu (*ROHM Co., Ltd., Japan*)
Nobuo Satoh (*Chiba Institute of Technology, Japan*)

- 18G2-1 Efficiency-Optimized Control Method for Multiport Converter with Current-Fed H-bridges**
Mina Kim¹, Hwa-Pyeong Park¹, Seung Yeol Oh¹, Jung Sik Choi¹, Daeseak Cha¹, Byoung-Sun Ko¹, Jee-Hoon Jung²
1) Korea Electronics Technology Institute (KETI), Korea, 2) Ulsan National Institute of Science and Technology (UNIST), Korea
- 18G2-2 Evaluation and Comparison of Dynamic ON-state Resistance Measurement Methods for GaN Devices**
Rui Zhong, Huiqing Wen
Xi'an Jiaotong-Liverpool University, China
- 18G2-3 State of Charge Estimation for Liquid Metal Batteries with Gaussian Process Regression Framework**
Sheng Wang, Zehang Li, E Zhang, Min Zhou, Kangli Wang
Huazhong University of Science and Technology, China
- 18G2-4 Design and Implementation of a High Step-Up DCDC Converter with Active Switched Inductor and Coupled Inductor**
Peng Luo, Tsorng-Juu Liang, Kai-Hui Chen, Shih-Ming Chen
National Cheng Kung University, Taiwan
- 18G2-5 A Non-Isolated Bidirectional DC-DC Converter with High Conversion Ratio**
Tsorng-Juu Liang, Ru-Cian Lin, Peng Luo, Kai-Hui Chen
National Cheng Kung University, Taiwan

Session 18H2 Design and Control of Energy Managing Converters for Automobiles

Chairs: Osamu Shimizu (*The University of Tokyo, Japan*)

Nobuyuki Imai (*Honda R&D Co., Ltd., Japan*)

18H2-1 Improved DC-Charging for Traction Drives with Hybrid Powered Dual Two-Level Inverter

Kai Kuhlmann, Johannes Teigelkötter, Johannes Büdel, Christian Herkommer

University of Applied Sciences Aschaffenburg, Germany

18H2-2 Variable Coupling Coefficient Integrated Inductor for Hybrid Energy Source Systems

Masanori Ishigaki, Koji Shigeuchi, Naoki Yanagizawa, Daiki Nitta, Shuji Tomura

Toyota Central R&D Labs., Inc., Japan

18H2-3 Dual Inverter Integrated DC Charging with Minimal Leakage Current Generation

Sitan Wang, Mehanathan Pathmanathan, Peter W. Lehn

University of Toronto, Canada

Wednesday, May 18: 16:00-18:05

Session 18A3 System Integration Technology in Power Electronics (OS)

Chairs: Kazuaki Mino (*Murata Manufacturing Co., Ltd., Japan*)

Neha NAIN (*ETH Zurich, Switzerland*)

18A3-1 Consideration of Integrated Power Converter for Renewable Energy- Grid -BES Interactive Applications

Invited Paper Goh Teck Chiang, Kyosuke Tanemura, Shuji Tomura

Toyota Central R&D Labs. INC, Japan

18A3-2 The Potential of LLC Resonant Converters Equipped With Split Resonant Capacitors: From Three-Phase to Fractal Structures

Invited Paper

Akiteru Chiba, Kazuto Takagi, Yuuki Aoyagi, Keita Ishikura

GS Yuasa Infrastructure Systems Co., Ltd., Japan

18A3-3 High Power Density Design of Single-Phase AC/DC Converter with Active Power Decoupling Capability Utilizing Triangular Current Mode for LED Driver Applications

Invited Paper

Hiroki Watanabe, Jun-ichi Itoh

Nagaoka University of Technology, Japan

18A3-4 Comparative Evaluation of Three-Phase AC-AC Voltage/Current-Source Converter Systems Employing Latest GaN Power Transistor Technology

Invited Paper

Neha Nain, Jonas Huber, Johann W. Kolar

ETH Zurich, Switzerland

18A3-5 Comparative Evaluation of ARCP and Three-Level TCM Soft-Switching Bridge-Legs for High-Frequency SiC Converter Systems

Invited Paper

Thomas Langbauer¹, Spasoje Miric², Michael Haider², Jonas Huber², Johann W. Kolar²

1) *Silicon Austria Labs GmbH, Austria*, 2) *ETH Zurich, Switzerland*

Session 18B3 Technical Trend of Magnetic-gear Machines (OS)

Chairs: Kenji Nakamura (*Tohoku University, Japan*)

Kyohei Kiyota (*Tokyo Institute of Technology, Japan*)

18B3-1 Design of a 15-MW Magnetic-Geared Generator

Invited Paper

Noboru Niguchi¹, Katsuhiro Hirata¹, Takuya Ito¹, Haruyuki Kometani², Ryoji Miyatake², Atsushi Yamamoto²

1) *Osaka University, Japan*, 2) *Mitsubishi Electric Corporation, Japan*

18B3-2 A Novel In-Wheel Motor Drive System of Multiple High-Speed Motors Integrated with Magnetic Gear for Electric Vehicle

Invited Paper

Kohei Aiso¹, Kan Akatsu², Yasuaki Aoyama³

1) *Shibaura Institute of Technology, Japan*, 2) *Yokohama National University, Japan*, 3) *Hitachi, Ltd., Japan*

18B3-3 Design of a Magnetic Geared Bearingless Slice Motor with Combined Windings

Invited Paper

Wolfgang Gruber¹, Tobias Konig², Eva-Maria Miliker¹

1) *Johannes Kepler University, Austria*, 2) *Linz Center of Mechatronics GmbH, Austria*

18B3-4 Novel Reluctance-type Magnetic Geared Motor with Integrated with High-speed Bearingless Motor

Invited Paper

Akira Kumashiro¹, Akira Chiba¹, Wolfgang Gruber², Wolfgang Amrhein², Gerald Jungmayr³

1) *Tokyo Institute of Technology, Japan*, 2) *Johannes Kepler University Linz, Austria*, 3) *Linz Center of Mechatronics GmbH, Austria*

Room C

Session 18C3 New Generation Transformers

Chairs: Takaaki Ibuchi (*Osaka University, Japan*)

Jing Lyu (*Shanghai Jiao Tong University, China*)

18C3-1 Feasibility Study of High-Frequency Transformer with High-Voltage Insulation Structure for SST Based Medium-Voltage Multi-Level Converter

Yuki Kawaguchi, Kimihisa Furukawa, Takae Shimada, Junpei Kusukawa

Hitachi, Ltd., Japan

18C3-2 Analytical Capacitance Calculation for Transformers with Grounded Core

Bastian Korthauer, Jürgen Biela

Laboratory for High Power Electronic Systems (HPE) ETH Zurich, Switzerland

18C3-3 Study the Thermal Performance of the CLLC Transformer in the OBC Designed Using SiC MOSFETs

Haoqi Zhu¹, Naoto Fujishima², Yuichi Onozawa², Sideng Hu¹

1) *Zhejiang University, China*, 2) *Fuji Electric Co., Ltd, Japan*

18C3-4 An Integrated Transformer for LLC Resonant Converter Applications of Low Output Voltages and High Currents

Philipp Rehlaender, Shobhit Sharma, Frank Schafmeister, Joachim Böcker

Paderborn University, Germany

18C3-5 Electromagnetic Field and Energy Flux in Wireless Power Transfer System

Itsuki Masuda, Manabu Ishitobi

National Institute of Technology, Nara College, Japan

Room D

Session 18D3 HILS

Chairs: Noriyasu Matsuno (*Myway Plus Corporation, Japan*)

Ke Ma (*Shanghai Jiao Tong University, China*)

18D3-1 Virtual Capacitor Concept for Partitioning of Large Converter Systems for RT-HIL Simulations

Philippe Bontemps, Stefan Milovanovic, Drazen Dujic

École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

18D3-2 Real-Time Simulation Method Using LPV Model of LLC Current Resonant Converter

Hideaki Funaki¹, Yuichi Noge¹, Masahito Shoyama¹, Yu Yonezawa²

1) *Kyushu University, Japan*, 2) *Nagoya University, Japan*

18D3-3 A modular signal processing platform for grid and motor control, HIL and PHIL applications

Benedikt Schmitz-Rode, Lukas Stefanski, Rüdiger Schwendemann, Simon Decker, Stefan Mersche, Philip Kiehnle,

Patrick Himmelmann, Andreas Liske, Marc Hiller

Karlsruhe Institute of Technology (KIT), Germany

18D3-4 Mission Profile Emulator for Sub-Modules of Modular Multilevel Converter with Resonant Filter Impedance

Enyi Li, Ke Ma

Shanghai Jiao Tong University, China

18D3-5 Disturbance Suppression for Mission Profile Emulator for Sub-Modules of Modular Multilevel Converter Under Nearest Level Modulation with Feedforward Control

Enyi Li, Ke Ma
Shanghai Jiao Tong University, China

Room E

Session 18E3 Control and Analysis of Dual Active Bridge Converters

Chairs: Koji Orikawa (*Hokkaido University, Japan*)

Jian Yin (*Shenzhen University, China*)

18E3-1 Improved Phase-Shift Scheme for Fast Power Reversal in a Bidirectional Dual Active Bridge DC/DC Converter Considering the AC-Link Equivalent Resistance

Xiaochao He, Jian Yin
Shenzhen University, China

18E3-2 Flux Control Modulation for Three-Phase Dual-Active Bridge DC-DC Converters

Niklas Fritz, David Heidenberger, David Bundgen, Rik W. De Doncker
RWTH Aachen University, Germany

18E3-3 A Fast Direct Power Digital Control Strategy for Dual Active Bridge DC-DC Converters

L. James¹, C.A. Teixeira¹, R.W. Wilkinson¹, B.P. McGrath¹, S.A. Gonzalez², M. Judewicz², P. Sokolowski¹
1) RMIT University, Australia, 2) Universidad Nacional de Mar del Plata (UNMDP), Argentina

18E3-4 A Transient Characteristics Improvement Method in Dual Active Bridge Converter with Multilevel Inverter Topology

Yasunobu Ueuchi, Nobukazu Hoshi, Takanobu Ohno
Tokyo University of Science, Japan

18E3-5 Real-time Power Flow Decoupling of Triple-Active-Bridge Converter for DC Microgrid System Applications

Kwabena Opoku Bempah, Kyung-Wook Heo, Jee-Hoon Jung
Ulsan National Institute of Science and Technology, Korea

Room F

Session 18F3 Railway Vehicles

Chairs: Shingo Makishima (*Toyo Denki Seizo K. K., Japan*)

Yoshiyasu Hagiwara (*Mitsubishi Electric Corporation, Japan*)

18F3-1 A Novel Maximum Adhesive Force Control without Vehicle Speed Sensor

Kanta Horikoshi, Kantaro Yoshimoto, Tomoki Yokoyama
Tokyo Denki University, Japan

18F3-2 Power Generation Control Method of Parallel Resonant PMSG System for Series Hybrid Vehicle

Shunsuke Jindo¹, Keiichiro Kondo¹, Minoru Kondo², Toshihide Yokouchi²
1) Waseda University, Japan, 2) Railway Technical Research Institute, Japan

18F3-3 A Method to Design Capacity of Onboard Energy Storage Device for Emergency Operation Based on Effective Balance of Power and Energy

Hiroyasu Kobayashi¹, Keiichiro Kondo², Masafumi Miyatake³, Takafumi Koseki⁴
1) Chiba University, Japan, 2) Waseda University, Japan, 3) Sophia University, Japan, 4) The University of Tokyo, Japan

18F3-4 Study on the feeder voltage control with adjusting power factor of train's power converters under multiple trains running in the same feeder section

Hiroshi Moriyama, Ken Kunomura, Kenji Sato, Toshiaki Takami, Toyokazu Hamajima, Toshimasa Shimizu, Takuya Yamagiwa
Central Japan Railway Company, Japan

Session 18G3 Grid Connected Systems related to Home Appliances

Chairs: Kaoru Inoue (*Doshisha University, Japan*)

Yun Yang (*The University of Hong Kong, China*)

- 18G3-1 Efficiency Optimization Method for Parallel Converters in Fault-tolerant Microgrids**
Pengwei Li, Ali M. Bazzi
University of Connecticut Storrs, USA
- 18G3-2 A Power Oscillation Damping Method for Virtual Synchronous Generators Based on Frequency Feedforward in Voltage Reference**
Jiazhi Wang, Zeng Liu, Yidong Shi, Jinjun Liu
Xi'an Jiaotong University, China
- 18G3-3 Dynamic and Steady-State Behavior of Distributed Power Supply in DC Architecture with Minimized DC Bus Capacitor**
Pakawadee Wutthiwai¹, Uthen Kamnarn¹, Jedsada Yodwong², Anon Namin¹, Phatiphat Thounthong³,
Noureddine Takorabet⁴
1) Rajamangala University of Technology Lanna, Thailand, 2) mu Space and Advanced Technology Company Limited, Thailand, 3) King Mongkut's University of Technology North Bangkok, Thailand, 4) Université de Lorraine, France
- 18G3-4 ADALINE Current Control for Single-Phase Active Power Filter**
Sarawut Janpong¹, Nanthi Suthikarnnarunai², Somboon Sooksatra¹, Keratiya Janpong³
1) Rangsit University, Thailand, 2) University of the Thai Chamber of Commerce, Thailand, 3) Maejo University, Thailand

Session 18H3 Battery related technologies for Automobile

Chairs: Hiroaki Matumori (*Nagoya Institute of Technology*)

Nobuyuki Imai (*Honda R&D Co., Ltd., Japan*)

- 18H3-1 Research on High-Power Rapid Charge Approach for EV Based on Clustered Multi-node Learning Gaussian Process**
Liguo Wang¹, Zhenteng Tian¹, Yuanting Hu², Chunlai Yu², Zongjie Wang³, Feng Gao⁴
1) Harbin Institute of Technology, China, 2) State Grid Heilongjiang Electric Power Co., Ltd, China, 3) University of Connecticut, USA, 4) North Minzu University, China
- 18H3-2 Remaining Useful Life Prediction Considering Operating Condition Change Based on Regression and Empirical Mode Decomposition**
Hyeon Ho Lee, Dong Hwan Kim, Tae-Won Noh, Byoung Kuk Lee
Sungkyunkwan University, Korea
- 18H3-3 Study on Power Source Properties Suitable for Volume Minimization in Electric Vehicle Hybrid Power-Source System**
Shunya Sakamoto¹, Atsushi Okada¹, Kensuke Sasaki¹, Takashi Kato¹, Keiichiro Kondo², Ryo Kimura²
1) Nissan Motor Co., Ltd, Japan, 2) Waseda University, Japan
- 18H3-4 An RLS Based Battery Modeling Method to Compensate for Recovery Effect in Battery Balancing**
Yiqing Lu, Haoyu Wang, Hengzhao Yang, Shaojie Chen, Wei Liu
ShanghaiTech University, China

Room A

Session 19A1 Modeling and Simulation Techniques for Power Electronics (OS)

Chairs: Koichi Shigematsu (*Nagoya University, Japan*)
Jongwon Shin (*Chung-Ang University, Korea*)

19A1-1 Practical Modeling and Simulation Techniques for Power Electronics

Invited Paper Hiroki Ishikawa
Gifu University, Japan

19A1-2 Simulating Wide Bandgap FET Models in LTspice

Invited Paper Jong-Won Shin, Joonho Shin
Chung-Ang University, Korea

19A1-3 Difficulty and solution in transient thermal resistance measurement for wide band gap power semiconductor device

Invited Paper Tsuyoshi Funaki¹, Shuhei Fukunaga¹, Tomoaki Hara², Takaaki Ibuchi¹
1) Osaka University, Japan, 2) Siemens AG, Japan

19A1-4 An Investigation and Proposal for Accurate Leakage Inductance Modeling Based on Dowell Model

Invited Paper Yu-Hsin Wu¹, Koichi Shigematsu¹, Yasumichi Omoto², Jun Imaoka¹, Masayoshi Yamamoto¹
1) Nagoya University, Japan, 2) NIDEC MOBILITY CORPORATION, Japan

19A1-5 Numerical Methods for the Periodic AC Analysis of DC Power Converters

Invited Paper Noel Delgado¹, Alan Courta², Datsen Davies Tharakan³
1) Raytheon Missiles & Defense, USA, 2) Synopsys, USA, 3) Synopsys, India

Room B

Session 19B1 Technical Trend of Next-generation Application Specific Electric Motors (OS)

Chairs: Yoshinari Asano (*Daikin Industries Ltd., Japan*)
Yuting Gao (*Nagoya Institute of Technology, Japan*)

19B1-1 Technical Trend of Next-generation Application Specific Electric Motors

Invited Paper Osamu Shimizu¹, Yosuke Kawazoe², Sho Uchiyama³, Yoshihiro Miyama⁴, Hideo Dohmeki⁵, Takashi Nakagami⁶, Tsuyoshi Miyaji⁷, Kyohei Kiyota⁸
1) The University of Tokyo, Japan, 2) Yasukawa Electric Corporation, Japan, 3) Meidensha Corporation, Japan, 4) Mitsubishi Electric Corporation, Japan, 5) Tokyo City University, Japan, 6) Mitsubishi Heavy Industry, Japan, 7) Aisin Corporation, Japan, 8) Tokyo Institute of Technology, Japan

19B1-2 Latest Technical Trend of Miniaturization, Weight Reduction, and High Efficiency of Electric Motors by Increasing the Rotational Speed

Invited Paper Akio Toba¹, Masanori Arata², Masayuki Sanada³, Yoshiaki Kano⁴, Tatsuya Tonari⁵
1) Fuji Electric Co., Ltd., Japan, 2) Chu-o University, Japan, 3) Osaka Prefecture University, Japan, 4) Daido University, Japan, 5) Daikin Industries, Ltd., Japan

19B1-3 Latest Technical Trend of Miniaturization, Weight Reduction and High Efficiency of Electric Motors by Applying New Topology

Invited Paper Takashi Kosaka¹, Yoshihiro Miyama², Hajime Ukaji³, Kensuke Sasaki⁴, Yuji Yamamoto⁵, Yuichi Yokoi⁶
1) Nagoya Institute of Technology, Japan, 2) Mitsubishi Electric Corporation, Japan, 3) Panasonic Corporation, Japan, 4) Nissan Motor Co., Ltd., Japan, 5) Toshiba Industrial Products and Systems Corporation, Japan, 6) Nagasaki University, Japan

19B1-4 Latest Technical Trend for Miniaturization, Weight Reduction, and High Efficiency by Applying New Materials

Invited Paper Shoji Shimomura¹, Yuji Enomoto², Masayuki Morimoto³, Yasuhiro Marukawa⁴, Kiyoshi Wajima⁵, Takao Yabumi⁶, Tomoyuki Okubo⁷, Tatsuya Saito⁸
1) Shibaura Institute of Technology, Japan, 2) Hitachi, Ltd., Japan, 3) Tokai University, Japan, 4) Hitachi Metals, Ltd, Japan, 5) Nippon Steel Corporation, Japan, 6) Daido Steel, Japan, 7) JFT Steel Corporation, Japan, 8) Sumitomo Electric Industries, Ltd, Japan

Room C

Session 19C1 Applications of Solid-State Device for Power System

Chairs: Takanori Isoke (*University of Tsukuba, Japan*)

Krishna Raj Potti (*Indian Institute of Technology Delhi, India*)

- 19C1-1 Resistive Superconducting Fault Current Limiter - Integrated Bidirectional Hybrid DC Circuit Breaker for HVDC Systems**
Siddavatam Ravi Prakash Reddy, Kaushik Rajashekara, Harish Sarma Krishnamoorthy
University of Houston, USA
- 19C1-2 Generalized Circuit Topology and Classification of Multiline Hybrid HVDC Circuit Breakers**
Yushi Koyama¹, Shinnosuke Hamajima¹, Takahiro Ishiguro²
1) *Toshiba Infrastructure Systems & Solutions Corporation, Japan*, 2) *Toshiba Energy Systems & Solutions Corporation, Japan*
- 19C1-3 DQ Impedance Modeling and Stability Analysis of SVG with Constant Reactive Power Control**
Yiming Tu, Tong Wu, Zeng Liu, Jinjun Liu
Xi'an Jiaotong University, China
- 19C1-4 Consideration of STATCOM for Power Transmission with Dual-Redundant Controllers**
Kohei Kobori, Takashi Sugiyama, Ryota Okuyama
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
- 19C1-5 Comparative Evaluation of MVAC-LVDC SST and Hybrid Transformer Concepts for Future Datacenters**
Jonas Huber¹, Peter Wallmeier², Ralf Pieper², Frank Schafmeister³, Johann W. Kolar¹
1) *ETH Zurich, Switzerland*, 2) *Delta Energy Systems GmbH, Germany*, 3) *University of Paderborn, Germany*

Room D

Session 19D1 Multi-level Converters II

Chairs: Junnosuke Haruna (*Utsunomiya University, Japan*)

Jianwen Zhang (*Shanghai Jiao Tong University, China*)

- 19D1-1 Modulation and Analysis of Current-Fed High Gain Multilevel DC-DC Converter in BESS Charging Mode**
Vinay Rathore, Siddavatam Ravi Prakash Reddy, Kaushik Rajashekara
1) *University of Houston, USA*
- 19D1-2 An Improved Valve-Side Fault-Riding-Through Control Strategy For Hybrid MMC**
Jiawei Zhang, Li Peng, Yuntao Xiao, Zhen Wang
Huazhong University of Science and Technology, China
- 19D1-3 A DC Fault Ride-Through Control of Half-Bridge MMCs for the HVDC Grid with DC Circuit Breakers**
Atsushi Chiba¹, Kenichiro Sano¹, Yushi Koyama², Kei Sekiguchi², Takahiro Ishiguro³, Daichi Suzuki³
1) *Tokyo Institute of Technology, Japan*, 2) *Toshiba Infrastructure Systems & Solutions Corporation, Japan*, 3) *Toshiba Energy Systems & Solutions Corporation, Japan*
- 19D1-4 Commissioning test and Operation results of New Hokkaido-Honshu HVDC Link**
Daichi Suzuki¹, Noriko Kawakami², Masanori Mori³, Takanori Uchiumi³
1) *Toshiba Energy Systems & Solutions Corporation, Japan*, 2) *Toshiba Mitsubishi-Electric Industrial Systems Corporation, Tokyo, Japan*, 3) *Hokkaido Electric Power Network inc., Hokkaido, Japan*

Room E

Session 19E1 Wireless Power Transfer III

Chairs: Katsuhiro Hata (*The University of Tokyo, Japan*)

Ming Liu (*Shanghai Jiao Tong University, China*)

- 19E1-1 A Consideration on Efficiency Maximization for Inductive Power Transfer System with Dual Converters**
Ryohei Okada, Ryosuke Ota, Nobukazu Hoshi
Tokyo University of Science, Japan
- 19E1-2 An IPT topology with High Misalignment Tolerance and Input Impedance Angle control**
Yijie Wang, Xilai Sun, Jianwei Mai, Liang Cai, Dianguo Xu
Harbin Institute of Technology, China

- 19E1-3 Activation Function Model for Wireless Power Transfer System With an LCC-S Compensated Network**
Shuangqing Lv, Wenjie Chen, Xiufang Hu
Xi'an Jiaotong University, China
- 19E1-4 One Pulse Control of Novel Variable Active Capacitor System for Wireless Power Transfer**
Shin-ichi Hamasaki, Keisuke Takashima, Shogo Yamashita, Tetsuji Daido
Nagasaki University, Japan

Room F

Session 19F1 Gate Drive Technology

Chairs: Daiki Yamaguchi (*National Institute of Advanced Industrial Science and Technology, Japan*)
Ravi Nath Tripathi (*Kyoto University of Advanced Science, Japan*)

- 19F1-1 Gate Drive Method Using Wireless Multiplex Transmission of Power and Signal**
Kyungmin Sung, Yosuke Ouchi, Sogo Amagai, Kaito Sagara, Yuma Kawasaki, Hiyang Sung
National Institute of Technology, Japan
- 19F1-2 An Investigation of a Power Module for Multiple Series-Connected Si-MOSFETs Realizing Voltage Balance by a Fully Digital Active Gate Control**
Hidemine Obara¹, Seiya Abe², Keiji Wada³
1) *Yokohama National University, Japan*, 2) *Kyushu Institute of Technology, Japan*, 3) *Tokyo Metropolitan University, Japan*
- 19F1-3 A Study on Digital Active Gate Driving of DC-DC Converter for Suppressing Switching Surge Voltage**
Shuhei Fukunaga¹, Hajime Takayama², Takashi Hikihara²
1) *Osaka University, Japan*, 2) *Kyoto University, Japan*
- 19F1-4 High Bandwidth Active Gate Driver for Simultaneous Reduction of Switching Surge and Switching Loss of SiC-MOSFET**
Yuichi Noge, Masahito Shoyama
Kyushu University, Japan

Room H

Session 19H1 Control method for Automobile

Chairs: Shigeyuki Takagi (*Tokyo University of Technology, Japan*)
Nobuhisa Yamaguchi (*DENSO CORPORATION, Japan*)

- 19H1-1 Design and Control of the Adjustable Turn-ratio LLC Converter for High-Efficiency Operation of Wired/Wireless Integrated EV Charging System**
Hyeon-Woo Jo, Dong Hyeon Sim, Ju-A Lee, Won-Jin Son, Byoung Kuk Lee
Sungkyunkwan University, Korea
- 19H1-2 MPPT operation performance of automotive photovoltaic system during driving**
Yosuke Tomita¹, Masanori Saito¹, Yoshiyuki Nagai¹, Tsutomu Tanimoto¹, Takumi Arai¹, Kimihiro Nishijima²
1) *Nissan Motor Co., Ltd. Japan*, 2) *Sojo University, Japan*
- 19H1-3 A Novel Charging Control for D-EPC with DC Power Sources Connected in Series**
Hiromu Akiyama, Hiroki Matsuno, Kantaro Yoshimoto, Tomoki Yokoyama
Tokyo Denki University, Japan
- 19H1-4 Decentralized Control Using Wireless Signal Communication for Multi-Port EV Charger with Multiple Cells**
Keita Ohata, Hiroki Watanabe, Jun-ichi Itoh, Keisuke Kusaka
Nagaoka University of Technology, Japan

Room A

Session 19A2 Power Electronics for Future Aircraft (OS)

Chairs: Koji Yamaguchi (*IHI Corporation, Japan*)

Tseng King Jet (*Singapore Institute of Technology, Singapore*)

19A2-1 High-Density Motor Drive Development for Electric Aircraft Propulsion: Cryogenic and non-Cryo Solutions

Invited Paper Fang Luo, Mustafeez-ul-Hassan, Zhao Yuan, Kushan Choksi
Stony Brook University, USA

19A2-2 Electromagnetic Design of Dual Winding Permanent Magnet Synchronous Motor for Electromechanical Actuators of Flight Control Systems

Invited Paper Yutaka Terao¹, Hiroshi Hirayama², Hirotaka Sugawara³, Hitoshi Oyori³
1) *The University of Tokyo, Japan*, 2) *Akita University, Japan*, 3) *IHI Corporation, Japan*

19A2-3 Construction of an Electric Aircraft System Model with Power Device Losses

Invited Paper Takamitsu Yamahigashi, Kensuke Shibuya, Koichi Shigematsu, Jun Imaoka, Masayoshi Yamamoto
Nagoya University, Japan

19A2-4 Wireless Charging Technologies and Standardization for Electric Unmanned Crafts

Invited Paper S. Cao¹, A. Nawawi², Z. Lim², J. Ang², X. Hu², C.F. Tong², K.J. Tseng¹
1) *Singapore Institute of Technology, Singapore*, 2) *Xnergy Autonomous Power Technologies Pte. Ltd., Singapore*

Room B

Session 19B2 Design and Control of Flux Modulation Permanent Magnet Machines (OS)

Chairs: Dawei Li (*Huazhong University of Science and Technology, China*)

Yuting Gao (*Nagoya Institute of Technology, Japan*)

19B2-1 Analysis of Double Flux Modulation Flux Reversal Machines with Different Consequent-Pole PM Topologies

Invited Paper Yuting Zheng, Lijian Wu, Youtong Fang
Zhejiang University of Science and Technology, China

19B2-2 Pole-Slot Combination Design and Investigation of Spoke-Type In-Wheel Motor Considering Flux Modulation

Invited Paper Zirun Lu, Zixuan Xiang, Xiaoyong Zhu, Min Jiang
Jiangsu University, China

19B2-3 A General Design Approach of Surface-Mounted Permanent Magnet Vernier Machine

Invited Paper Yu Zhao, Dawei Li, Xiang Ren, Ronghai Qu
Huazhong University of Science and Technology, China

19B2-4 Investigation of Variable Field Harmonic Principle in Hybrid-Excited Switched-Flux Machine

Invited Paper Hui Yang¹, Yanding Bi^{2,1}, Cheng Qian¹, Dawei Li³, Heyun Lin¹, Z. Q. Zhu⁴, Shuangxia Niu²
1) *Southeast University, China*, 2) *The Hong Kong Polytechnic University, China*, 3) *Huazhong University of Science and Technology, China*, 4) *The University of Sheffield, UK*

Room C

Session 19C2 Multi-level converters III

Chairs: Hiroyuki Asahara (*Okayama University of Science, Japan*)

Kyo-Beum Lee (*Ajou University, Korea*)

19C2-1 An Isolated Modular Multi-level DC Transformer with Embedded Multi-port Current Flow Controller for Meshed DC Distribution Grids

Yuwen Liu¹, Xinming Fan², Jianqiao Zhou¹, Gang Shi¹, Jiacheng Wang³, Jiajie Zang³, Xu Cai¹, Jianwen Zhang¹
1) *Shanghai Jiao Tong University, China*, 2) *Foshan Power Supply Bureau of Guangdong Power Grid Co., Ltd., China*, 3) *Simon Fraser University, Canada*

- 19C2-2 A Novel Multiport Modular Multilevel Converter for AC-DC Hybrid Distribution Power System**
Yong Sun¹, Yongshan Xiao², Xinming Fan³, Jianwen Zhang¹, Jianqiao Zhou¹, Gang Shi¹, Xu Cai¹
1) Shanghai Jiaotong University, China, 2) Ocean University of China, China, 3) Guangdong Power Grid Co.,Ltd., China
- 19C2-3 Operation of Single-Delta Bridge-Cell Converter With Single-Phase Medium-Frequency Transformer Under Low Magnetizing Inductance**
Kento Okumura, Makoto Hagiwara
Tokyo Institute of Technology, Japan
- 19C2-4 Cost-effective Valve Test Circuit for MMC Based HVDC Power Station**
Chi-Hwan Bae¹, Hak-Soo Kim¹, Kwang-Rae Jo², Eui-Cheol Nho¹
1) Pukyong National University, Korea, 2) Technology & Research Institute, Korea

Room D

Session 19D2 PFC Converters

Chairs: Kenichi Nagayoshi (*Toyota Industries Corporation, Japan*)
Ryosuke Ota (*Tokyo University of Science, Japan*)

- 19D2-1 Individual-Phase Displacement Power Factor Control Strategy of an Active Power-Line Conditioner in Three-Phase Four-Wire Distribution Feeders**
Yuka Sabi¹, Yuya Kihara¹, Hiroaki Yamada¹, Toshihiko Tanaka¹, Fuka Ikeda², Masayuki Okamoto², Seong Ryong Lee³
1) Yamaguchi University, Japan, 2) National Institute of Technology, Japan, 3) Kunsan National University, Korea
- 19D2-2 Improvement of Characteristics in CRM-PFC Using a Control Method based on Switching Frequency Limitation**
Ryunosuke Araumi¹, Ryuji Yamada¹, Keiji Wada²
1) Fuji Electric Co., Ltd., Japan, 2) Tokyo Metropolitan University, Japan
- 19D2-3 Aggregated Modeling for Paralleled PFC Converters in Three-Phase Data Center Power Systems**
Tianhua Zhu¹, Xiongfei Wang¹, Fangzhou Zhao¹, Guoqing Gao¹, Grover Torricco²
1) Aalborg University, Aalborg, Denmark, 2) Huawei technologies Sweden AB, Sweden

Room E

Session 19E2 Softswitching Converters

Chairs: Tomokazu Mishima (*Kobe University, Japan*)
Feng Wang (*Xi'an Jiaotong University, China*)

- 19E2-1 An Accurate Backflow Power Calculation Method for the CLLC Resonant Converter Based on FHA and Time-Domain model**
Yichen Wang, Feng Wang, Fang Zhuo, Xiaoqing Yin, Jiachen Tian, Haoyu Wang
Xi'an Jiaotong University, China
- 19E2-2 Light Load Efficiency Boost Technique for Switched Tank Converters Based on Hybrid ZVS-ZCS Control**
Jiawei Liang, Haoyu Wang
ShanghaiTech University, China
- 19E2-3 Derivation of Resonant Period for Soft Switching by Linearizing Output Capacitance of Switching Device**
Sihoon Choi, Ayato Suzuki, Jun Imaoka, Masayoshi Yamamoto
Nagoya University, Japan
- 19E2-4 Single-Phase PWM Control of qZSIs for Switching-Loss and Capacitor Reduction Utilizing Accurate DC-Side Current Reference**
Tomoyuki Mannen
University of Tsukuba, Japan

Session 19F2 DC-AC Converters

Chairs: Kansuke Fujii (*Fuji Electric Co., Ltd., Japan*)
Cheng Huang (*University of Tsukuba, Japan*)

- 19F2-1 Experimental Verification of Interleaved Grid-Tied Inverter Using Discontinuous Current Mode with Magnetically Coupled Inductor**
Shuntaro Uesugi, Cheng Huang, Tomoyuki Mannen, Takanori Isobe
University of Tsukuba, Japan
- 19F2-2 Current Ripple Reduction with Enhanced ZVS Operation Based on Off-time Discrete Control for DCM Inverters to Achieve High Efficiency**
Cheng Huang, Tomoyuki Mannen, Takanori Isobe
University of Tsukuba, Japan
- 19F2-3 A More Accurate ZVS Criterion for Resonant Converters**
Chanh-Tin Truong, Sung-Jin Choi
University of Ulsan, Korea
- 19F2-4 Characterization and Switching Strategy Development for SMP SiC Power Modules**
Yu Shiogai¹, Alberto Castellazzi², Takashi Hikihara¹
1) *Kyoto University, Japan*, 2) *Kyoto University of Advanced Science, Japan*

Room G

Session 19G2 Motor Drive System and Control I

Chairs: Yukinori Inoue (*Osaka Metropolitan University, Japan*)
Shizunori Hamada (*Meidensha Corporation, Japan*)

- 19G2-1 High-Speed and Low-Latency Transmission by Millimeter-Wave Digital Wireless System for Si-IGBT/SiC-MOSFET Driver Control**
Yukako Tsutsumi¹, Koji Akita¹, Hiroyuki Kitagawa¹, Kentaro Suzuki², Ryosuke Saito², Yoshihiro Tawada³
1) *Toshiba Corporation, Japan*, 2) *Toshiba Infrastructure Systems & Solutions Corporation, Japan*, 3) *Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan*
- 19G2-2 Motor Current Reconstruction Method Using Single Shunt Resistance by High-Frequency Voltage Injection**
Takuji Mitsui, Yoshitaka Iwaji
Ibaraki University, Japan
- 19G2-3 Hexagonal Voltage Modification Scheme to Improve Torque Capability of Low-Cost Drives**
Hyung-June Cho¹, Yong-Cheol Kwon², Seung-Ki Sul¹
1) *Seoul National University, Korea*, 2) *PLECKO Co., Ltd., Korea*
- 19G2-4 Design of Predictive Controllers and Input Filters for Matrix Converter PMSM Drive Systems**
Tian-Hua Liu, Jia-Han Li
National Taiwan University of Science and Technology, Taiwan

Room H

Session 19H2 Converter topologies for Automobiles

Chairs: Sakahisa Nagai (*The University of Tokyo, Japan*)
Nobuhisa Yamaguchi (*DENSO CORPORATION, Japan*)

- 19H2-1 Static and Dynamic Cryogenic Characterizations of Commercial High Performance GaN HEMTs for More Electric Aircraft**
Yuqi Wei, Md Maksudul Hossain, H. Alan Mantooth
University of Arkansas, USA
- 19H2-2 A New Family of Non-Isolated Single-Inductor Three-Port Converter Based on A Storage Port Switch-Commutated Unit**
Chengdong Yin, Hong Li, Yamin Li, Wenzhe Su, Trillion Q. Zheng
Beijing Jiaotong University, China

19H2-3 Analysis and Theoretical Comparison of 1-to-1.5 Resonant Switched Capacitor Converters for High-Voltage EV Batteries

Masatoshi Uno, Toko Sanada, Yuto Fujii
Ibaraki University, Japan

19H2-4 Analysis and Conceptualization of a 800V 100 kVA Full-GaN Three-Level Flying Capacitor Inverter for Next-Generation Electric Vehicle Drives

Davide Cittanti, Enrico Vico, Eric Armando, Radu Bojoi
Politecnico di Torino, Italy

Thursday, May 19: 14:05-15:45

Room A

Session 19A3 Power Electronics for Renewable Energy Interconnected Grid (OS)

Chairs: Naomitsu Urasaki (*University of the Ryukyus, Japan*)

Sjur Føyen (*Norwegian University of Science and Technology, Norway*)

19A3-1 Analysis of Power Electronics-Dominated Hybrid AC/DC Grid for Data-Driven Oscillation Diagnosis

Invited Paper Haoxiang Zong¹, Chen Zhang¹, Xu Cai¹, Marta Molinas²
1) *Shanghai Jiao Tong University, China*, 2) *Norwegian University of Science and Technology, Norway*

19A3-2 Modeling and Calculation of Grid Frequency Support Effect and Transient Energy Demand of a Virtual Synchronous Generator

Invited Paper Jia Liu, Jinjun Liu
Xi'an Jiaotong University, China

19A3-3 A High Side Voltage Fluctuation Suppression Control of Bidirectional Chopper to Reduce Capacitance of DC Bus

Invited Paper Hiroaki Kakigano
Ritsumeikan University, Japan

19A3-4 Application of Reinforcement Learning Algorithm to Parameter Identification for MPPT Control of PMSG Wind Energy Conversion Systems

Invited Paper Ryo Miyara¹, Jargalsaikhan Nyam¹, Takeyoshi Kato², Natarajan Prabakaran³, Hitoshi Takahashi⁴, Tomonobu Senjyu¹
1) *University of the Ryukyus, Japan*, 2) *Nagoya University, Japan*, 3) *SASTRA Deemed University, India*, 4) *Fuji Electric Co., Ltd., Japan*

Room B

Session 19B3 Energy Storage Systems

Chairs: Yushi Miura (*Nagaoka University of Technology, Japan*)

Giuseppe Guidi (*Sintef Energy Research, Norway*)

19B3-1 Autonomous Control for Cooperative Operation between Energy Storage Systems

Tomohiro Yamaguchi, Takayuki Matsumoto
GS Yuasa Infrastructure Systems Co., Ltd., Japan

19B3-2 Design of Integral Droop Control for Hybrid Energy Storage System Considering Ramp Rate Characteristic

Seung-Hyun Choi¹, Jae-Sang Kim¹, Jeong-Eon Park^{1,2}, Donghyeon Yu¹, Gun-Woo Moon¹
1) *Korea Advanced Institute of Science and Technology (KAIST), Korea*, 2) *Korea Aerospace Research Institute (KARI), Korea*

19B3-3 New Circuit Structure Applying MMC and Its Control for Quick Charger System

Shin-ichi Hamasaki, Konosuke Takahashi, Yuga Fujita, Tetsuji Daido
Nagasaki University, Japan

19B3-4 Efficiency Characteristic of a High-Power Reconfigurable Battery with Series-Connected Topology

Jan Engelhardt, Jan Martin Zepter, Tatiana Gabderakhmanova, Mattia Marinelli
Technical University of Denmark, Denmark

Room C

Session 19C3 Multi-level Converters IV

Chairs: Kazuto Takagi (*GS Yuasa Infrastructure Systems Co., Ltd., Japan*)

Jianqiao Zhou (*Shanghai Jiao Tong University, China*)

- 19C3-1 Design Considerations for the Intermediate Circuit of a Multimegawatt Medium-Voltage Neutral-Point-Clamped Inverter**
Aleksi Mattsson¹, Juhamatti Korhonen¹, Pasi Nuutinen¹, Pasi Peltoniemi¹, Olli Pyrhönen¹, Pertti Silventoinen¹, Riku Pöllänen²
1) *LUT University, Finland*, 2) *The Switch Drive Systems Oy, Finland*
- 19C3-2 A Fast Neutral-Point Potential Balance Modulation Method for T-type Three-Level Inverter**
Sizheng Wang, Hui Wang
Central South University, China
- 19C3-3 Simplified Finite Set Model Predictive Control for T-type Three-Level Battery Energy Storage Power Conversion System**
Huaiyu Fan, Ning Gao, Weimin Wu
Shanghai Maritime University, China
- 19C3-4 Passivity-Based Design for High-Order Harmonic Voltage Emulation of Grid Emulators**
Zejie Li, Fangzhou Zhao, Xiongfei Wang
Aalborg University, Denmark

Room D

Session 19D3 Control and Analysis of Converters III

Chairs: Hiroki Ishikawa (*Gifu University, Japan*)

Younghoon Cho (*Konkuk University, Korea*)

- 19D3-1 Current Balancing of Interleaved Boost PFC Converter with Auxiliary Winding Coupled Inductor**
Dongkwan Yoon, Sungmin Lee, Jaehyeon Bang, Younghoon Cho
Konkuk University, Korea
- 19D3-2 Online Optimization of Zero-Sequence Voltage Injection of PWM Strategy for 3L-NPC converters**
Mateja Novak, Ariya Sangwongwanich, Frede Blaabjerg
Aalborg University, Denmark
- 19D3-3 Submodule Capacitor Sizing for Cascaded H-Bridge STATCOM with Sum of Squares Formulation**
Hengyi Wang¹, Fei Wang¹, Fei Gao², Jianqiang Cheng³
1) *University of Shanghai, China*, 2) *Ministry of Education, China*, 3) *The University of Arizona, USA*
- 19D3-4 Voltage Balancing Control for Y-Connected Modular Converter in MV Drive Application**
DongUk Kim¹, Sungmin Kim¹
Hanyang University, Korea

Room E

Session 19E3 Simulation of Power Electronics Systems

Chairs: Kazuhiro Umetani (*Okayama University, Japan*)

Jinjun Liu (*Xi'an Jiaotong University, China*)

- 19E3-1 Frequency-dependent Equivalent Circuit Parameter Calculation of Gapped Multiwinding Inductors**
Thomas Ewald, Richard Schlesinger, Jan P. Agner, Jürgen Biela
ETH Zurich, Switzerland
- 19E3-2 Model Extraction for Power Electronics Systems Using Vector Fitting Based on Sampling Optimized Method**
Zipeng Liu, Jinjun Liu, Zeng Liu
Xi'an Jiaotong University, China
- 19E3-3 Unification of SISO Open-loop Gain Based Stability Analysis Methods for Three-phase Cascaded System**
Tong Wu¹, Jinjun Liu¹, Yiming Tu¹, Zeng Liu¹, Teng Liu²
1) *Xi'an Jiaotong University, China*, 2) *Aalborg University, Denmark*

19E3-4 Multi-objective Optimization for Dual Active Bridge Converter Based on Genetic Algorithm

Lingfeng Jiang, Linxiao Gong, Xinyu Jin, Zhichong Shao, Wang Yong
Shanghai Jiao Tong University, China

Room F

Session 19F3 Control and Analysis of DC-DC Converters

Chairs: Kazunori Hasegawa (*Kyushu Institute of Technology, Japan*)

Jaydeep Saha (*National University of Singapore, Singapore*)

19F3-1 Effect of Parasitic Components on Dynamic Response in Buck Converters

Hanhim Sung, Donghan Seo, Dongwook Kim, Jong-Won Shin
Chung-Ang University, Korea

19F3-2 Transient Performance Improvement of Digital Average Current Controlled Multiphase Interleaved Buck Converter

Guihua Mao¹, Guohua Zhou¹, Klaus Moth², Yashank Bansal³, Yuan Gao³, Stig Munk-Nielsen³
1) *Southwest Jiaotong University, China*, 2) *LivingPower company, Denmark*, 3) *Aalborg University, Denmark*

19F3-3 Burst Control Incorporated in Switching Period for Bidirectional Series Resonant Converter Achieving Small Voltage Ripple and Fully Soft Switching

Zhijian Fang^{1,2,3}, Yuangeng Xia^{1,2,3}, Fei Xie^{1,2,3}, Hanlin Dong^{1,2,3}, Zhiguo Wei^{1,2,3}
1) *China University of Geosciences, China*, 2) *Hubei Key Laboratory of Advanced Control and Intelligent Automation for Complex Systems, China*, 3) *Ministry of Education, China*

19F3-4 Comparative Overview of Power Balance Control for Two-stage and Single-stage Isolated MVAC-LVDC Cascaded Converters

Jaydeep Saha¹, Naga Brahmendra Yadav Gorla², Sanjib Kumar Panda²
1) *National University of Singapore, Singapore*, 2) *Nanyang Technological University, Singapore*

Room G

Session 19G3 Motor Drive System and Control II

Chairs: Masahiro Aoyama (*Shizuoka University, Japan*)

Yuichi Yokoi (*Nagasaki University, Japan*)

19G3-1 Decoupling Control Method in an M- and T-axis Current Vector Control System of a Permanent Magnet Synchronous Motor

Daiki Sekiguchi¹, Yukinori Inoue², Shigeo Morimoto², Masayuki Sanada²
1) *Osaka Prefecture University, Japan*, 2) *Osaka Metropolitan University, Japan*

19G3-2 Online Deadbeat Predictive Direct Torque and Active Flux Control for IPMSM Drive

S M Showybul Islam Shakib, Dan Xiao, Rukmi Dutta, Muhammed Fazlur Rahman
University of New South Wales, Australia

19G3-3 Voltage Compensation Performance of the Voltage Unbalance Compensator Using the Method of Symmetrical Components

Tomoya Katsuki, Iori Yamakawa, Akihiro Imakiire, Satoshi Matsumoto
Kyushu Institute of Technology, Japan

19G3-4 Voltage-Integral-based Reference Tracking Modulation Method for High-Efficiency Motor Drive

Yuto Kobayashi¹, Kiyoshi Ohishi¹, Yuki Yokokura¹, Tenjiro Hiwatari², Akira Satake²
1) *Nagaoka University of Technology, Japan*, 2) *Mitsubishi Electric Corporation, Japan*

Room H

Session 19H3 Detection, estimation, and diagnosis in rotating machines

Chairs: Kenji Nakamura (*Tohoku University, Japan*)

Lew Andrew R. Tria (*University of the Philippines Diliman, Philippines*)

19H3-1 Torque Estimation of a Variable Speed Induction Motor without Torque and Rotational Speed Meters

Shu Yamamoto¹, Hideaki Hirahara¹, Masayuki Motosugi^{1,2}
1) *Polytechnic University, Tokyo, Japan*, 2) *Polytechnic Center Kochi, Japan*

- 19H3-2 Real-time Dynamic Eccentricity Detection by Analyzing Harmonic Components of No-load Line-line Voltages on Multi-three-phase PMSMs**
Kodai Okazaki¹, Kan Yang², Kan Akatsu²
1) Mitsubishi Electric Corporation, Japan, 2) Yokohama National University, Japan
- 19H3-3 TFFC-RNN:A New RNN Based Approach for Bearing and Misalignment Compound Fault**
Ziran Guo, Ming Yang
Harbin Institute of Technology, China
- 19H3-4 Light-Weight and Compact Magnetic Rotation Angle Sensor with Partial Arc Stator Using Three Hall-Effect Sensors**
Tatsuo Nishimura, Koji Nishizawa, Yoshihiro Miyama, Hideaki Arita
Mitsubishi Electric Corporation, Japan

Thursday, May 19: 16:05-18:10

Room A

Session 19A4 Electromagnetic Compatibility (OS)

Chairs: Hideki Ayano (*National Institute of Technology, Japan*)
Wilmar Martinez (*KU Leuven, Belgium*)

- 19A4-1 EMC implications of implementing WBG devices in battery charger modules for electric vehicles**
Invited Paper Wilmar Martinez, WeiRen Lin, Camilo Suarez
KU Leuven-EnergyVille, Belgium
- 19A4-2 Impedance Analysis of Single-Phase PFC Converter in the Frequency Range of 0-150 kHz**
Invited Paper Pooya Davari, Frede Blaabjerg
Aalborg University, Denmark
- 19A4-3 Reduction of Input- and Output-Side Common-Mode Currents Based on a Coupled Common-Mode Inductor in DC-Fed Three-Phase Motor Drive Systems**
Invited Paper Shotaro Takahashi, Sari Maekawa
Seikei University, Japan
- 19A4-4 EMI model of Air-conditioning Outdoor Machines**
Invited Paper Fan Peng, Changsheng Hu, Dehong Xu, Hui Wang, Wenxing Zhong
Zhejiang University, China
- 19A4-5 Prediction of Disturbance Current from Railway Traction Inverters at Train's Maximum Design Speed**
Invited Paper Satoru Hatukade
Railway Technical Research Institute, Japan

Room B

Session 19B4 Reliability and Diagnostics of Power Converters II

Chairs: Ryota Kondo (*Mitsubishi Electric Corporation, Japan*)
Spasoje Miric (*ETH Zurich, Switzerland*)

- 19B4-1 Reliability Modeling and Assessment of De-rated Redundant Power Converters**
Saeed Peyghami¹, Mostafa Abarzadeh², Frede Blaabjerg¹
1) Aalborg University, Denmark, 2) SmartD Technologies Inc., Canada
- 19B4-2 A Stress Emulation Method for Concurrent Testing of AC and DC Capacitors**
Bo Yao, Xing Wei, Haoran Wang, Huai Wang
Aalborg University, Denmark
- 19B4-3 Condition Monitoring of a DC-Link Capacitor Used in a PWM Inverter With a Six-Pulse Diode Rectifier Without Current Sensors**
Kazunori Hasegawa, Tsukasa Kubo, Yuto Hirose
Kyushu Institute of Technology, Japan

19B4-4 Local Heat Generation Analysis Method of Ferrite Cores for Wireless Power Transfer Coil Considering Compressive Stress

Norihito Kimura¹, Hiroaki Yuasa²

1) SOKEN, INC., Japan, 2) TOYOTA MOTOR CORPORATION, Japan

Room C

Session 19C4 Advanced magnetics

Chairs: Tsuyoshi Funaki (*Osaka University, Japan*)

Alberto Castellazzi (*Kyoto University of Advanced Science, Japan*)

19C4-1 Basic Characteristics of Thin-Film Single-Layer Coreless Micro-Transformers for Digital Isolators

Motochika Inohara, Satoshi Sugahara

Fukuyama University, Japan

19C4-2 An Adaptive Active Inductor for the AC Filter of Grid-connected Drive

Feng Liu¹, Guorong Zhu¹, Zhe Kong¹, Haoran Wang², Huai Wang³

1) Wuhan University of Technology, China, 2) Three Gorges Intelligent Industrial Control Technology Co.Ltd, China, 3) Aalborg University, Denmark

19C4-3 Iron Loss Properties of Amorphous Ring under High-Frequency SiC Inverter Excitation with Different Dead-times Using High Sampling Rate

Nguyen Gia Minh Thao¹, Keisuke Fujisaki¹, Duc-Kien Ngo², Kenya Naruse¹

1) Toyota Technological Institute, Japan, 2) The University of Danang–University of Technology and Education, Vietnam

19C4-4 An Integrated Matrix Magnetics for Isolated Single-stage DC/DC Converter

Fei Li, Laili Wang, Longyang Yu

Xi'an Jiaotong University, China

19C4-5 A Load Test Method Using Two Power Supplies for High-Frequency Transformers

Koji Orikawa, Shogo Nishikawa, Satoshi Ogasawara

Hokkaido University, Japan

Room D

Session 19D4 SiC Device Applications

Chairs: Takeshi Horiguchi (*Mitsubishi Electric Corporation, Japan*)

Yanbo Wang (*Aalborg University, Denmark*)

19D4-1 Verification and Application of an Analytical Switching Loss Model for a SiC MOSFET and Schottky Diode Half-Bridge

Anliang Hu, Jürgen Biela

ETH Zurich, Switzerland

19D4-2 Experimental Verification of a Gate-Drive Circuit Using Distributed Signal Processing for Fast-Switching Operation of SiC MOSFETs

Daiki Yamaguchi, Shinji Sato, Atsushi Yao, Hiroshi Sato

National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan

19D4-3 Real-time FPGA Simulation of Dual Active Bridge Converter with SiC MOSFET Device Model

Gard Lyng Rodal, Dimosthenis Pefitsis

Norwegian University of Science and Technology, Norway

19D4-4 Low Inductive Platform for Long- and Short-term Dynamic Characterization of SiC MOSFETs

Daniel A. Philipps, Tobias N. Ubostad, Dimosthenis Pefitsis

Norwegian University of Science and Technology, Norway

Session 19E4 DC-DC Converters IV

Chairs: Yoshiya Ohnuma (*Nagaoka Power Electronics co., Ltd., Japan*)

Qinglei Bu (*Xi'an Jiaotong-Liverpool University, China*)

- 19E4-1 99%, 15 W/cm³ capacitively coupled modular DCPET for low-voltage dc power supply system**
Keigo Arita, Yusuke Hayashi, Kazuto Takao
Toshiba Corporation, Japan
- 19E4-2 A Hybrid Step-up DC-DC Converter based on Ladder Switched-capacitor and High-frequency Transformer**
Qinqin Dong¹, Yu Fu¹, Shanwei Liu¹, Shouxiang Li¹, Guoju zhang²
1) *Beijing Institute of Technology, China*, 2) *Chinese Academy of Sciences, China*
- 19E4-3 A Family of High Step-up Isolated DC-DC Converters based on Fibonacci Switched-capacitor Cell**
Shanwei Liu¹, Qinqin Dong¹, Yu Fu¹, Shouxiang Li¹, Guoju Zhang²
1) *Beijing Institute of Technology, China*, 2) *Chinese Academy of Sciences, China*
- 19E4-4 Transient Bias Suppression Optimization for Bidirectional 2/3-Level DC-DC Converters**
Qinglei Bu^{1,2}, Huiqing Wen¹, Yinxiao Zhu^{1,2}, Haochen Shi³, Guanying Chu¹
1) *Xi'an Jiaotong-Liverpool University, China*, 2) *University of Liverpool, UK*, 3) *Huazhong University of Science and Technology, China*
- 19E4-5 Analysis and Improvement of Harmonic Content in Multi-level Three-phase DAB Converters with Different Transformer Windings Connections**
Babak Khanzadeh, Torbjörn Thiringer, Yuriy Serdyuk
Chalmers University of Technology, Sweden

Session 19F4 Multi-level Converters V

Chairs: Hiroaki Yamada (*Yamaguchi University, Japan*)

Kenichiro Sano (*Tokyo Institute of Technology, Japan*)

- 19F4-1 A Multiple-AC-Ports Power Electronic Transformer**
Xinyi Kong¹, Xinming Fan², Jianqiao Zhou¹, Gang Shi¹, Jiajie Zang¹, Jiacheng Wang¹, Xu Cai¹, Jianwen Zhang¹
1) *Shanghai Jiaotong University, China*, 2) *Foshan Power Supply Bureau of Guangdong Power Grid Co., Ltd., China*
- 19F4-2 A 1200V DC-link Hybrid Si/SiC Four-level ANPC Inverter with Balanced Loss Distribution, dv/dt and Cost**
Jun Wang, Lihong Xie, Xibo Yuan, Wenzhi Zhou, Ian Laird
University of Bristol, UK
- 19F4-3 Efficiency Improvement of Flying-Capacitor Linear Amplifier by Unequal Capacitor Voltage Ratio**
Hidemine Obara, Keiichi Matsushima
Yokohama National University, Japan
- 19F4-4 DC Power Filter Design for a Neutral-Point Clamped Hybrid Multilevel Converter**
Caspar T. Collins, Tim C. Green
Imperial College London, UK

Session 19G4 Reluctance Motor Drives

Chairs: Kohei Aiso (*Shibaura Institute of Technology, Japan*)

Tetsuya Kojima (*Mitsubishi Electric, Japan*)

- 19G4-1 Effect of Inductance Model on Sensorless Control Performance of SynRM with Magnetic Saturation**
Yuma Tsujii¹, Shigeo Morimoto², Yukinori Inoue², Masayuki Sanada²
1) *Osaka Prefecture University, Japan*, 2) *Osaka Metropolitan University, Japan*
- 19G4-2 Standstill Sensorless Self-Commissioning Strategy of Synchronous Machine Considering Rotor Rotation Reduction Technique**
Hyun-Jun Lee, Je-Eok Joo, Young-Doo Yoon
Hanyang University, Korea

- 19G4-3 Improved Parameter Estimation Method for Flux Saturation Model of Synchronous Reluctance Machines**
Tae-Gyeom Woo, Hyun-Jun Lee, Young-Doo Yoon
Hanyang University, Korea
- 19G4-4 Proposal of Optimal Design Method for Capacitance in Operating Area Expandable SR Motor Drive Circuit**
Taisei Kurishima, Ryuya Sugai, Hiroki Goto, Hirohito Funato, Junnosuke Haruna
Utsunomiya University, Japan
- 19G4-5 An Open-Loop Control for the Determination of the MTPV-Trajectory of a SynRM**
Vasken Ketchedjian, André Haspel, Jörg Haarer, Jörg Roth-Stielow
University of Stuttgart, Germany

Room H

Session 19H4 Motor analysis

Chairs: Masafumi Fujita (*Toshiba Energy Systems & Solutions Corporation, Japan*)
Masatsugu Nakano (*Mitsubishi Electric Corporation, Japan*)

- 19H4-1 Analytical Approach to Estimate Torque Characterization of Synchronous Motors Assisted by FEA**
Zheng-Feng Li, Ming-Shi Huang, Lin-Wei Huang
National Taipei University of Technology, Taiwan
- 19H4-2 Cost-efficient Analysis of Core and PM Eddy Current Loss Considering Current Harmonics**
Jun-Yeol Ryu, Jun-Woo Chin, Myung-Seop Lim
Hanyang University, Korea
- 19H4-3 Efficient Frequency-domain Evaluation of Transient Voltage Effects in Electric Machines**
Bianca Wex¹, Siegfried Silber¹, Petra Miletic², Wolfgang Gruber³
1) Linz Center of Mechatronics, Austria, 2) University of Rijeka, Croatia, 3) Johannes Kepler University, Austria
- 19H4-4 Analysis of Winding AC Loss in a Permanent Magnet Synchronous Machine With High Slot Fill Aluminum Winding**
Hiroya Sugimoto¹, Yuto Yamada¹, Kazuhito Imae²
1) Tokyo Denki University, Japan, 2) Aster Co., Ltd., Japan
- 19H4-5 Learning Thermal Properties and Temperature Models of Electric Motors with Neural Ordinary Differential Equations**
Wilhelm Kirchgässner, Oliver Wallscheid, Joachim Böcker
Paderborn University, Germany