

Program

Session Nov 26

Session Nov 27

Industry Session

Date: November 26

Time: 15:00-16:30

Venue: Room: A

Moderator: Keiichiro Kondo

Waseda University, Japan

IS-1 15:00-15:45

[JIA-to-ICEMS]

Inverter Air Conditioner Promotion by Developing a High Power Density Motor Drive System

Nobuo Hayashi

Daikin Industries, Ltd.

IS-2 15:45-16:30

[JIA-to-ICEMS]

Outstanding Technical Features of Traction System in N700S Shinkansen New Generation Standardized High Speed Train

Kenji Sato

Central Japan Railway Company

Opening Ceremony

Date: November 27

Time: 9:30-10:00

Venue: Room: A

Chair: Akira Chiba

Institute of Science Tokyo, Japan

Keynote Session 1

Date: November 27

Time: 10:00-12:30

Venue: Room: A

Chair: Kan Akatsu

Yokohama National University, Japan

KS1-1 10:00-10:45

Superconducting Maglev and Chuo Shinkansen

Dr. Junichi Kitano

Central Japan Railway Company

KS1-2 10:45-11:30

Research on Power Electronics Technology for Future Power Grid

Professor Rae-Young Kim

Hanyang University

KS1-3 11:30-12:15

Research on Permanent-Magnet Synchronous Machines with Hybrid Utilization of Permanent Magnets

Professor Ping Zheng

Harbin Institute of Technology, China

Session PS1-1

Permanent Magnet Machines 4

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kenji Nakamura

Tohoku University, Japan

PS1-1-1

Experimental Investigation on the Influence of a Hollow Rotor Shaft Cooling and Oil Properties on No-load Losses in Traction Electric Machines

A. Gilson, R. Sindjui, G. Bourhis, and G. Zito

IFP Energies nouvelles, France

PS1-1-2

Novel Refrigerant Cooling Method for Traction Motor Thermal Management

Sun Lee¹, Andrew Botham¹, Jigar Mistry², Reza Nasirizarandi², and Narayan C. Kar¹

¹University of Windsor, Canada, ²R&D Americas, Schaeffler, Canada

PS1-1-3

Analysis and Desing of IPMSM for Reducing AC Copper Loss in EV Traction Motor

Chang-Hyeon Wang, Ho-Jin Oh, Han-Joon Yoon, Nam-Ho Kim, and Sang-Yong Jung

Sungkyunkwan University, Republic of Korea

PS1-1-4

Impact of Leakage Flux on Permanent Magnet Synchronous Machines in Traction Drives Using 2D and 3D Finite Element Analysis Comparative Study

Ioannis Thomidis, Walaa Chliouet Benaboud, and Rik W. De Doncker

RWTH Aachen University, Germany

PS1-1-5

Experimental Validation of a Prediction Method for Bearing Currents in Traction Drive Systems

Lennart Jünemann, Pauline Höltje, Bernd Ponick, and Axel Mertens

Leibniz University Hannover, Germany

PS1-1-6

Rotor Design Considering Demagnetization Characteristics of Ribless IPMSM for EV Propulsion

In-seok Song, Ho-Jin Oh, DoHyun Jang, and Sang-Yong Jung

Sungkyunkwan University, Republic of Korea

PS1-1-7

Review of High Torque Density Permanent Magnet Machines for Electric Propulsion System

Yanlei Yu¹, Feng Chai², and Christopher H. T. Lee¹

¹Nanyang Technological University, Singapore, ²Harbin Institute of Technology, China

PS1-1-8

Optimisation of Permanent Magnet Synchronous Motor for Electric Vehicles

Pengbo Ming, Jun Di, Shifan Luo, Weili Li, and Junci Cao

Beijing Jiaotong University, China

PS1-1-9

Optimization Study of Torque in the IPMSM for E-bike Application

Jinming Hu¹, Fei Zhao¹, Zeting Mei², Jing Wang², and Dezhi Chen³

¹Harbin Institution of Technology, China, ²Shenzhen Sailvan Network Technology Co., Ltd., China, ³Shenyang University of Technology, China

Session PS1-2

Permanent Magnet Machines 5

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kenji Nakamura

Tohoku University, Japan

Program

PS1-2-1

Design and Optimization of an Outer-rotor PMSM for Torque Ripple Minimization

Gwan-Hui Jang¹, Sehwan Kim², and Gilsu Choi¹
¹Inha University, Republic of Korea, ²Korea Institute of Machinery and Materials, Republic of Korea

PS1-2-2

Comparative Analysis of Torque Ripple in IPMSM Topologies using the Frozen Permeability Method

Ho-Jin Oh, Yongmin Kim, Chang-Hyeon Wang, and Sang-Yong Jung
Sungkyunkwan University, Republic of Korea

PS1-2-3

Fault-tolerant Control Method to Reduce Torque Ripple for Symmetrical Winding Multi-phase Brushless DC Motor Under Open-circuit Faults

Lixiang Zhu, Wei Chen, Xinmin Li, and Zhiqiang Wang
Tiangong University, China

PS1-2-4

An Optimization Design for Reducing Cogging Torque in Permanent Magnet Synchronous Motors

Feiyang Liu, Jinglin Liu, and Yuyuan Yang
Northwestern Polytechnical University, China

PS1-2-5

Investigation and Analysis of Cogging Torque for Axial Flux Permanent Magnet Machines

Yanbo Lu^{1,2}, Chen Wang^{1,2}, and Jian Huang^{1,2}
¹Key Laboratory of Anhui Province, China, ²Anhui Polytechnic University, China

PS1-2-6

Study of Rotor Slotting on Cogging Torque of Spoke-type Permanent Magnet Machine

Haolin Shu^{1,2}, Ming Jiang^{1,2}, and Chen Wang^{1,2}
¹Key Laboratory of Anhui Province, China, ²Anhui Polytechnic University, China

PS1-2-7

Reduction of Axial Magnetic Force and Starting Current in Single-sided Axial-flux Machine with Ring PM Unit and Flux-weakening Control

Ryuga Koyanagi¹, Hiroya Sugimoto¹, Akihiro Ochiai², and Tadashi Sato²
¹Tokyo Denki University, Japan, ²Ebara Corporation, Japan

PS1-2-8

Vibration and Noise Analysis and Suppression of High Torque Density Permanent Magnet Motor

Baoxin Li¹, Ziheng Yin¹, Ruiwu Cao¹, Kai Wang¹, and Zheng Wang²
¹Nanjing University of Aeronautics and Astronautics, China, ²Southeast University, China

PS1-2-9

Unbalanced Magnetic Radial Pull During Module Open Circuit Fault in a Multi-modular, High Voltage PM Synchronous Direct Drive Generator for Offshore Wind

Pål Stabel Keim, Casper Leonard Klop, Lorrana Faria da Rocha, Runar Møllerud, Arne Nysveen, and Robert Nilssen
Norwegian University of Science and Technology, Norway

Session PS1-3

Permanent Magnet Machines 6

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kenji Nakamura

Tohoku University, Japan

PS1-3-1

Multi-objective Optimization of a Novel Permanent Magnet Starter-generator

Haoquan Zhang, Baoquan Kou, He Zhang, and Junren Mu
Harbin Institute of Technology, China

PS1-3-2

Multi-objective Optimization for a Low-speed High-torque Permanent Magnet Motor

Ziheng Yin¹, Baoxin Li¹, Ruiwu Cao¹, Kai Wang¹, and Zheng Wang²
¹Nanjing University of Aeronautics and Astronautics, China, ²Southeast University, China

PS1-3-3

Analytical Modeling and Optimization of Three-segment Halbach Permanent Magnet Array High Lift Motor

Maixia Shang, Jinglin Liu, Xiaobao Chai, and Mengqi Li
Northwestern Polytechnical University, China

PS1-3-4

Optimization Design Research of Dual-airgap High-torque Permanent Magnet Motor Based on Coevolution Algorithm

Yingjie Xu¹, Siyang Yu¹, Yue Zhang², Hongkui Zhang^{1,3}, and Fengge Zhang¹
¹Shenyang University of Technology, China, ²Shandong University, China, ³CCTEG, China

PS1-3-5

Improved IPM Motor Design with Integrated Ribs for Stress Reduction and Weight Optimization

Lucio José Fernando Cáceres Vera¹, Min-Fu Hsieh¹, and Guan-Ming Chen²
¹NCKU, Taiwan, ²China Steel Corporation, Taiwan

PS1-3-6

Back EMF Waveform Optimization of Hybrid Less Rare-earth Synchronous Reluctance Motor Using PSO Algorithm

Ziyu Wang¹, Xiaolin Wang¹, Qixing Gao², and Fanghua Zhang¹
¹Nanjing University of Aeronautics and Astronautics, China, ²Yanshan University, China

PS1-3-7

Cost Optimization Method for Less-rare-earth Permanent Magnet Synchronous Motor Based on Surrogate Model

Biao Wang, Guangwei Liu, Zhenyao Xu, and Fengge Zhang
Shenyang University of Technology, China

PS1-3-8

Design Proposal Based on Characteristic Analysis of Permanent Magnet Utilization Ratio in Dual Rotor IPMSM

Jae-Hyeong Park^{1,2}, Sung-Bae Jun², Tae-Yong Lee², Minyeong Choi², Sanghoon Moon², and Sang-Yong Jung¹
¹Sungkyunkwan University, Republic of Korea, ²Hyundai Motor Company, Republic of Korea

Session PS1-4

Permanent Magnet Machines 7

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kenji Nakamura

Tohoku University, Japan

Program

PS1-4-1

Magnet Reduction Effect of Split Rotor and Non-magnetic Wedge in V-shaped Interior Permanent Magnet Motor

Takuhiro Uzawa and Yuki Hidaka
Nagaoka University of Technology, Japan

PS1-4-2

Investigation of Angle Displacements in a Novel Dual-three-phase Equinumerous-slot-pole PMSM

Yongtao Liang¹, Zaixin Song¹, Yidan Ma^{1,2}, Yujie Chen¹, and Xiaoyu Lang¹
¹The Hong Kong Polytechnic University, China, ²Xi'an Jiaotong University, China

PS1-4-3

Design and Performance Analysis of a Novel Permanent Magnet Synchronous Motor with Stepped Magnetic Poles

Jinjin Duan, Zhihui Chen, Jiajun Zhu, and Hongxi Hu
Nanjing University of Aeronautics and Astronautics, China

PS1-4-4

A Novel Permanent Magnet Synchronous Machines with Improved Magnetic Field Characteristics and Performance Analysis

Xiaoyu Liang, Yuhong Zheng, Mingqiao Wang, Yong Liu, Ping Zheng, Wei Liu, and Minghao Wang
Harbin Institute of Technology, China

PS1-4-5

Design and Analysis of Fractional-slot Concentrated Winding PMSMs with Unequal Tooth Towards Improving Torque Density

Zicheng Yin, Xiaoyan Huang, and Ang Liu
Zhejiang University, China

PS1-4-6

A Novel Two Degrees-of-freedom Rotary-linear Permanent Magnet Machine

Peixin Wang, Heyang Liang, Jikai Si, Rui Nie, and Shuai Xu
Zhengzhou University, China

PS1-4-7

Design and Analysis of a Rotor-coreless Multi-disk Axial Flux Permanent Magnet Motor with Unaligned Permanent Magnets

Qiyu Guo, Wenliang Zhao, Ning Wang, Yan Ren, and Xiuhe Wang
Shandong University, China

PS1-4-8

Design and Analysis of Permanent Magnet Synchronous Motor Based on Asymmetric Auxiliary Teeth for Rotor Mechanical Position Self-sensing Technology

Xiaogang Lin¹, Zheng Zeng¹, Yuwei Zhao^{1,2}, and Wei Xie¹
¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS1-4-9

Electromagnetic Performance Comparison of Dual-rotor Permanent Magnet Motor with Three Different Rotor Topologies

Yu Fu, Jing Wang, and Weiwei Geng
Nanjing University of Science and Technology, China

Session PS1-5

Permanent Magnet Machines 8

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kenji Nakamura
Tohoku University, Japan

PS1-5-1

Research of the Variable Frequency Compressor Motor Based on Air Grooves of Rotor Yoke

Yusheng Hu^{1,2,3}, Xumin Zhao^{1,2,3}, Bo Zhou³, Hui Zhang³, Qitao Li³, and Zhongpeng Xu³

¹State Key Laboratory of Air Conditioning Equipment and System Energy Conservation Zhuhai, China, ²Guangdong Key Laboratory of Refrigeration Equipment and Energy Conservation Technology, Inc., China, ³Gree electric appliances, inc. of zhuhai, China

PS1-5-2

Design of an Adjustable-performance Internal Permanent Magnet Motor for DC Inverter Compressors used in Air-conditioning Systems

Chia-Sheng Chiang², Kai-Yi Huang¹, Ming-Tsung Chiu¹, Yao-Yang Hsieh¹, and Chung-Ming Lin¹

¹New Widetech Industries Co., Ltd., Japan ²Tokai University, Japan

PS1-5-3

Research on Design and Electromagnetic Characteristics Analysis of Super Premium Efficiency (IE4) Permanent Magnet Assisted Synchronous Reluctance Motor for Rare Earth Permanent Magnet Reduction

Do Yun Kwon, Ki Won Kim, Tae Hoon Kwon, and Myung Jeong
HD Hyundai Electric, Republic of Korea

PS1-5-4

High Slot Fill Aluminum Distributed Winding for High-speed and High Power Density Electric Machines

Yuto Yamada, Jun Ebinuma, and Hiroya Sugimoto
Tokyo Denki University, Japan

PS1-5-5

Feasibility Analysis and Sizing for High-speed IPMSM Designs

Guoyu Chu, Rukmi Dutta, John E. Fletcher, and M. F. Rahman
UNSW, Australia

PS1-5-6

Rotor Stress Analysis for High-speed PM Machines Considering Fringe Effect

Jiayue Zhou, Xi Xiao, and Hang Xu
Tsinghua University, China

PS1-5-7

Design and Analysis of Fault-tolerant IPM Considering Bidirectional Electromagnetic-thermal Coupling Constraints

Yiming Ma¹, Xiangdong Su², Zhenxiao Yin², Yujia Zhang², and Hang Zhao²

¹CSG (China Southern Grid), China, ²The Hong Kong University of Science and Technology (Guangzhou), China

PS1-5-8

Investigation of Multi-phase Electric Motors Having the Same Electromagnetic Structure Considering Performance Trade-off

HyeonMyeong Woo, Sangjin Lee, Yechan Park, Sangmin Lee, and Cheewoo Lee
Pusan National University, Republic of Korea

Program

PS1-5-9 Pulsation Reducing Effect in DC Current and Torque for Motor Fault-tolerance Based on Second Order Component Power Cancellation

Sota Takahashi and Yuki Hidaka
Nagaoka University of Technology, Japan

Session PS1-6

PM Machine Control and Drives 1

Date: November 27
Time: 13:00-14:00
Venue: FIT Arena
Chair: Sari Maekawa
Meiji University, Japan

PS1-6-1 Improved MTPA Control Strategy with Adaptive Gain for Permanent Magnet Synchronous Reluctance Motors

Jun Huang¹, Bo Wang¹, Haoyuan Yu¹, and Dewen Tian²
¹Southeast University, China, ²China North Vehicle Research Institute, China

PS1-6-2 Modified Virtual Signal Injection Control of MTPA for IPMSM Considering Switching Operating Conditions

Guidan Li, Xufeng Rui, Bin Li, Xiaochen Ma, and Yulu Ling
Tianjin University, China

PS1-6-3 Accurate MTPA Control Based on Ferrari Method for IPMSM with Partial Derivative Term Calculation

Yiyang Li^{1,2}, Xin Gu^{1,3}, Zhiqiang Wang^{1,3}, Liyan Guo^{1,3}, Wei Chen^{1,3}, Xinmin Li^{1,3}, and Chen Li⁴
¹Tiangong University, China, ²Tianjin Key Laboratory of Intelligent Control of Electrical Equipment, China, ³National Local Joint Engineering Research Center, China, ⁴Zhejiang University, China

PS1-6-4 A Loss Minimization Dynamic-static Transition Control Strategy Based on Model Predictive Current Control for IPMSMs

Cheng Song¹, Jinhua Du^{1,2}, Guoqiang Zhang¹, Boyan Zhang¹, Han Wu¹, and Geping Xu³
¹Xi'an Jiaotong University, China, ²Shaanxi Province Key Laboratory of Smart Grid, China, ³Xi'an XiChi Electric Co., Ltd., China

PS1-6-5 Position Offset Injection based Fast and Accurate Maximum Torque Per Ampere (MTPA) Control of Interior PMSMs

Zhe Tong¹, Fengyu Wang¹, Yuting Lu¹, Beichen Ding¹, and Guodong Feng^{1,2}
¹Sun Yat-sen University, China, ²Guangdong Provincial Key Laboratory of Fire Science and Intelligent Emergency Technology, China

PS1-6-6 Auto Associative Kernel Regression Data-driven Method for Permanent Magnet Synchronous Motor Control

Hang Xu, Xi Xiao, and Jiayue Zhou
Tsinghua University, China

PS1-6-7 Comparative Analysis of PID, Self-tuning PID, and Adaptive Neuro-fuzzy Logic Inference System Controllers for BLDC Motor Speed Control

Theeraphong Srichiangsa, Piyapath Siratarnsophon, Sirichai Wattanasophon, and Sarinee Ouitrakul
Kasetsart University, Thailand

PS1-6-8 IPOA-NLADRC Based Permanent Magnet Synchronous Motor Control Strategy

Shanyong Xu¹, Youqing Ma¹, Yourui Huang^{1,2}, and Tao Han¹
¹Anhui University of Science and Technology, China, ²West Anhui University, China

Session PS1-7

PM Machine Control and Drives 2

Date: November 27
Time: 13:00-14:00
Venue: FIT Arena
Chair: Sari Maekawa
Meiji University, Japan

PS1-7-1 Control Strategy for Small DC-link Capacitor Brushless DC Motor Drives Using a Single DC-link Current Sensor

Hang Gao¹, Xinmin Li¹, Xin Gu¹, Wei Chen¹, and Changliang Xia^{1,2}
¹Tiangong University, China, ²Zhejiang University, China

PS1-7-2 An Open-winding Permanent Magnet Synchronous Motor Drive System Based on the CSI-VSI Hybrid Converter

Run Zhou, Jiadan Wei, Zhihui Wang, Yidi Meng, and Zeyu Zhang
¹Nanjing University of Aeronautics and Astronautics, China

PS1-7-3 Research on Fractional-order Active Disturbance Rejection Control Method for Permanent Magnet Synchronous Motor

Enming Cui¹, Yiguang Chen¹, Ruxi Sun², and Xiaolong Zhao¹
¹Tianjin University, China, ²Tianjin Huaneng Yangliuqing Power Co., Ltd., China

PS1-7-4 Multi-vector Model Predictive Control for Permanent Magnet Synchronous Motors with Disturbance Compensation

Zhaoyi Wang¹, Jialiang Dai¹, Jungho Ahn¹, Seungjoo Kim², and Ju Lee¹
¹Hanyang University, Republic of Korea, ²Korea Testing Certification, Republic of Korea

PS1-7-5 An Improved Active Disturbance Rejection Control for Speed Control of Permanent Magnet Synchronous Motor Using Reduced-order Extended State Observer

Xiaolong Zhao¹, Yiguang Chen¹, Ruxi Sun², and Enming Cui¹
¹Tianjin University, China, ²Tianjin Huaneng Yangliuqing Power Co., Ltd., China

PS1-7-6 Improved Sliding Mode Control Strategy with Disturbance Compensation for PMSM Speed Regulation System

Yong Zhao, Jingxiu Wu, Yong Kong, Qiang Liu, and Lei Zhang
University of Nanjing Xiaozhuang, China

PS1-7-7 Current Sampling Error Suppression Method for Deadbeat Predictive Direct Speed Control Based on Quasi-resonant Controller

Guodong Yu, Haoyi Mu, Shaobin Li, Xudong Bai, and Yongxiang Xu
Harbin Institute of Technology, China

Program

PS1-7-8

High-efficiency Drive Technology for High-speed, Multi-pole Motors with Minor Sampling Process

Katsuya Haruki and Yoshitaka Iwaji
Ibaraki University, Japan

PS1-7-9

Adaptive One Sample Ahead Preview Control for Non-Sinusoidal PMSM with dq Coordinate Implementation

Guilherme V. Hollweg¹, Lucas R. Rocha², Van-Hai Bui¹, Rodrigo P. Vieira², Mengqi Wang¹, and Wencong Su¹
¹University of Michigan-Dearborn, USA, ²Federal University of Santa Maria, Brazil

Session PS1-8

Sensorless Control 2

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Sari Maekawa

Meiji University, Japan

PS1-8-1

Rotor Position Error Compensation for Sensorless Control of SPMSM Based on BP Neural Network

Linyi Shen¹, Peiyu Yao¹, and Guodong Feng^{1,2}
¹Sun Yat-sen University, China, ²Guangdong Provincial Key Laboratory of Fire Science and Intelligent Emergency, China

PS1-8-2

A Sensorless Control Method for an Open-phase Five-phase PMSM by Using Series-SOGI and an Adaptive Neutral-voltage Compensation

Jie Chen¹, Bing Tian¹, Yingzhen Li², and Qiming Bai³
¹Nanjing University of Aeronautics and Astronautics, China, ²China Industrial Control Systems, China, ³Jiangsu Co., Ltd., China

PS1-8-3

Sensorless Control of SPMSM with Improved Extended Kalman Filter Based on Runge-Kutta Model

Peiru Sun^{1,2}, Baodong Chen^{1,2}, Shiqiang Zheng^{1,2}, Lirong Deng^{1,2}, Gengkui Wei^{1,2}, and Hao Wang^{1,2}
¹Beihang University, China, ²National Institute of Extremely-Weak Magnetic Field Infrastructure, China

PS1-8-4

Second Order Generalized Integrator Filtering for Enhanced Sliding Mode Observer with Fuzzy Logic Switching Function

Kunsheng Cai, Shuanghong Wang, and Zixin Li
Huazhong University of Science and Technology, China

PS1-8-5

Sensorless Active Disturbance Rejection Control of PMSM Based on Extended Kalman Filter

Li Liu¹, Jialiang Dai¹, Zhaoyi Wang¹, Seungjoo Kim², and Ju Lee¹
¹Huazhong University, Republic of Korea, ²Korea Testing Certification, Republic of Korea

PS1-8-6

Full-order Super-twisting Non-singular Terminal Sliding Mode Observer for PMSM Sensorless Control

Siyuan Liu¹, Ling Liu¹, Zihao Li¹, Peng Kou¹, and Yue Zhang²
¹Xi'an Jiaotong University, China, ²Dongfang Electric Machinery, China

PS1-8-7

A Nonlinear Flux Observer Based on Limit Cycle Oscillator for Sensorless Permanent Magnet Synchronous Motor Drives

Quanjiang Wang, Song Zhang, and Wen Jiang
Qingdao University, China

PS1-8-8

Multiple Signal Classification Method of EMF-based Speed and Position Estimation for Surface PMSM Sensorless Drives

Jiasheng Yin, Jinglin Liu, and Zhiman Lu
Northwestern Polytechnical University, China

Session PS1-9

Power Converters of Renewable Energy Systems 1

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Hitoshi Haga

Shizuoka University, Japan

PS1-9-1

Extended Describing Function Method based Modeling Technique for Three-port Series Resonant Converters

Zhijing Ye, Chi Li, and Zedong Zheng
Tsinghua University, China

PS1-9-2

Power Decoupled VSG Based on Full-state Feedback for Better Dynamic Performance and Improved System Robustness

Yipeng Ding, Xiaoqi Xu, Yi Wang, Yanjun Tian, Yuhua Gao, Zhen Zhang, and Yuwei Li
North China Electric Power University, China

PS1-9-3

Study on Phase-change Cooling for a Reactor Used in Offshore Wind Power Converters

Zhao Sheng¹, Yang Zhangbin¹, Yuan Wenhong¹, Lei Xiao^{1,2}, Peng Daixiao³, Chen Feiyu³, and Bi Yanke⁴
¹Chinese Academy of Sciences, China, ²China Three Gorges Corporation, China, ³China Three Gorges Construction Engineering Corporation, China, ⁴Rongxin Huiko Electric Co., Ltd., China

PS1-9-4

Optimal Placement and Sizing of Hybrid Distribution Transformers in Active Distribution Networks Under Load and PV Generation Uncertainty

Yanting Xue, Deliang Liang, and Yibin Liu
Xi'an Jiaotong University, China

PS1-9-5

MPPT Control Method for Micro Wind Turbine System with Newton Method

Itta Mizutani and Naoki Yamamura
Mie University, Japan

PS1-9-6

Performance Improvement of a Magnus Effect-based Turbine Generator for a Point Absorber Wave Energy Converter

Ken-ichiro Yamashita and Seina Takekoshi
Salesian Polytechnic, Japan

Program

PS1-9-7

Design of Direct Drive Dual 3-phase Permanent Magnet Generator for Ship-mounted Wind Power Applications Considering Redundancy

Young-Ho Hwang¹, In-seok Song¹, Kyung-Won Jeon², Byung-Hee Kang³, Seok-Won Jung¹, and Sang-Yong Jung¹
¹Sungkyunkwan University, Republic of Korea, ²Hanhwa Ocean, Republic of Korea, ³SJ Global Engineering, Republic of Korea

PS1-9-8

Power Fluctuation Suppression Under Distorted Grid Voltage in Wind Power System Using Wound Rotor Induction Generator

Kichiro Yamamoto, Tomoya Nakahira, and Atsushi Shinohara
Kagoshima University, Japan

PS1-9-9

Comparative Study of Operating Characteristics of Doubly-fed Variable-speed Pumped Storage Unit under Two Different Control Strategies

Tao Lei¹, Haoyu Kang¹, Jianjun Liu², Lin Luo², Jin Wang¹, and Libin Zhou¹
¹Huazhong University of Science and Technology, China, ²Dongfang Electric Machinery Co., Ltd., China

PS1-9-10

Combined Capacity and Internal Resistance Estimation of Lithium-ion Batteries Based on Voltage Recovery

Qianyuan Dong and Jinglin Liu
Northwestern Polytechnical University, China

Session PS1-10

Power Converters of Motor Drives

Date: November 27

Time: 13:00-14:00

Venue: FIT Arena

Chair: Hitoshi Haga

Shizuoka University, Japan

PS1-10-1

Loss Evaluation of Three-phase Inverter Driven Two-phase PWM Scheme at High Switching Frequency

Masataka Minami and Tenshin Kamahara
Kindai University, Japan

PS1-10-2

An Overview of Resonant DC-link Inverters

Cheng He, Dong Zhang, Jing Guo, Tao Fan, and Xuhui Wen
Chinese Academy of Sciences, China

PS1-10-3

Robotic Grasp Detection Method Based on a Novel Multi-scale Multi-task Mutual-learning Architecture in Neural Network

Baixiang Wang, Yinbei Li, Jiaqiang Yang, and Yasir Salam
Zhejiang University, China

PS1-10-4

A Study on Giant Magnetostrictive Actuator for Interior Sound Control System of the Ultra-compact Mobility: Fundamental Consideration on Formation of the Giant Magnetostrictive Phases Depending on Heat Treatment Condition

Taro Kato¹, Ryusei Naganuma¹, Koki Bando¹, Kentaro Sawada², Wu Wenbao², Ikkei Kobayashi², Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Ayato Endo⁶, Hideaki Kato², Takayoshi Narita², and Mitusaki Furui¹
¹Tokyo University of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology (KOSEN), Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Fukuoka Institute of Technology, Japan

PS1-10-5

Topology Optimization for a Spoke-type Permanent Magnet Synchronous Motor Based on a Siamese Convolutional Network

Yidan Ma^{1,2}, Zaixin Song¹, Yongtao Liang¹, and Jianfu Cao²
¹The Hong Kong Polytechnic University, China, ²Xi'an Jiaotong University, China

PS1-10-6

Contact Tip Trajectory in Steady-state Regime Prediction Using Deep Learning for Piezoelectric Actuators

Marc Favier, Xinxin Liao, Marjan Ghorbani, Paolo Germano, and Yves Perriard
École Polytechnique Fédérale de Lausanne, Switzerland

PS1-10-7

Efficiency Map Versus Time-stepping Solutions for Drive Cycle Performance Analysis of Permanent Magnet Synchronous Motors

Pawan Kumar Dhakal, Kourosh Heidarikani, Roland Seebacher, and Annette Muetze
Graz University of Technology, Austria

PS1-10-8

Maximum Torque per Ampere Control of IPMSM Drive for Electric Two-wheeler Applications

Adrish Bhaumik¹, Xiaocong Li², Hongxuan Wang¹, Lim Shouk Gaem Jeanette², and Prahlad Vadakkepat¹
¹National University of Singapore, Singapore, ²Agency for Science, Technology and Research (A*STAR), Singapore

Session KS2

Keynote Session 2

Date: November 27

Time: 14:30-16:00

Venue: Room: A

Chair: Akira Chiba

Institute of Science Tokyo, Japan

Takashi Kosaka

Nagoya Institute of Technology, Japan

KS2-1

14:30-15:15

High Performance Integrated Motor Drives Using Wide Bandgap Devices Including Current Source Inverter

Professor Bulent Sarlioglu
University of Wisconsin-Madison, USA

KS2-2

15:15-16:00

Design and Manufacturing of MW-class High Performance Electrical Machines

Fengyu Zhang, David Gerada, Hadi Naderiallaf, Tianjie Zou, Gaurang Vakil, Ram Ramanathan, Mohammad Ilkhani, Michele Degano, and Chris Gerada
Power Electronics, Machines and Control Research Institute, UK

Session OS1B

Induction Machines

Date: November 27

Time: 16:20-18:20

Venue: Room: B

Chair: Makoto Ito

Hitachi, Ltd., Japan

Nijan Yogal

Physikalisch-Technische Bundesanstalt, Germany

Program

OS1B-1 16:20-16:40
Compatibility Determination of Single-phase Induction Motor and Load

Nakarin Prempri
King Mongkut's University of Technology, Thailand

OS1B-2 16:40-17:00
A Performance Analysis of a 12-slot 10-pole Concentrated Winding Induction Motor with Wave-winding Rotor for Loss Reduction

Kosuke Kihara and Yuichi Yokoi
Nagasaki University, Japan

OS1B-3 17:00-17:20
Equivalent Two-dimensional Finite Element Analysis of Axial Flux Induction Motor with Double Stator and Single Rotor

Qin Wang, Jing Wang, and Weiwei Geng
Nanjing University of Science and Technology, China

OS1B-4 17:20-17:40
Controllability Enhancement of Doubly Fed Induction Generators by Use of Tapped Stator Windings

Boštjan Polajžer¹, Annette Muetze², Matej Kerndl¹, and Jožef Ritonja¹
¹University of Maribor, Slovenia, ²Graz University of Technology, Austria

OS1B-5 17:40-18:00
Designing for Success: The Imperative of Critical Speed in Electrical Motors - Industry Perspective

Suhaila Mansor and Ir. Abdul Wahid Jafar
PETRONAS, Malaysia

OS1B-6 18:00-18:20
Influence of Rotor Closed Slots on Magnetic Field Harmonics and Electromagnetic Vibration in Induction Motors

Longhui Liu, Yu Xiao, Xiaolong Zhao, Jin Wang, and Libing Zhou
Huazhong University of Science and Technology, China

Session OS1C

Permanent Magnet Machines 1

Date: November 27

Time: 16:20-18:20

Venue: Room: C

Chair: Takashi Kato

Nissan Motor Co., Ltd., Japan

Shun Cai

University College London, UK

OS1C-1 16:20-16:40
Aluminum Windings and Their Manufacturing Technologies in Electrical Machines: A Review

Chenyi Zhao¹, Han Zhao^{2,3}, Jing Li¹, Xiaochen Zhang^{1,2}, Yixiao Ruan^{2,4}, and Huanran Wang⁵

¹University of Nottingham Ningbo China, China, ²Yongjiang Laboratory, China, ³University of Chinese Academy of Sciences, China, ⁴Tianjin University, China, ⁵Zhejiang University, China

OS1C-2 16:40-17:00
Investigation of Reducing Magnet Amount in Traction Motors with Aluminum Windings

Daichi Washio and Kan Akatsu
Yokohama National University, Japan

OS1C-3 17:00-17:20
Layered Structure of Permanent Magnet for Eddy Current Loss Reduction in Electric Machine Design

Yitong Li¹, Wei Xu¹, Shuhua Fang¹, and Xiping Liu²
¹Southeast University, China, ²Jiangxi University of Science and Technology, China

OS1C-4 17:20-17:40
Evaluation of an IPMSM Featuring a Rotor Core Directly Injection-molded with Sm-Fe-N Bonded Magnets

Yukihiro Yoshida¹, Rie Yoshida², Taisei Uwano¹, Sho Sakurai¹, Masahiro Abe², Shuichi Tada², Muneo Yamamoto², and Katsubumi Tajima¹

¹Akita University, Japan, ²Nichia Corporation, Japan

OS1C-5 17:40-18:00
A Study on Slot-pole Combinations of Slit Stator Motors

Masaki Shimoguchi, Yuichi Yokoi, and Tsuyoshi Higuchi
Nagasaki University, Japan

OS1C-6 18:00-18:20
Improving Reluctance Torque of Outer-rotor-type PM Motor with Segmented Rotor Structure

Sho Sakurai, Yukihiro Yoshida, and Katsubumi Tajima
Akita University, Japan

Session OS1D

Reluctance Machines 1

Date: November 27

Time: 16:20-18:20

Venue: Room: D

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

Zhenyao Xu

Shenyang University of Technology, China

OS1D-1 16:20-16:40
Standalone Testing Method of Synchronous Reluctance Motor for Determining Operating Characteristics

Masatsugu Oyamada, Sunao Wakasugi, Yusuke Moriyama, and Fumiya Koga

TMEIC Corporation, Japan

OS1D-2 16:40-17:00
Enhanced Performance of a Synchronous Reluctance Motor due to Less Rare-earth Magnets Combined Ferrite and NdFeB

Kazuto Sakai¹ and Yuto Kojima²

¹Toyo University, Japan, ²Toyo University, Japan

OS1D-3 17:00-17:20
A Novel Synchronous Reluctance Machine with Unequal-turn Concentric Winding

Yue Tang¹, Yawei Wang¹, Shengqiao Hao¹, Yuanjian Chen¹, Yeming Zheng¹, Likun Wang², and Ronghai Qu¹

¹Huazhong University of Science and Technology, China, ²Harbin University of Science and Technology, China

OS1D-4 17:20-17:40
Research on High-speed PM-assisted Synchronous Reluctance Motor based on Dual-phase Materials

Xianghai Zhang, Jing Ou, and Dianguo Xu
Harbin Institute of Technology, China

Program

OS1D-5 **17:40-18:00**
Characteristics Analysis of a Novel Permanent Magnet Assisted 12/8 Segmental Rotor Type Switched Reluctance Motor

Tao Li¹, Zhenyao Xu¹, Yue Zhang², Dong-Hee Lee³, and Yuli Bao⁴
¹Shenyang University of Technology, China, ²Shandong University, China, ³Kyungsung University, Republic of Korea, ⁴University of Nottingham Ningbo China, China

OS1D-6 **18:00-18:20**
Optimization of SRG Comprehensive Performance Based on Two-step Commutation

Zhiyuan Chai¹, Minjun Guan², Yanting Liu¹, Chuang Liu¹, and Kai Wang¹
¹Nanjing University of Aeronautics and Astronautics, China, ²Jinling Institute of Technology, China

Session OS1E

Flux Switching & Variable Flux Machines 1

Date: November 27

Time: 16:20-18:20

Venue: Room: E

Chair: Wataru Kitagawa

Nagoya Institute of Technology, Japan

Yu Zeng

Jiangsu University, China

OS1E-1 **16:20-16:40**
Influence of Ratio of Outer Diameter and Axial Length on Torque Density in Axial Wound Field Flux Switching Motor with Segmental Rotors

Yudai Koishi and Hiroki Goto
Utsunomiya University, Japan

OS1E-2 **16:40-17:00**
Analysis of PM Volume Reduction Methods for Hybrid Excitation Switched Flux Machines

Wentao Zhang, Zhongze Wu, Wei Hua, and Ji Qi
Southeast University, China

OS1E-3 **17:00-17:20**
Axial-gap Type Adjustable Field Permanent Magnet Synchronous Motor Using Coil-end and Zero-sequence Current

Kiyohiro Iwama and Toshihiko Noguchi
Shizuoka University, Japan

OS1E-4 **17:20-17:40**
A Study on Performance Improvement via Magnetic Saturation in a 12-slot 10-pole Concentrated-winding Permanent-magnet Motor

Takanori Yoshikawa, Yuichi Yokoi, and Tsuyoshi Higuchi
Nagasaki University, Japan

OS1E-5 **17:40-18:00**
Proposal of Variable Magnet Vernier Motor for High Efficiency in Wide Speed Range

Yusuke Ozawa and Kohei Aiso
Shibaura Institute of Technology, Japan

OS1E-6 **18:00-18:20**
Design and Analysis of Variable Flux PM Machine for Extending Speed Region to Improve the Drive Cycle Efficiency

H. N. Phyu, Yang Zaifeng, Akash Singh, and Jonathan Hey
*Agency for Science Technology and Research (A*STAR), Singapore*

Session OS1F

Multi-winding/Multi-phase Machine Control

Date: November 27

Time: 16:20-18:20

Venue: Room: F

Chair: Tetsuji Daido

Nagasaki University, Japan

Zhe Chen

Northwestern Polytechnical University, China

OS1F-1 **16:20-16:40**
Harmonic Current Suppression Scheme for Dual Three-phase PMSM Based on Harmonic Subspace Phase-shifting Operation

Xiaochen Ma¹, Bin Li¹, Xuefeng Rui¹, and Weijie Hou²
¹Tianjin University, China, ²Tianjin Key Laboratory of Microgravity and Hypogravity Environment Simulation Technology, China

OS1F-2 **16:40-17:00**
DSOGI Based Rotor Position Estimation for DTP-PMSM Considering DC Bias

Feng yang Liu, Gui jie Yang, and Jian yong Su
Harbin Institute of Technology, China

OS1F-3 **17:00-17:20**
Data-driven based Model-free MPC for DTP-PMSM with Optimized Space Vector

Xiaojun Zhang¹, Liang Yan¹, Jiaqiang Yang¹, Weiqiang Sun¹, Yuqi Jia², and Anqi Situ¹
¹Zhejiang University, China, ²Aviation Key Laboratory of Science and Technology on Aero Electromechanical System Integration, China

OS1F-4 **17:20-17:40**
High Precision Model Predictive Current Control of Dual Three-phase Permanent Magnet Synchronous Motor

Shuaihang Wei^{1,2}, Tingna Shi^{1,2}, Chen Li^{1,2}, and Zhanqing Zhou²
¹Zhejiang University, China, ²Tiangong University, China

OS1F-5 **17:40-18:00**
A Radial Force Mode Control in IPMSM Using Multi-phase Motor

Shojiro Fujita and Kan Akatsu
Yokohama National University, Japan

OS1F-6 **18:00-18:20**
Online Capacitor Monitoring Strategy In 3L-NPC Inverter Driven Open Winding Multiphase Drives

Shusen Ni¹, Chaohui Liu², and Zedong Zheng¹
¹Tsinghua University, China, ²National New Energy Vehicle Technology Innovation Center, China

Session SS1

Special Session 1: Bearingless Motos and Drives

Date: November 27

Time: 16:20-18:00

Venue: Room: G

Chair: Junichi Asama

Shizuoka University, Japan

Victor Tedesco

The Texas Heart Institute, USA

Program

SS1-1 **16:20-16:45**
Comparison of High Pole Number Bearingless Motors with Irregular Distribution of Stator Slots

Hiroya Sugimoto¹, Shoma Kono¹, and Junichi Asama²
¹Tokyo Denki University, Japan, ²Shizuoka University, Japan

SS1-2 **16:45-17:10**
Decoupling Force and Torque Generation in Bearingless Motors with Toroidal Windings

Wolfgang Gruber and Andreas Pröll
Johannes Kepler University Linz, Austria

SS1-3 **17:10-17:35**
Development of a Bearingless PM Motor with Axial Magnetic Suspension Using Zero-sequence Current

Yusuke Fujii, Koki Matsuda, and Kaito Tanaka
Tokyo Institute of Technology, Japan

SS1-4 **17:35-18:00**
Design, Modelling and Performance Evaluation of a Single-phase Passively Levitated Self-bearing Machine

Paul-Emile Lobet, Aurélien Georges, Joachim Van Verdegheem, and Bruno Dehez
Université catholique de Louvain (UCLouvain), Belgium

Session OS1H

Induction Motor Control and Drives

Date: November 27

Time: 16:20-18:20

Venue: Room: H

Chair: Ikuya Sato
Fuji Electric Co., Ltd., Japan
Boštjan Polajžer
University of Maribor, Slovenia

OS1H-1 **16:20-16:40**
Predictive Controller Based on Indirect Vector Control for Induction Motor in Electric Vehicle

Chakrit Panpean¹, Nontakan Mangkala², Phonsit Santiprapan³, and Jeerawan Homjan⁴
¹King Mongkut's University of Technology, Thailand, ²Suranaree University of Technology, Thailand, ³Prince of Songkla University, Thailand, ⁴Rajamangala University of Technology Suvarnabhumi, Thailand

OS1H-2 **16:40-17:00**
An Improved Torque Ripple Minimization Pulsewidth Modulation for Induction Motors Under Low Carrier Ratio

Yang Shen¹, Yiming Ma², Yujia Zhang¹, Zhenxiao Yin¹, and Hang Zhao¹
¹Hong Kong University of Science and Technology (Guangzhou), China, ²CSG PGC Energy Storage Research Institute, China

OS1H-3 **17:00-17:20**
Speed Sensor-less Control of Induction Machines in Low-speed Region Based on the Gain-scheduled Adaptive Flux Observer and Frequency Control

Yoshiyasu Takase, Noor Aamir Baloch, Yasumasa Hamabe, Shinya Morimoto, and Takahiro Saeki
YASKAWA Electric Corporation, Japan

OS1H-4 **17:20-17:40**
Study on Predictive Control Strategy of Pumped-storage DFIM with Dual-objective Constraint Model Under Grid Voltage Imbalance Condition

Wei Liu^{1,2}, Ruihua Zhang^{1,2}, Bo Zhang^{1,2}, Qiongxuan Ge^{1,2}, and Yaohua Li^{1,2}
¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

OS1H-5 **17:40-18:00**
Design of an Induction Machine with an Additional Asymmetrical Rotor Winding Providing a Rotor-fixed Anisotropy for Self-sensing Control

Constantin Schepe and Bernd Ponick
Leibniz University Hannover, Germany

OS1H-6 **18:00-18:20**
Real-time Extraction for Stator Interturn Fault Features in Induction Motor Drives Using Tracking Filters

Koroku Nishizawa, Mengyu Li, Jing Bai, and Ikuya Sato
Fuji Electric Co., Ltd., Japan

Session OS11

PM Motor Control 1

Date: November 27

Time: 16:20-18:20

Venue: Room: I

Chair: Naoki Kawamura
Chubu University, Japan
Shuai Mao
Northwestern Polytechnical University, China

OS11-1 **16:20-16:40**
Seamless Switch of Control Mode Over Current Vector Control and Voltage Phase Control in IPMSM

Takumi Kokago and Keiichiro Kondo
Waseda University, Japan

OS11-2 **16:40-17:00**
Voltage Overshoot Mitigation for PMSM Voltage Closed-loop Field-weakening Control Based on a Low-pass Feedforward Compensator

Linzhi Wang, Yong Yu, Bo Wang, and Dianguo Xu
Harbin Institute of Technology, China

OS11-3 **17:00-17:20**
Torque Derivative Value Manipulated Type Torque Feedback Control System for PMSM

Naoki Kawamura and Masaru Hasegawa
Chubu University, Japan

OS11-4 **17:20-17:40**
Active Disturbance Rejection Control - based on Delayed Signal Cancellation for Current Harmonics Reduction in Permanent Magnet Synchronous Motors Drives

Huayu Ji¹, Zifeng Chen¹, Xijian Lin¹, Xinghao Wang¹, Xi Luo¹, and Dianxun Xiao^{1,2}
¹The Hong Kong University of Science and Technology (Guangzhou), China, ²HKUST, China

OS11-5 **17:40-18:00**
Current Tracking for PMSMs Using Discrete Time Delay Control with Estimation Error Compensation

Gan Wang, Yanfei Cao, Hongjie Li, and Tingna Shi
Zhejiang University, China

OS11-6 **18:00-18:20**
Ultra-local Model-free Predictive Control with Switching Strategy of PMSMs for Two-phase Stationary Current

Xueyan Wang, Zhenxiao Yin, Yang Shen, Ming Liu, and Hang Zhao
The Hong Kong University of Science and Technology (Guangzhou), China

Program

Session OS1J

Switched Reluctance Motor Control and Drives

Date: November 27

Time: 16:20-18:20

Venue: Room: J

Chair: Kazuhiro Ohyama

Fukuoka Institute of Technology, Japan

OS1J-1 16:20-16:40

Towards Sustainable Mobility: Optimal Flux Control of Drive Cycles for Variable Flux Motors via Deep Reinforcement Learning

Zaifeng Yang, Hla Nu Phyu, Xiacong Li, and Jonathan Hey
*Agency for Science, Technology and Research (A*STAR), Singapore*

OS1J-2 16:40-17:00

Speed – Torque Range Expansion of In-wheel Axial-flux SR Motor for Compact EV

Shintaro Nagasawa, Yusuke Nishigai, and Kenji Nakamura
Tohoku University, Japan

OS1J-3 17:00-17:20

Characteristics of Switched Reluctance Motor using Operating Area Expandable Drive Circuit in Unexpanded Operating Area

Taisei Ishizawa, Ryuya Sugai, Hiroki Goto, and Hirohito Funato
Utsunomiya University, Japan

OS1J-4 17:20-17:40

An Online Torque Sharing Function with Torque Reference Self-adjusting Method for Switched Reluctance Machines

Zixin Li, Shuanghong Wang, and Libing Zhou
Huazhong University of Science and Technology, China

OS1J-5 17:40-18:00

Investigation on the Maximum Efficient Current Waveform of SRM Considering Torque Ripple Reduction

Atsunori Miyata, Yudai Koishi, Dai Kojima, and Hiroki Goto
Utsunomiya University, Japan

OS1J-6 18:00-18:20

Loss Reduction in V/f Control for Switched Reluctance Motor Driven by Single-pulse Voltage

Hirohito Kato, Hiroki Watanabe, and Jun-ichi Itoh
Nagaoka University of Technology, Japan

Session OS1K

Power Converters of Renewable Energy Systems 1

Date: November 27

Time: 16:20-18:20

Venue: Room: K

Chair: Ken-ichi Kondo

Kansai University, Japan

Yi Wang

North China Electric Power University, China

OS1K-1 16:20-16:40

A High Gain Common Ground Inverter without Electrolytic Capacitors

Jiangpeng Yang, Fanglin Bai, Yanni Ming, Yang Li, Linzhe Li, and Zeliang Shu
Southwest Jiaotong University, China

OS1K-2 16:40-17:00

A Minimum Backflow Power with Optimal Current Stress Method of Single-stage DAB Microinverter

Ruinan Xue, Panbao Wang, Yousu Yao, Wei Wang, and Dianguo Xu
Harbin Institute of Technology, China

OS1K-3 17:00-17:20

A Current-limiting Scheme with Adjustable Virtual Impedance for Three-phase Four-wire Grid Forming Inverters

Preenapan Panya, Surapong Suwankawin, and Somboon Sangwongwanich
Chulalongkorn University, Thailand

OS1K-4 17:20-17:40

A 36-pulse Thyristor Hydrogen Converter Based on a Nine-phase Phase-shifting Transformer

Jingfang Wang¹, Changbao Wang¹, Teng Liu², and Bin Wang¹
¹Harbin Engineering University, China, ²Beijing Feiyu Microelectronic Circuits Company Limited, China

OS1K-5 17:40-18:00

Energy Management Strategy of Fuel Cell Management System for Flooding Condition with Distributed Supercapacitors Storage Element

Apinya Siangsanoh¹, Panupan Srisomboon¹, Matheepot Phattanasak¹, Roghayeh Gavagsaz-Ghoachani², Jean-Philippe Martin³, Serge Pierfederici³, and Sophie Didierjean⁴
¹KMUTNB, Thailand, ²Shahid Beheshti University, Iran, ³Université de Lorraine, France, ⁴Shahid Beheshti University, Iran, ⁵LEMETA, Université de Lorraine, France

OS1K-6 18:00-18:20

A Proposal of Permanent Magnet Transverse Flux Generator for Large Wind Turbine Generation System

Kumano T and Shinkai T
Meiji University, Japan

Session OS1L

Power Converters of Motor Drives

Date: November 27

Time: 16:20-18:20

Venue: Room: L

Chair: Akihito Mizukoshi

National Institute of Technology, Kisarazu College, Japan

Takanobu Ohno

University of Innsbruck, Austria

OS1L-1 16:20-16:40

Space Vector Modulation with Flexible Switching Pause Period Function for Three-phase PMSM Drive Inverters

Keitaro Kawarazaki and Nobukazu Hoshi
Tokyo University of Science, Japan

OS1L-2 16:40-17:00

High-power Density Three-phase Inverter with 3D Circuit Structure Using Liquid Immersion Cooling

Norihiro Izu and Daiki Satou
Tokyo Denki University, Japan

Program

OS1L-3 **17:00-17:20**

Prototype Design and Testing of a Novel Unidirectional Back-to-back T-type Three-level Converter for High Efficiency Applications

Monchai Ariyapuek¹, Somboon Sangwongwanich¹, Surapong Suwankawin¹, Puchong Jirachaisophon², Pongsak Mongkoldee², and Masaki Kanamori³
¹Chulalongkorn University, Thailand, ²Carrier Air Conditioning Co., Ltd., Thailand, ³Carrier Japan Corporation, Japan

OS1L-4 **17:20-17:40**

Design and Comparison of Multilevel Energy Storage Converter Topologies for High Power Motor Drive Applications

Fanqiang Gao^{1,2}, Zixin Li^{1,2}, Ye Zhang^{1,2}, Jinhao Zhang^{1,2}, Yaohua Li^{1,2}, Hang Zhang¹, and Cong Zhao^{1,2}
¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

OS1L-5 **17:40-18:00**

Wide Frequency Range Second Harmonic Suppression in Cascaded H-bridge Energy Storage Converters Using a Disturbance Observer

Jinhao Zhang, Fanqiang Gao, Zixin Li, Ye Zhang, Cong Zhao, and Yaohua Li
Chinese Academy of Sciences, China, University of Chinese Academy of Sciences, China

OS1L-6 **18:00-18:20**

Application of GaN E-HEMT to Reaction Wheel Motor Drive

David Lwo¹, Min-Fu Hsieh¹, Yen-Kai Kuo¹, Xue-Pin Lu¹, Chen-Lin Chan¹, and Chih-Chao Hsu²
¹National Cheng Kung University, Taiwan, ²National Chung-Shan Institute of Science and Technology, Taiwan

Program

Session OGS1

Organized Session 1: Rotating Machines for Traction and Propulsion Applications

Date: November 28
Time: 9:30-11:35
Venue: Room: A
Chair: Kenji Nakamura
Tohoku University, Japan
Kyohei Kiyota
Institute of Science Tokyo, Japan

OGS1-1 9:30-9:55
Motor Initiatives Aimed at Reduction of Rare-earth Usage
Shunji Oki
Nissan Motor Co., Ltd., Japan

OGS1-2 9:55-10:20
Development of High Power-density Motors for Electric Axles using Nd-based Bonded Magnets
Masahiro Kayano¹, Kenya Naruse^{1,2}, Choongsik Kim¹, Aki Watarai¹, Hironari Mitarai¹, and Kenji Nakamura²
¹AICHI STEEL Corporation, Japan, ²Tohoku University, Japan

OGS1-3 10:20-10:45
Integration of Motor Drive and Charger System with Two-phase Motor and H-bridge Inverter for Electric Vehicle
Soumei Nakatomi, Yoshihisa Kubota, Takumi Todoroki, Kiyoshi Asami, Keisuke Azusawa, Kota Kasaoka, and Keiya Nimura
Honda R&D Co., Ltd., Japan

OGS1-4 10:45-11:10
Increasing the Power Density of In-wheel Motor using Direct-drive Technology
Makoto Ito¹, Testuya Suto¹, Akeshi Takahashi², Takafumi Hara¹, and Ryuichiro Iwano¹
¹Hitachi, Ltd., Japan, ²Hitachi Astemo, Ltd., Japan

OGS1-5 11:10-11:35
Development of a Megawatt-class Engine Embedded Electric Machine for Aircraft Electrification
Tomoya Yamamoto¹, Takehiro Jikumaru¹, Ren Tsunata², and Masatsugu Takemoto²
¹IHI Corporation, Japan, ²Okayama University, Japan

Session OS2B

Linear Drives and Magnetic Levitations 1

Date: November 28
Time: 9:30-11:50
Venue: Room: B
Chair: Hiroyuki Ohsaki
The University of Tokyo, Japan
Jinhua Du
Xi'an Jiaotong University, China

OS2B-1 9:30-9:50
The Parameter Sensitivity Analysis of Linear Permanent Magnet Assisted Synchronous Reluctance Motor
Yu Hanchuan, Xuzhen Huang, and Zhuoran Zhang
Nanjing University of Aeronautics and Astronautics, China

OS2B-2 9:50-10:10
Maximizing Thrust Force and Reducing Eddy Current Loss in Arc Linear Servo Motors Using 3D FE Analysis of Partial Magnet Segmentation
Zuhair Abbas, Byoung-Wook Jo, Sung-Won Lee, Dae-Hyeon Kim, and Jin Hur
Incheon National University, Republic of Korea

OS2B-3 10:10-10:30
Effect of Primary Iron Core on Performance Characteristics of Linear Switched Reluctance Motor with High-temperature Superconducting Excitation Windings
Ryuto Motoda¹, Shuma Kawabata¹, and Tadashi Hirayama²
¹Kagoshima University, Japan, ²Kogakuin University, Japan

OS2B-4 10:30-10:50
Systemic Stability Evaluation of a Miniature Maglev Drive System for a Pediatric Left Ventricular Assist Device
Nobuyuki Kurita^{1,2,3,4}, Victor Tedesco³, Ethan Maddin³, Chris Hoi Hong Chan³, Iki Adachi^{1,2}, O. H. Frazier^{1,3}, and Yaxin Wang³
¹Baylor College of Medicine, USA, ²Texas Children's Hospital, USA, ³Texas Heart Institute, USA, ⁴Gunma University, Japan

OS2B-5 10:50-11:10
Design Method and Systemic Robustness Evaluation for the Magnetically Levitated Drive System of a Hemocompatibility Assessment Platform
Nobuyuki Kurita^{1,2,4}, Victor Tedesco³, Ethan Maddin³, Chris Hoi Hong Chan³, Iki Adachi^{1,2}, O. H. Frazier^{1,3}, and Yaxin Wang³
¹Baylor College of Medicine, USA, ²Texas Children's Hospital, USA, ³Texas Heart Institute, USA, ⁴Gunma University, Japan

OS2B-6 11:10-11:30
Additive Manufacturing Overlapping Winding for Enhanced Performance of a Coreless Permanent Magnet Synchronous Linear Motor
Zheng Wang, Xuzhen Huang, and Jing Li
Nanjing University of Aeronautics and Astronautics, China

OS2B-7 11:30-11:50
Research on the Characteristics of Multi-mover Independent Coil Permanent Magnet Linear Synchronous Motor
Qinwei Sun, Mingyi Wang, Minghong Liu, and Liyi Li
Harbin Institute of Technology, China

Session OS2C

Permanent Magnet Machines 2

Date: November 28
Time: 9:30-11:50
Venue: Room: C
Chair: Yoshihiro Miyama
Mitsubishi Electric Corporation, Japan
Yanlei Yu
Nanyang Technological University, Singapore

OS2C-1 9:30-9:50
Optimal Design of Fractional Slot Number Using Response Surface Method on the Cogging Torque and Unbalanced Magnetic Pull Reduction in Permanent Magnet Machine
Tajuddin Nur¹, Syamsir Abduh², Herlina³, and Eduard Muljadi⁴
¹Atma Jaya Catholic University of Indonesia, ²PLN Institute of Technology, Indonesia, ³Universitas Sriwijaya, Indonesia, ⁴Auburn University, USA

Program

OS2C-2 9:50-10:10

Design and Analysis of a Hybrid Excitation Synchronous Generator with Radial Additional Air-gaps

Longxin Du¹, Zhuoran Zhang¹, and Chen Wang²

¹Nanjing University of Aeronautics and Astronautics, China, ²Anhui Polytechnic University, China

OS2C-3 10:10-10:30

Achieving Magnetic Force and Cogging Torque Reduction in a Permanent Magnet Generator with Concentrated Slot Technique and Pole Arc Optimization at Magnet Edge

Syamsir Abduh¹, Tajuddin Nur², Eduard Muljadi³, and Herlina⁴

¹Institut Teknologi PLN, Indonesia, ²Universitas Katolik Indonesia Atma Jaya, Indonesia, ³Auburn University, USA, ⁴Sriwijaya University, Indonesia

OS2C-4 10:30-10:50

An Optimized Boundary to Characterize the Relationship between Training Data Quantity and Neural Network Accuracy in Describing Variable Parameters of PMSMs

Yilin Ma^{1,2}, Huan Yang^{1,2}, Rongxiang Zhao¹, and Xiangning He¹

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

OS2C-5 10:50-11:10

Design and Optimization of Magnetizer for Axial Flux Permanent Magnet Motor with Halbach Array

Puspa Subedi, Ju-Hyeong Moon B, and Dong-Woo kang C

Keimyung University, Republic of Korea

OS2C-6 11:10-11:30

Reconstruction Method of Stator Magnetomotive Force of High-speed Fault-tolerant Permanent Magnet Synchronous Motor with Single Winding Independent Control Structure

Zhibai Gao¹, Jiwei Cao¹, Chengbao Zhong², Jiayi Liu¹,

Yuchen Song¹, and Liyi Li¹

¹Harbin Institute of Technology, China, ²Guangdong Provincial Key Laboratory of High-Performance Servo System, China

OS2C-7 11:30-11:50

Fast Diagnosis of Faults with One-phase High-resistance Characteristics in FPPMSM

Wei Liu, Zihang Yuan, Chengde Tong, Mingqiao Wang, and Ping Zheng

Harbin Institute of Technology, China

Session OS2D

Synchronous Machines 1

Date: November 28

Time: 9:30-11:50

Venue: Room: D

Chair: Yuichi Yokoi

Nagasaki University, Japan

Hao Chen

Zhejiang University, China

OS2D-1 9:30-9:50

Validation of the Analytical Prediction of the Damper Winding Pole-to-pole Impedance in Hydro Generators

Andreas Ridder¹, Allan de Barros¹, Urban Lundin², Bo Hernnäs^{2,3}, Babette Schwarz⁴, and Bernd Ponick¹

¹Leibniz University Hannover, Germany, ²Uppsala University, Sweden, ³Voith Hydro AB, Sweden, ⁴Voith Hydro Holding GmbH & Co. KG, Germany

OS2D-2 9:50-10:10

Digitalization of Excitation Control Circuit for Self-starting Salient-pole Synchronous Motor

K. Matsuura, Y. Kosugi, and T. Watanabe

TMEIC Corporation, Japan

OS2D-3 10:10-10:30

Shaft Voltage Reduction Technique by Layered-shield of Wound Field Synchronous Motor

Jun-Hyeok Heo¹, Jun-Kyu Kang¹, Jun-Hyuk Im², and Jin Hur¹

¹Incheon National University, Republic of Korea, ²Daegu Mechatronics & Materials Institute, Republic of Korea

OS2D-4 10:30-10:50

Temperature Calculation Method for Transposed Armature Windings and its Verification through Direct Measurement of Strand Temperatures

Kenichi Hattori¹, Kazuhiko Takahashi¹, Keiji Kobashi²,

Hiroshi Okabe³, and Seijiro Muramatsu

¹Mitsubishi Generator, Japan, ²Hokkaido University, Japan,

³Mitsubishi Heavy Industries, Japan

OS2D-5 10:50-11:10

Secondary-fault Diagnosis of a Rotating Rectifier in a Three-stage Starter-generator based on the Idle Winding Terminal Voltage

Shoucheng Li¹, Chenghao Sun¹, Wenjing Xu¹, Ji Pang²,

Sijia Cheng¹, Jiawei Zhang¹, Xinyu Li³, and Shuye Ding¹

¹Nanjing Normal University, China, ²Xi'an University of Posts & Telecommunications, China, ³State Grid Xi'an Electric Power Supply Company, China

OS2D-6 11:10-11:30

Static Testing System for Electromagnetic Torque Characteristics of Synchronous Motors

Jiuyin Zhang¹, Jian-Xin Shen¹, Wen-Jie Wan¹, Dan Shi¹, Shun Cai²,

and Yunchong Wang¹

¹Zhejiang University, China, ²University College London, UK

OS2D-7 11:30-11:50

Carbon Emission Evaluation and Comparison for Different Electric Machines

Xuebei Zhang, Zeyuan Xu, Fengyu Zhang,

Mostafa Ahmadi Darmani, Jianan Jiang, Chris Gerada,

and David Gerada

University of Nottingham, UK

Session OS2E

Numerical Analysis and Modeling 1

Date: November 28

Time: 9:30-11:50

Venue: Room: E

Chair: Yasuhito Takahashi

Doshisha University, Japan

OS2E-1 9:30-9:50

Fast Calculation of Proximity Loss Induced by Harmonic Current in Electrical Machines Using Magnetic Equivalent Circuit

Yixiang Yuan¹, Mostafa Ahmadi Darmani², Yuli Bao¹,

Xiaochen Zhang³, David Gerada², and He Zhang³

¹University of Nottingham Ningbo China, China, ²University of Nottingham, UK, ³Yongjiang Laboratory, China

OS2E-2 9:50-10:10

Rotational Magnetic Field Calculation of Electrical Motors by Incorporating a Modified Anisotropic Vector Hysteresis Model

Jiatong Yin, Yongjian Li, Shuaichao Yue, Hongtao Shi,

and Jiapeng Zhou

Hebei University of Technology, China

Program

OS2E-3 10:10-10:30

Study on Torque Ripple Reduction of Asymmetric Flux Barrier using Topology Optimization and Frozen Permeability Method

Shunsuke Yamamoto and Yuki Hidaka
Nagaoka University of Technology, Japan

OS2E-4 10:30-10:50

Theoretical Assessment of Electrical Steel Magnetic Components During PWM-type Conversion: A Comparison Between Two Hysteresis Models

Shengze Gao^{1,2}, Benjamin Ducharme^{3,4}, Yanhui Gao², and Xiaojun Zhao¹
¹North China Electric Power University, China, ²Oita University, Japan, ³Tohoku University, Japan, ⁴Univ Lyon, France

OS2E-5 10:50-11:10

Lumped Parameter Thermal Network Modeling and Analyzing for a 15 kW, 120000 rpm High-speed Cage Solid Rotor Induction Motor

Dongdong Zhang¹, Quan Zhang¹, Jiawei Yi¹, Shuaijun Chu², Zhihao Zhu¹, Min Sun¹, Qinyuan Dong¹, and Cunhao Rong³
¹Guangxi University, China, ²Xi'an Jiaotong University, China, ³Southeast University, China

OS2E-6 11:10-11:30

Modelling for PWM Carrier Loss Evaluation in Claw-pole Machine using MATLAB/Simulink

Yusuke Okunishi¹, Takashi Kosaka¹, Yu Hirai², Yoshihiro Miyama², and Hideaki Arita²
¹Nagoya Institute of Technology, Japan, ²Mitsubishi Electric Corporation, Japan

OS2E-7 11:30-11:50

Analytical Calculation of Cogging Torque Considering Core Reluctance by Using Equivalent Field Winding Model

Peidong Hu¹, Dong Yan¹, Zhen Zhang², Tingna Shi¹, and Changliang Xia^{1,2}
¹Zhejiang University, China, ²Zhejiang University Advanced Electrical Equipment Innovation Center, China

Session OS2F

Noise, Vibration and Reliability of Electric Machines 1

Date: November 28

Time: 9:30-11:50

Venue: Room: F

Chair: Katsutoku Takeuchi

Toshiba Infrastructure Systems & Solutions Corporation, Japan

Yatai Ji

Tsinghua University, China

OS2F-1 9:30-9:50

Precise Vibration Measurement with Mechanical Load Isolation for Sub-fractional Horsepower Motors

Shahin Asgari, Nejat Saed, and Annette Muetze
Christian Doppler Laboratory for Brushless Drives for Pump and Fan Applications, Austria, Graz University of Technology, Austria

OS2F-2 9:50-10:10

Temperature Impact on Insulation Lifetime During Electrical Endurance Tests

Yatai Ji¹, Paolo Giangrande², Weiduo Zhao³, Michael Galea⁴, Giampaolo Buticchi³, and Pinjia Zhang¹
¹Tsinghua University, China., ²University of Bergamo, Italy., ³University of Nottingham Ningbo China, China, ⁴University of Malta, Malta

OS2F-3 10:10-10:30

Compensation of Radial Mode 0 Vibration of an Electrically Excited Synchronous Machine using Harmonic Field Current Injection

Jonas Jansen and Axel Mertens
Leibniz University Hannover, Germany

OS2F-4 10:30-10:50

On the Use of Machine Learning to Improve the Analytical NVH Predictions of Electric Machines

Fabien Chauvicourt, Raluca Raia, Sebastian Ciceo, and Kohta Sugiura
Siemens Digital Industries Software, Belgium

OS2F-5 10:50-11:10

A Sparsity-driven Method to Iteratively Extract Motor Fault Signatures in Varying-speed Operations

Dehong Liu, Yebin Wang, and Shinya Tsuruta
Mitsubishi Electric Research Laboratories, USA

OS2F-6 11:10-11:30

Determination of the Equivalent Mechanical Properties of the Stator Core for Vibration Analysis in Hydro Generators

Allan de Barros¹, Amir Ebrahimi², Babette Schwarz³, and Bernd Ponick¹

¹Leibniz University Hannover, Germany, ²University of Bremen, Germany, ³Voith Hydro Holding GmbH & Co. KG, Germany

OS2F-7 11:30-11:50

Analysis and Suppression of Synchronous Reluctance Motors with Mirror Asymmetric Rotors

Yujie Yuan, Yawei Wang, Xuan Li, Yuanjian Chen, Yeming Zheng, and Ronghai Qu
Huazhong University of Science and Technology, China

Session OS2G

PM Motor Control 2

Date: November 28

Time: 9:30-11:50

Venue: Room: G

Chair: Tetsuya Kojima

Mitsubishi Electric Corporation, Japan

Frederik De Belie

Ghent University, Belgium

OS2G-1 9:30-9:50

A Dual Internal Mode Decoupling Control Strategy for Permanent Magnet Synchronous Motor Drives Fed by the Current Source Inverter

Yuzhuo Lu, Tianhao Yao, Youtong Wu, and Quntao An
Harbin Institute of Technology, China

OS2G-2 9:50-10:10

Current Source Inverter Drive System with Equivalent DC-machine Control Characteristics

Spasoje Mirić¹, Predrag Pejović², Takanobu Ohno¹, and Michael Haider
¹University of Innsbruck, Austria, ²University of Belgrade, Serbia

OS2G-3 10:10-10:30

Torque Synchronous Control for Dual-PMSM Contrarotating Propulsion System Based on Parameter Compensation

Minghao Wang, Mingqiao Wang, Chengde Tong, Ziyu Zhou, and Ping Zheng
Harbin Institute of Technology, China

Program

OS2G-4 10:30-10:50
Hybrid Frequency and Power Dual-converter for Harmonics Suppression of Open-end Winding High-speed PMSM

Yang Liang, Shuchen Xu, Shangze Li, Deliang Liang, Shaofeng Jia, Yuheng Wang, Shuaijun Chu, and Qidong Wen
Xi'an Jiaotong University, China

OS2G-5 10:50-11:10
Common Mode Voltage Elimination and Conducted EMI Reduction for Two-unit PMSM

Yongxiang Xu, Pan Wang, Haiyang Gao, Jibin Zou, and Shaoshan Jin
Harbin Institute of Technology, China

OS2G-6 11:10-11:30
Analysis of High-frequency Harmonics of the Common Mode Voltage Under AZSPWM1

Yongxiang Xu, Haiyang Gao, Pan Wang, and Jibin Zou
Harbin Institute of Technology, China

OS2G-7 11:30-11:50
Control Strategy Considering Angle Difference of PM Synchronous Motor with an Integrated Common-mode Voltage Filter

Jing Zhang¹, Xiaochen Zhang^{1,2}, Chunyang Gu^{1,2}, and Jing Li¹
¹University of Nottingham, China, ²Yongjiang Laboratory, China

Session OS2H

Synchronous Machine Control and Drives 1

Date: November 28

Time: 9:30-11:50

Venue: Room: H

Chair: Kiyohiro Iwama

Shizuoka University, Japan

Zhiwei Chen

Zhengzhou University of Light Industry, China

OS2H-1 9:30-9:50
An Active Disturbance Rejection Control Strategy for the HVDC Generation System of More Electric Aircraft

Yankun Wang, Zhuoran Zhang, Yiming Yao, Heng Shi, Hanqi Li, and Jincai Li
Nanjing University of Aeronautics and Astronautics, China

OS2H-2 9:50-10:10
A Starting Control Scheme for Dual Three-phase Three-stage Brushless Synchronous Starter/generator Based on VSD Conversion

Jun Zhang¹, Junwei Zhang², Kun Gao², Hanbing Dan¹, and Mei Su¹
¹Central South University, China, ²Aecc South Industry Company Limited, China

OS2H-3 10:10-10:30
Parameter-independent Back Electromotive Force Information Estimation Method of the Main Exciter of the Brushless Synchronous Starter Generator

Shuai Mao, Chongzhao Ma, Shuo Zhang, Ziqun Guo, Jiachen Shi, and Weiguo Liu
Northwestern Polytechnical University, China

OS2H-4 10:30-10:50
A Novel Field Current Estimation Method of the Brushless Synchronous Starter/generator

Chongzhao Ma, Shuai Mao, Guangzhao Luo, Weiguo Liu, Ziqun Guo, and Shuo Zhang
Northwestern Polytechnical University, China

OS2H-5 10:50-11:10
Q-axis Current-based Excitation Current Calculation Method for Torque Ripple Suppression of Hybrid Excitation Machine

Changzhou Lu, Zhuoran Zhang, Xiangpei Gu, Yao Sun, Taiyang Dai, and Weijia Jiang
Nanjing University of Aeronautics and Astronautics, China

OS2H-6 11:10-11:30
Suspension Control for Bearingless Doubly Salient Electromagnetic Motor Considering Magnetic Saturation Based on Back Propagation Neural Network

Zhongshan Luo, Li Yu, Wei Chen, and Haonan Zou
Nanjing University of Aeronautics and Astronautics, China

OS2H-7 11:30-11:50
Small-signal Modeling and Impedance Analysis of Doubly Salient Electrical-magnetic Generator Considering Saturation

Lu Wang, Li Yu, Yiming Yao, Yongtao Guan, and Zhuoran Zhang
Nanjing University of Aeronautics and Astronautics, China

Session OS2I

Sensorless Control 1

Date: November 28

Time: 9:30-11:50

Venue: Room: I

Chair: Atsushi Shinohara

Kagoshima University, Japan

Jiadan Wei

Nanjing University of Aeronautics and Astronautics, China

OS2I-1 9:30-9:50
Discrete Variable Gain Second-order Sliding Mode Observer Design for Position-sensorless Control of Permanent Magnet Synchronous

Jiangwen Liu, Chengming Zhang, Pengrui Fu, Yiming Sun, Chaoyu Zhang, and Liyi Li
Harbin Institute of Technology, China

OS2I-2 9:50-10:10
An Improved Speed Observer Based on Current Prediction Compensation for PMSM Sensorless Control

Zhe Chen¹, Cong Gao¹, Peiyang Chen¹, Jincheng Li¹, Hang Zhang², and Guangzhao Luo¹
¹Northwestern Polytechnical University, China, ²Xi'an University of Technology, China

OS2I-3 10:10-10:30
Improvement of Sensorless Rotor Angle Estimation using Zero-sequence Voltage Measurement

Robin Meisinger¹, Wolfgang Gruber¹, and Siegfried Silber²
¹Johannes Kepler University Linz, Austria, ²Linz Center of Mechatronics, Austria

OS2I-4 10:30-10:50
Dynamic Position Estimator for a PMSM using Regular Current Sampling and Numerical Optimisation

Viktor Willich, Niklas Himker, and Axel Mertens
Leibniz University Hannover, Germany

OS2I-5 10:50-11:10
An Improved Speed Estimation Method for PMSM Using Speed Correction

Weiqliang Sun¹, Zhebin Yang¹, Xiaojun Zhang¹, Anqi Situ¹, Yuqi Jia², and Jiaqiang Yang¹
¹Zhejiang University, China, ²Aviation Key Laboratory of Science and Technology on Aero Electromechanical System Integration, China

Program

OS2I-6 11:10-11:30
Double ESO Aided Nonlinear Flux Observer for Sensorless Control of PMSM

Zhe Chen¹, Jincheng Li¹, Kun Zhang², Mingyuan Zhangliu¹, Hang Zhang³, and Guangzhao Luo¹
¹Northwestern Polytechnical University, China, ²Nanjing Engineering Institute of Aircraft Systems, China, ³Xi'an University of Technology, China

OS2I-7 11:30-11:50
Sensorless Control Strategy for Permanent Magnet Synchronous Motors Based on Enhanced SOGI-FLL with Limit Cycle Oscillator

Siqi Wang¹, Guoqiang Zhang¹, Yuan Yuan², Kai Tian², Xiangqian Zhang², Shuhui Jin², Gaolin Wang¹, and Dianguo Xu¹
¹Harbin Institute of Technology, China, ²Tianjin Research Institute of Electric Science Co., Ltd., China

Session OS2J

Motion Control and Servo Systems

Date: November 28

Time: 9:30-11:50

Venue: Room: J

Chair: Seiichiro Katsura

Keio University, Japan

OS2J-1 9:30-9:50
Integrated Motor Control with Active Bearings for Speed Regulation with Rotor Imbalance

Tingyu Lin, Dunant Halim, Zhuang Xu, and Chung Ket Thein
University of Nottingham Ningbo China, China

OS2J-2 9:50-10:10
Iterative Learning Controller Based on Linear Extended State Observer for Six-degree-of-freedom Micro-motion Stage

Junchi Li, Mingyi Wang, Minghong Liu, Chengming Zhang, and Liyi Li
Harbin Institute of Technology, China

OS2J-3 10:10-10:30
Speed Control of Separately Excited DC Motor Using Fuzzy Logic Controller

Jeerawan Homjan¹, Phonsit Santiprapan², and Chakrit Panpean³
¹Rajamangala University of Technology Suvarnabhumi, Thailand, ²Prince of Songkla University, Thailand, ³King Mongkut's University of Technology, Thailand

OS2J-4 10:30-10:50
Advanced Task Realization by Robot Fingers Using Mode Quarry Matrix

Aina Kojima, Shunichi Sakurai, and Seiichiro Katsura
Keio University, Japan

OS2J-5 10:50-11:10
Motion Analysis of Gravity Compensation Mechanism with Low Inertia Using Parallel Wire Mechanism

Yusaku Kuroki and Seiichiro Katsura
Keio University, Japan

OS2J-6 11:10-11:30
A Comparative Study of Vibration Damping Based on Wave Model—Decoupling Reflected Waves from Traveling Waves

Kosuke Shikata¹, Krzysztof Szabat², and Seiichiro Katsura¹
¹Keio University, Japan, ²Wroclaw University of Science and Technology, Poland

OS2J-7 11:30-11:50
Development of a Pneumatic Leader-follower System with Force Feedback

Keisuke Goto, Hajime Moriguchi, Hiroaki Kobayashi, and Osamu Ichikawa
Polytechnic University, Japan

Session OS2K

Power Converter 1 (DC-DC)

Date: November 28

Time: 9:30-11:50

Venue: Room: K

Chair: Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

Tzung-Lin Lee

National Sun Yat-sen University, Taiwan

OS2K-1 9:30-9:50
Enhanced Model Predictive Controller Utilizing Kalman Filter for Dual Active Bridge Converter in More Electric Aircraft

Han Wu, Bingqiang Li, Dongheng Wang, Saleem Riaz, and Yuening Deng
Northwestern Polytechnical University, China

OS2K-2 9:50-10:10
Non-inverting Buck-boost (NIBB) Converter Analysis of GaN Half Bridges Operation for 24V Unity Conversion Ratio

Ravi Nath Tripathi
Kyushu Institute of Technology, Japan

OS2K-3 10:10-10:30
A Dual Three-phase LLC Resonant Converter with Phase Shedding Strategy for High Power Application

Xinghong Luo¹, Xuliang Yao¹, Yannan Gao², and Jingfang Wang¹
¹Harbin Engineering University, China, ²Guangdong Ocean University, China

OS2K-4 10:30-10:50
Ripple Current Compensation of DAB Converter with Matching Transformer-less Series DC Active Filter in DC Distribution Feeder

Yuya Abe and Yamada Hiroaki
Yamaguchi University, Japan

OS2K-5 10:50-11:10
Adaptive Neuron Adjustment for Transient Accuracy Enhancement in FPGA-based Power Electronics Simulation

Haowen Weng, Zixiang Liao, and Can Wang
Harbin Institute of Technology (Shenzhen), China

OS2K-6 11:10-11:30
A Multicellular Converter Topology Allowing for the Scaling of GaN HEMTs to Higher Power Applications

Jordon A Dobson¹, Alan J Watson¹, Paul Evans¹, Neo Lophitis¹, Mark Johnson¹, and Rob Leedham²
¹University of Nottingham, UK, ²Amantys Power Electronics Ltd, UK

OS2K-7 11:30-11:50
Multiple Output Power Supply Utilizing Multi-winding Transformers

Thanachot Srirongkol, Narong Thumputi, and Satit Owatthaiphong
King Mongkut's University of Technology, Thailand

Program

Session OS2L

Power Electronics of Mobility Applications

Date: November 28

Time: 9:30-11:50

Venue: Room: L

Chair: Junichi Itoh

Nagaoka University of Technology, Japan

Burin Yodwong

King Mongkut's University of Technology, Thailand

OS2L-1 9:30-9:50

A Seamless Operation of Bidirectional Battery Charger for Electric Vehicles with Power Quality Compensator

Reo Emoto¹, Shun Okamoto², Fuka Ikeda², Masayuki Okamoto², Hiroaki Yamada¹, and Toshihiko Tanaka¹

¹Yamaguchi University, Japan, ²National Institute of Technology, Ube College, Japan

OS2L-2 9:50-10:10

Adaptive Stabilization of a Three-stage Brushless Generator-based DC Electrical Power System in More Electric Aircraft

Fan Yang, Xin Chen, Donghui Zhang, and Zhiyuan Teng
Nanjing University of Aeronautics and Astronautics, China

OS2L-3 10:10-10:30

Analysis of the Vehicle-grid System Stability Considering Electromagnetic Transient Characteristics of High-speed Railway Vehicles

Wenjing Tian, Chenghao Liu, Sixian Zhu, Jien Ma, Lin Qiu, Zhenzhi Lin, and Youtong Fang
Zhejiang University, China

OS2L-4 10:30-10:50

Quantification of Steady-state Efficiency Maps vs. Time-stepping Solutions for Drive Cycle Performance Analysis of Induction Motors

Kourosh Heidarikani, Pawan Kumar Dhakal, Roland Seebacher, and Annette Muetze
Graz University of Technology, Austria

OS2L-5 10:50-11:10

A Novel Phase-unit Axial-modular Permanent Magnet Machine with U-core Stators for Aerospace Propulsion System

Yanlei Yu¹, Feng Chai², Yulong Pei², Guanghui Yang³, and Christopher H. T. Lee¹

¹Nanyang Technological University, Singapore, ²Harbin Institute of Technology, China, ³Zhejiang University of Technology, China

OS2L-6 11:10-11:30

Superconducting-based Power Transmission Architecture Design for Hydrogen Hybrid-electric Aircraft

Heng Yu, Yulong Li, Enze Ma, Huaqi Lian, Xingjian Li, and Shijie Xu
Beihang University, China

OS2L-7 11:30-11:50

Design Study on High Power Density Quasi-coreless PMSM for Vehicle Traction Drive Rotating at 50,000r/min as the Maximum Speed

Teruchika Ishihara, Ayaka Sakuma, and Takashi Kosaka
Nagoya Institute of Technology, Japan

Session PS2-1

Permanent Magnet Machines 9

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS2-1-1

Robust Design Considering Assembly Imperfection of 20 W Chip Moulder Motor

Su-Hwan Kim, Jun-Kyu Kang, Jun-Hyeok Heo, Ikhlmaq Ahmad, and Jin Hur

Incheon National University, Republic of Korea

PS2-1-2

Design and Analysis of Service Robot Motor with High Torque and High Back Drivability Focusing on the Torque/inertia Ratio

Toshihide Yamada¹, Yoshihiro Okumatsu¹, Hiroyuki Kaimori², and Hideki Ohguchi³

¹TOYOTA MOTOR Co., Japan, ²Science Solutions International Laboratory, Inc., Japan, ³Tokai Univ., Japan

PS2-1-3

Impact of Partially Demagnetized Permanent Magnets on Operating Range of an Interior Permanent Magnet Synchronous Machine

Pavel Ogrizek, Mitja Garmut, and Martin Petrun
University of Maribor, Slovenia

PS2-1-4

Selection and Analysis of Rotor Structure for Expansion of IPMSM Operating Range

Arisa Matsuo, Yusuke Yatsu, and Kenji Suzuki
Tokyo City University, Japan

PS2-1-5

Analysis and Research on the Influence of Different Rotor Structures on the Magnetic Field Characteristics of Machines

Xiaoyu Liang, Xinyu Dong, Mingqiao Wang, Ping Zheng, Yong Liu, Minghao Wang, and Wei Liu

Harbin Institute of Technology, China

PS2-1-6

Design and Analysis of Axial Flux Motors with Rotor Mechanical Position Observation Capability

Wei Chen^{1,2}, Xiaogang Lin², Guohao Jiang², Tao Zheng², and Wei Xie²

¹Fuzhou University, China, ²Chinese Academy of Sciences, China

PS2-1-7

Electromagnetic Reduced Order Model of a Permanent Magnet Synchronous Motor

Grace Firsta Lukman¹, Gyeongwan Yun¹, Chansoo Park², Dongmin Park², and Cheewoo Lee¹

¹Pusan National University, Republic of Korea, ²LG Electronics, Republic of Korea

PS2-1-8

Eddy Current Loss Suppression of Rotor in HSPMSG Considering Skin Effect

Guodong Yu, Xudong Bai, Haoyi Mu, Yongxiang Xv, and Jibin Zou
Harbin Institute of Technology, China

Program

Session PS2-2

Synchronous Machines 2

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS2-2-1

Sensorless Rotor Position Estimation and Control for a Three-stage Synchronous Starter-generator

Shu-An Chin^{1,2}, Min-Fu Hsieh¹, Xue-Pin Lu¹, Yong-Han Huang¹, I-Hsien Lin², and Kuang-Pin Chen²

¹National Cheng Kung University, Taiwan, ²National Chung-Shan Institute of Science and Technology, Taiwan

PS2-2-2

Characteristic Analysis of Demagnetizing Fault of Pod Propulsion Motor

Heng Kuang^{1,2}, Yang Xiao¹, Zhang Wen¹, and Yanan Wang¹

¹Wuhan Institute of Marine Electric Propulsion, China, ²Shenyang University of Technology, China

PS2-2-3

Design of Electrically Excited Synchronous Motors for Traction Applications Using Optimisation with Genetic Algorithms

Leander Philipp Eschenmann¹, Christian Nörenberg², and Bernd Ponick¹

¹Leibniz University Hannover, Germany, ²Audi AG, Germany

PS2-2-4

Inductance Measurement of Synchronous Motors with Solid Elements Using Quasi-static Approach Considering Saturation Effects

Andrea Credo¹, Simone Mari¹, Federico Centi¹, Marco Tursini¹, Ilya Petrov², and Juha Pyrhönen²

¹University of L'Aquila, Italy, ²Lappeenranta University of Technology, Finland

PS2-2-5

Comparison of Hysteresis Motor Output According to Applied Voltage

Seung-Min Song, Ji-Hoon Han, Eui-Jin Choi, Jong-Hoon Park, and Sun-Ki Hong

Hoseo University, Republic of Korea

PS2-2-6

Torque Ripple Effects According to Hysteresis Motor Closed-slot Structures Geometry with Finite Element Analysis

Jong-Hoon Park, Ji-Hoon Han, Seung-Min Song, and Sun-Ki Hong

Hoseo University, Republic of Korea

PS2-2-7

Simulation, Design and Optimization of an Electric High-speed Motor with Distributed Tooth-coil Winding

Marco Garbe¹, Daniel Dieterich¹, Juri Dolgirev², Michael Magin¹, and Sven Urschel¹

¹Kaiserslautern University of Applied Sciences, Germany, ²EGH Elektro-Geraetebau-Hambruecken, Germany

PS2-2-8

A Parallel Hybrid Excitation Brushless Generator Operating Efficiently within Wide-speed Range

Weijia Jiang, Zhuoran Zhang, Xiangpei Gu, Taiyang Dai, and Changzhou Lu

Nanjing University of Aeronautics and Astronautics, China

PS2-2-9

Research on a New Topology of Asynchronous Excitation Three Stage Brushless Generator without Rotating Rectifier

Haonan Tian, Zhuoran Zhang, Jincai Li, and Yankun Wang

Nanjing University of Aeronautics and Astronautics, China

Session PS2-3

Reluctance machines 2

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS2-3-1

Temperature-rise Determination Test for Synchronous Reluctance Machines Applying Superposition and Equivalent-loading Methods

Katsutoku Takeuchi¹, Makoto Matsushita¹, Masatsugu Oyamada², Sunao Wakasugi², Yusuke Moriyama², and Fumiya Koga²

¹Toshiba Infrastructure Systems & Solutions Corporation, Japan, ²TMEIC Corporation, Japan

PS2-3-2

Design and Optimization of a Ferrite Assisted Synchronous Reluctance Motor for New Energy Vehicles

Bin Chen^{1,2}, Yong Xiao^{1,2}, Xia Li^{1,2}, Xueqiu Han², Yusheng Hu^{1,2,3}, and Liyi Li³

¹Guangdong Provincial Key Laboratory of High-Performance Servo System, China, ²GREE ELECTRIC APPLIANCES INC. of ZHUHAI, China, ³Harbin Institute of Technology, China

PS2-3-3

Design and Verification of IE6 Ultra Efficiency Line-start Permanent Magnet Assisted Synchronous Reluctance Motor

Yusheng Hu^{1,2}, Yong Xiao^{1,2}, Jinfei Shi^{1,2}, Bin Chen^{1,2}, Ying Li², and Liyi Li³

¹Guangdong Provincial Key Laboratory of High-Performance Servo System, China, ²GREE ELECTRIC APPLIANCES, INC. of ZHUHAI, China, ³Harbin Institute of Technology, China

PS2-3-4

Axial Design Guidelines for Torque Ripple Reduction in Additively Manufactured Synchronous Reluctance Rotors

Marius Schubert and Bernd Ponick

Leibniz University Hannover, Germany

PS2-3-5

Assessments of Permanent-magnet-assisted Synchronous Reluctance Motors for Electric Forklift Applications in Severe Operational Environments

Cheng-Tsung Liu¹, YiYun Fu¹, Sheng-Chan Yen², Ta-Yin Luo², and Kuan Yang²

¹National Sun Yat-sen University, Taiwan, ²Nidec Taiwan Corporation, Taiwan

PS2-3-6

Static Torque Characteristics of SRM with a Three-dimensional Gap Structure

Iori Shimohama¹, Kazuhiro Ohyama¹, Hiroaki Fujii², Hitoshi Uehara², and Yasushi Hyakutake²

¹Fukuoka Institute, Japan, ²Meiwa MFG. Co., Ltd., Japan

Program

PS2-3-7

Fault-tolerant Control for Power Converter in Switched Reluctance Motor (SRM) Applications

Paisak Poolphaka¹, Pairote Thongprasri², Ehsan Jamshidpour³, Thierry Lubin⁴, and Nouredine Takorabet⁵

^{1,2}Kasetsart University Si Racha Campus, Thailand, ^{3,4,5}University of Lorraine, France

PS2-3-8

Performance Evaluation of Novel Segmental Rotor Switch Reluctance Motor with Magnetic Bridge

Sinian Su¹, Jianbo Sun¹, Shuixi Zhang², Honggang Wang³, Shuanghong Wang¹, Yang Yang¹, Ziqi Zhao¹, Ronghai Qu¹, and Huangyuan Wu⁴

¹Huazhong University of Science and Technology, China, ²State Grid Henan Power Company Luohe Power Supply Company, China, ³Henan Tailong Power Equipment Co., Ltd., China, ⁴Cyan Exploring Power Technology Wuxi Co, China

Session PS2-4

Linear Drives and Magnetic Levitations 3

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS2-4-1

Method for Enhancing the Stability Margin of the Magnetic Bearing-rotor System Based on a Novel Low Frequency Phase Shifter

Yang Yan^{1,2}, Kun Wang^{1,2}, Shiqiang Zheng^{1,2}, Le Bo^{1,2}, Min Zhang^{1,2}, and Yucheng Ge^{1,2}

¹Beihang University, China, ²National Institute of Extremely-Weak Magnetic Field Infrastructure, China

PS2-4-2

Study of the Basic Charging Characteristics in the Vertical Linear Vibration Power Generator

Hodaka Kojima, Eiji Shirahama, Ken-ichi Kondo, and Shunsuke Ohashi

Kansai University, Japan

PS2-4-3

Study of Pitching Suppression in a Propulsion and Levitation Integrated Conveyance System Using the Linear Stepper Motor

Shota Mitsui, Akito Konishi, Ken-ichi Kondo, and Shunsuke Ohashi

Kansai University, Japan

PS2-4-4

Non-contact Hanging for Flexible Steel Plate by Magnetic Levitation: Investigation on Levitating Characteristics in Stationary State

Rintaro Itoyama¹, Ayato Endo¹, Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Taro Kato⁶, Takayoshi Narita², and Hideaki Kato²

¹Fukuoka Institute of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology, Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Tokyo University of Technology, Japan

PS2-4-5

Placement of Electromagnets for Edge-supported Maglev Systems: Experimental Study on the Relationship between Steady Current and Vibration Characteristics during Electromagnet Direction Change

Shotaro Baba¹, Ayato Endo¹, Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Taro Kato⁶, Takayoshi Narita², and Hideaki Kato²

¹Fukuoka Institute of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology, Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Tokyo University of Technology, Japan

PS2-4-6

Improvement Technology of Driving-environment Using Two-degree-of-freedom Active Seat Suspension: Design of Ride Comfort by Vibration Control Using Voice Coil Motor

Eiichi Okamura¹, Ayato Endo¹, Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Taro Kato⁶, Hideaki Kato², and Takayoshi Narita²

¹Fukuoka Institute of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology, Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Tokyo University of Technology, Japan

PS2-4-7

Non-contact Magnetic Suspension for Edge of Flexible Steel Plate: Experimental Consideration on Stable Levitation

Kazuma Kawashima¹, Ayato Endo¹, Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Taro Kato⁶, Takayoshi Narita², and Hideaki Kato²

¹Fukuoka Institute of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology, Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Tokyo University of Technology, Japan

PS2-4-8

Vibration Control for Flexible Steel Plate during Magnetic Suspension: Suppression of Two-degree-of-freedom Vibration by Edge Supported System

Seita Onitsuka¹, Ayato Endo¹, Jumpei Kuroda², Daigo Uchino³, Kazuki Ogawa⁴, Keigo Ikeda⁵, Taro Kato⁶, Takayoshi Narita², and Hideaki Kato²

¹Fukuoka Institute of Technology, Japan, ²Tokai University, Japan, ³National Institute of Technology, Numazu College, Japan, ⁴Aichi University of Technology, Japan, ⁵Hokkaido University of Science, Japan, ⁶Tokyo University of Technology, Japan

PS2-4-9

Influence of Blade Row Stages on the Pumping Speed of Molecular Pump Based on Entire Blade Row Algorithm

Hao Li¹, Kun wang¹, Zhanpeng Cui¹, Shiqiang Zheng¹, and Yin Zhang²

¹Beihang University, China, ²Hangzhou Kuntai Maglev Technology Co., Ltd., China

Session PS2-5

Induction Machine Control and Drives

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Takayuki Miyajima

Daikin Industries, Ltd., Japan

Program

PS2-5-1

Improvement of Control Mode Switching Method for Copper Loss Reduction of Induction Machines

Ryosuke Kubota¹ and Kazuhiro Ohyama²

¹Fukuoka Institute of Technology, Junior College, Japan, ²Fukuoka Institute of Technology, Japan

PS2-5-2

Initial Speed Estimation Method for Induction Motors using Regression Analysis and Self-excited Vibration Phenomenon

Hiroto Kominami¹, Yoshitaka Iwaji¹, Naoki Kunihiro², Kazuma Okuda², and Takashi Kaneko²

¹Ibaraki University, Japan., ²Hitachi, Ltd., Japan

PS2-5-3

A Novel Speed Measurement Algorithm Based on Linear Extended State Observer for Segmented Linear Induction Motors with Cooperative Control

Fan Manyi^{1,2}, Liming Shi^{1,2}, Yaohua Li^{1,2}, Fei Xu^{1,2}, and Zhang Bo¹

¹Key Laboratory of High Density Electromagnetic Power and Systems (Chinese Academy of Sciences), China, ²Shandong Key Laboratory of Advanced Electromagnetic Conversion Technology (Institute of Electrical Engineering and Advanced Electromagnetic Drive Technology, Qilu Zhongke), China

PS2-5-4

An Improved PLL Control Method for DFIG Under Asymmetric Faults

Xianglong Kong, Hailiang Xu, Pingjuan Ge, Xiangyu Chen, and Ruitong Mao

China University of Petroleum (East China), China

PS2-5-5

Transient Control of Grid-forming Doubly-fed Induction Generator Considering Power Angle Stability and Fault Current Limitation

Ruitong Mao, Pingjuan Ge, Hailiang Xu, and Xianglong Kong
China University of Petroleum (East China), China

Session PS2-6

Synchronous Machine Control and Drives

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Takayuki Miyajima

Daikin Industries, Ltd., Japan

PS2-6-1

An Open-circuit Fault Diagnosis Method for Single Switch of Controlled Rectifier in Doubly Salient Electromagnetic Generator System

Wenbo Zhou¹, Bo Zhou¹, Yijun Zhang¹, Wenjing Fang¹, and Xie Xie¹

¹Nanjing University of Aeronautics and Astronautics, China

PS2-6-2

Reduction of Iron Loss and Back EMFs of the Doubly Salient Synchronous Reluctance Motor by Estimation of Flux Linkage

Ryo Hasegawa¹ and Kyohei Kiyota¹

¹Tokyo Institute of Technology, Japan

PS2-6-3

The Loss-minimizing Control Strategy for DSEM Driving System with Current Source Converter

Sen Wang, Jiadan Wei, Xiangyu Zhai, and Yidi Meng

Nanjing University of Aeronautics and Astronautics, China

PS2-6-4

A High Frequency Square Wave Harmonic Excitation Control Strategy for Self-excited Synchronous Motors

Yuwei Zhao^{1,2}, Xiaogang Lin¹, and Wei Xie¹

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS2-6-5

A Novel Brushless Excitation System Capable of Bipolar Field Current Control from the Stator of Electrically/Hybrid-excited Synchronous Motor

Shovan Dey, Annoy Kumar Das, and Baylon G. Fernandes

Indian Institute of Technology Bombay, India.

PS2-6-6

Robust Current Predictive Control of Synchronous Reluctance Machines Considering Magnetic Saturation

Yu Sui, Chong Bao, Haina Sun, and Shoujun Song

Northwestern Polytechnical University, China

PS2-6-7

Efficiency Optimization Control Strategy for Synchronous Reluctance Motor Considering Iron Loss

Chong Bao, Yu Sui, Chenyi Yang, Lvan Su, Haina Sun, and Shoujun Song

Northwestern Polytechnical University, China

PS2-6-8

Adaptive Dead-time Algorithm to Reduce Current Harmonics in Three-phase Motor Inverters Used for Electric Vehicles

Nguyen Gia Minh Thao¹, Duc-Kien Ngo², Md Yakub Ali Khan¹, Arockia Selvakumar Arockia Doss³, Motoki Ota¹, and Keisuke Fujisaki⁴

¹Shimane University, Japan, ²University of Danang–University of Technology and Education, Vietnam, ³Vellore Institute of Technology, India, ⁴Toyota Technological Institute, Japan

PS2-6-9

Study on Minimization of Smoothing Capacitor by Increasing Response of Power Supply Converter

Yoshiya Sato and Yoshitaka Iwaji

Ibaraki University, Japan

Session PS2-7

PM Machine Control and Drives (III)

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Takayuki Miyajima

Daikin Industries, Ltd., Japan

PS2-7-1

Robust Model Predictive Control Based on Linear Fitting for Surface-mounted Permanent Magnet Synchronous Motor

Hanrui Wang^{1,2}, Nannan Sun^{1,2}, Chen Li^{3,4}, Youliang Fu^{1,2}, Qinghui Meng^{1,2}, Yanfei Cao⁴, Guangjie Shao^{1,2}, Fei Wang^{1,2}, and Jing Zhang^{1,2}

¹Weichai Power Co., Ltd., China, ²State Key Laboratory of Engine and Powertrain System, China, ³Zhejiang University Advanced Electrical Equipment Innovation Center, China, ⁴Zhejiang University, China

PS2-7-2

A Feedback-error-driven Method for Deadbeat Model Predictive Control Algorithm of PMSM

Zhiman Lu, Jinglin Liu, and Jiasheng Yin

Northwestern Polytechnical University, China

Program

PS2-7-3

Quantitative Neutral Point Voltage Balance-based Modulated Model Predictive Control for Three-level NPC Inverter-fed PMSM Drive

Guoqian Sun, Chun Gan, Chong Zhang, and Ronghai Qu
Huazhong University of Science and Technology, China

PS2-7-4

A Modified Modulation Strategy for a Five-level Inverter Based Open-end Winding PMSM with Floating Capacitor

Shuchen Xu, Yang Liang, and Deliang Liang
Xi'an Jiaotong University, China

PS2-7-5

Model-free Current Predictive Control of Permanent Magnet Synchronous Motor based on Ultralocal Model

Mohan Yang¹, Hongfeng Li¹, Kexin Yao², and Haobo Xu¹
¹Tianjin University, China, ²Huazhong University of Science and Technology, China

PS2-7-6

Optimized Predictive Power Control of PMSG with Horizon Disturbance Observer

Zhenxing Cheng¹, Liyi Li¹, Xiaopeng Li², Chengbao Zhong³, and Jiayi Liu¹
¹Harbin Institute of Technology, China, ²China Academy of Engineering Physics, China, ³Gree Electric Appliances, China

PS2-7-7

Multi-motor Coordinated Control System of Outer Rotor Permanent Magnet Synchronous Motor

Biao Hou, Fengge Zhang, and Shi Jin
Shenyang University of Technology, China

PS2-7-8

Implementation of Two-wheel Independence Drive System Based on Indirect Field-oriented and Direct Torque Control Strategies

Rachain Saita, Satit Owatchaiphong, and Narong Thumputi
King Mongkut's University of Technology, Thailand

PS2-7-9

PMSM Characteristics Comparison of Rheostatic Brake Circuit Differences Targeted for Electric Hybrid Aircraft

Shunsuke Noguchi
Japan Aerospace Exploration Agency, Japan

PS2-7-10

Compensation of Speed Synchronization Error of 4-wheel Distributed Drive System based on Fuzzy PI and Virtual PMSM Coupling Control

Chenkai Ma¹, Jianbo Wang¹, Liang Han², Kan Liu¹, Wei Hu¹, Jing Zhou¹, Shichao Zhou¹, Kaiqing Li¹, and Tao Peng¹
¹Hunan University, China, ²China Railway Rolling Stock Corporation, China

Session PS2-8

Multi-winding/Multi-phase Machine Control

Date: November 28
Time: 12:00-13:00
Venue: FIT Arena
Chair: Takayuki Miyajima
Daikin Industries, Ltd., Japan

PS2-8-1

A Robust H_∞ Control Strategy for Enhanced Performance of Multiphase PMSM

Yongbo Li¹, Hongwei Ma¹, and Zedong Zheng²
¹Beijing Institute of Technology, China, ²Tsinghua University, China

PS2-8-2

An Improved Deadbeat Direct Torque and Flux Control of Five-phase Permanent Magnet Synchronous Motor

Yujia Zhang, Yang Shen, Zhenxiao Yin, Yuxuan Liang, and Hang Zhao
Hong Kong University of Science and Technology (Guangzhou), China

PS2-8-3

Direct Torque Control System of Dual Three-phase PMSM with Load Torque Observer

Dajun Chen, Xiang Li, Ruiwu Cao, Ning Jiang, and Kai Wang
Nanjing University of Aeronautics and Astronautics, China

PS2-8-4

Order Reduction-based Fault-tolerant Decoupling Control for Dual Three-phase PMSM with Two-phase Open-circuit Fault

Cong Huang, Wei Hu, Kan Liu, Jianbo Wang, Wen Li, Jing Zhou, Tao Peng, Wenrui Liu, and Chenkai Ma
Hunan University, China

PS2-8-5

Fault-tolerant Control Strategies for Dual Three-phase Permanent Magnet Synchronous Machine with YASA Topology under Open-circuit Faults

Zhihong Liu¹, Lingyun Shao¹, Zhuoran Zhang¹, Xueyi Yan², and Zhongze Wu²
¹Nanjing University of Aeronautics and Astronautics, China, ²Southeast University, China

PS2-8-6

Research on Fault-tolerant Control Strategy of Dual-winding Permanent Magnet Synchronous Motor

Shuo Liu¹, Shi Jin¹, Guangwei Liu¹, and Yue Zhang²
¹Shenyang University of Technology, China, ²Shandong University, China

PS2-8-7

Fault-tolerant Control Strategy for Single-phase Open Circuit Fault for Six-phase Doubly Salient Electromagnetic Machine

Xingwei Zhou¹, Shengming Chen¹, Peixing Liu², Shuwen Xu¹, and Zefeng Yang¹
¹Hohai University, China, ²State Grid Jibei Electric Power Co., Ltd., China

Session PS2-9

Power Converter 1 (DC-DC)

Date: November 28
Time: 12:00-13:00
Venue: FIT Arena
Chair: Shohei Komeda
Tokyo University of Marine Science and Technology, Japan

PS2-9-1

Fuzzy Neural Nonsingular Terminal Sliding Mode Control of DC-DC Buck Converter

Xiaoyu Gong and Juntao Fei
Hohai University, China

Program

PS2-9-2

Complete Soft Switching Implementation Based on LCC-LCC Compensation Network for Wireless Power Transfer System

Xi Zhang, Han Guang, Qingxiang Xie, and Qianfan Zhang
Harbin Institute of Technology, China

PS2-9-3

Power Optimization Strategy for Buck Circuits Based on Digital Twins

Yuang Luo^{1,2}, Lu Zhao¹, Yikesha Halimulati^{1,2}, Qiongxuan Ge¹, Shi Cheng^{1,2}, and Yuhang Chi^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS2-9-4

Back-flow Power Optimization Strategy of DAB Converter with Extended Phase Shift Control

Hongwei Fang¹, Weijie Wang¹, Fan Jiang², and Yike Du¹

¹Tianjin University, China, ²China Institute of Marine Technology & Economy, China

PS2-9-5

DC-link Capacitor Lifetime Extension for Two-level Back-to-back Converters Based on Zero-sequence Voltage Injection

Qiuqiong Lin, Ziyu Wei, and Pinjia Zhang
Tsinghua University, China

Session PS2-10

Power Converter 2 (AC-DC, DC-AC)

Date: November 28

Time: 12:00-13:00

Venue: FIT Arena

Chair: Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

PS2-10-1

A New Hybrid Modulation Method with Low Current Distortion and Switching Losses for Single-phase Three-level Inverters

Paiboon Kiatsookkanatorn¹, Phongsathorn Sangsuwan¹, Prachuab Iamsamang², and Somboon Sangwongwanich³

¹Rajamangala University of Technology Suvornabhumi (RUS), Thailand, ²Bangkokthonburi University, Thailand, ³Chulalongkorn University, Thailand

PS2-10-2

Improved Capacitor Voltage Balancing Method for CHB Inverter Based on Hybrid Modulation Strategy and Reference Voltage Reconfiguration

Ye Zhang^{1,2}, Zixin Li^{1,2}, Fanqiang Gao^{1,2}, Cong Zhao^{1,2}, and Yaohua Li^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS2-10-3

Carrier-based Discontinuous PWM Strategy by Switching Clamp Modes for Vienna Rectifier with Unbalanced DC-links

Zhijian Zhang¹, Bingxing Li¹, Li Ding¹, Nannan Zhao², Ziming Hu², Chengrui Li³, Gaolin Wang¹, and Dianguo Xu¹

¹Harbin Institute of Technology, China, ²Midea Group, China, ³Harbin Institute of Technology (Shenzhen), China

PS2-10-4

Control of Quick Charger System Applying MMC with High Frequency AC Output

Shin-ichi Hamasaki, Kazuhiro Inoue, and Tetsuji Daido
Nagasaki University, Japan

PS2-10-5

A Compact Hybrid Multilevel Converter with Wide Operation Range

Xiaoyin Wu, Yuhua Gao, Yi Wang, Rui Wang, and Xiaoqi Xu
North China Electric Power University, China

PS2-10-6

Control of Variable Speed Pumped Storage Unit Based on Power Electronic Transformer Under Unbalance of Power Grid Voltage

Pei Huang (Corresponding Author), Xiang Peng, and Renjun Dian
Wuhan University of Science and Technology, China

PS2-10-7

Three-phase to Single-phase Matrix Converter that Suppresses Voltage Fluctuations during Load Changes

Akito Murata and Naoki Yamamura
Mie University, Japan

PS2-10-8

Common Mode Voltage Suppression Method for Third-harmonic Injection Two-stage Matrix Converter in Low Modulation Ratio

Yaotian Shi, Bo Zhou, Chengjia Lu, Qingyun Chang, and Yang Huang
Nanjing University of Aeronautics and Astronautics, China

PS2-10-9

IPF Improvement of DPWM-controlled for DMC with a Double PI Controller

Sahel Solemanifard and Tzung-Lin Lee
National Sun Yat-Sen University, Taiwan

Session PS3-1

Linear Drives and Magnetic Levitations 4

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS3-1-1

Design and Optimization of a Permanent Magnet biased Hybrid Magnetic Bearing for Turbo-molecular Pump

Kaixuan Wang^{1,2}, Di Wang^{1,2}, and Yun Le^{1,2}

¹Beihang University, China, ²National Institute of Extremely-Weak Magnetic Field Infrastructure, China

PS3-1-2

Model Calibration of Inconsistent Coils Shape Driven by Coupling Effect of Magnetic Levitation Planar Motor

Fuxiang Chen, Kai Liu, Yingtong Wu, Aoqi Hu, Xinpeng Wei, Cailin Hong, and Lizhan Zeng

Huazhong University of Science and Technology, China

PS3-1-3

Influence of Secondary Structure on the Transverse Edge Effect of LP-DSLIM

Zhuo Zhang^{1,2}, Yumei Du^{1,2}, Yongxian Liu^{1,2}, Ruihua Zhang^{1,2}, and Liming Shi^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

Program

PS3-1-4

Modal Vibration Control of Magnetic Bearing Rotor System Based on Second Order Generalized Integrator-gradient Estimator

Zhengpu Chen, Jun Liu, and Jinxiang Zhou
Beihang University, China

PS3-1-5

Simulation of Vibration Characteristics of Magnetically Levitated Steel Plate under Disturbance Condition

Kazuki Ogawa¹, Yamato Uchida², Ikkei Kobayashi², Jumpei Kuroda², Keigo Ikeda³, Taro Kato⁴, Ayato Endo⁵, Takayoshi Narita², and Hideaki Kato²
¹Aichi University of Technology, Japan, ²Tokai University, Japan, ³Hokkaido University of Science, Japan, ⁴Tokyo University of Technology, Japan, ⁵Fukuoka Institute of Technology, Japan

PS3-1-6

Analysis and Control of Self-sensing Model of Isolated Axial Magnetic Bearing

Rui Zhang, Ning Wang, Hao Wu, and Liwei Song
Harbin Institute of Technology, China

PS3-1-7

Structural Optimization Design of Permanent Magnet Linear Force Motor for Aviation

Yuyuan Yang, Jinglin Liu, Xinran Shi, and Feiyang Liu
Northwestern Polytechnical University, China

PS3-1-8

The Method of Single-segment Layer-by-layer Substitution for Inverse Design of Passive Magnetic Springs

Rui Zhou, Cailin Hong, Lifeng Fu, Wei Zhang, Yumei Bai, Wei Jiang, and Jiulin Wu
Huazhong University of Science and Technology, China

PS3-1-9

Research on Optimization Design of Double-sided Consequent-pole Permanent Magnet Synchronous Linear Motor

Jing Li, Xuzhen Huang, Qiang Tan, Zheng Wang, Yue Yang, and Yansong Liu
Nanjing University of Aeronautics and Astronautics, China

Session PS3-2

Flux Switching & Variable Flux Machines 2

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS3-2-1

Investigation of Design Methods to Improve the Performance of a Motor Which is Capable of Switching between WFFSM Drive and SynRM Drive

Iori Kokubo and Kyohei Kiyota
Tokyo Institute of Technology, Japan

PS3-2-2

Study on Pole-slot Combinations of Half-wave Rectified Variable Field Flux Motor with Axial Gap Structure

Kentaro Yazama¹, Takashi Abe¹, Yoshitsugu Otomo¹, and Takahiro Koga^{1,2}
¹Nagasaki University, Japan, ²ANSYS Japan K.K., Japan

PS3-2-3

Experimental Validation of a Six-pole Half-wave Rectified Variable Field Flux Motor

Shu Yoshida¹, Takashi Abe¹, Yoshitsugu Otomo¹, and Takahiro Koga^{1,2}
¹Nagasaki University, Japan, ²ANSYS Japan K.K., Japan

PS3-2-4

Design Study on Hybrid Excitation Generator for Micro-hydroelectric System

Kazuto Maruyama¹, Takashi Kosaka¹, Yasushi Kato^{1,2}, Naoki Yamamoto², Yoshiki Yasuda², and Akio Yamagiwa²
¹Nagoya Institute of Technology, Japan, ²Daikin Industries, Ltd., Japan

PS3-2-5

Comparison of Variable Flux Memory Machine and Double-variable Flux Memory Machine with Hybrid Magnetic Circuits

Xianxian Zeng, Heyun Lin, Yuxiang Zhong, Xifang Zhao, and Hui Yang
Southeast University, China

PS3-2-6

Design and Analysis of Variable Flux Motor with Rotatable Magnet

Daiki Gotoh and Masayuki Kato
Ibaraki University, Japan

PS3-2-7

Field Unit Type Magnet-assisted Wound Field Motor for HEV and EV Applications with Distributed Mortise Structure

Yuki Hidaka¹, Kengo Adachi¹, and Daisuke Sato²
¹Nagaoka University of Technology, Japan, ²Nagaoka Motor Development Co., Ltd., Japan

Session PS3-3

Special Machines

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS3-3-1

Precise Prediction of Air-gap Magnetic Harmonics for IPMSM Based on Improved Magnetic Field Modulation Theory

Jiyuan Ma, Yu Zeng, Wenxiang Zhao, Jinghua Ji, Qingze Hu, and Chen Jia
Jiangsu University, China

PS3-3-2

A Novel Equivalent Magnetic Network Method for Permanent Magnet Vernier Motor

Hongwei Fang¹, Hang Ye¹, Yike Du¹, Zhaoxia Xiao², and JinGuo Zhang¹
¹Tianjin University, China, ²Tiangong University, China

PS3-3-3

Scaling Effect Analysis of Surface-mounted Permanent Magnet Vernier Machine with Concentrated Windings

Junzhou Li, Yuting Gao, Yuanzhi Zhang, and Xiaoming Zha
Wuhan University, China

Program

PS3-3-4

A Novel Consequent-pole Vernier Permanent Magnet Machine with Dual Armature Winding Configuration

Qiang Wang¹, Renjun Dian¹, Wenyu Yan¹, and Linjie Ren²(Corresponding Author)

¹Wuhan University of Science and Technology, ²Tsinghua University, China

PS3-3-5

A High Strength and Low Cogging Torque Modulator Structure for Magnetic-geared Machines

Jinjie Tao¹, Dong Wei¹, Kan Liu¹, Zi-Qiang Zhu², Yan Ding¹, Huaqiang Cai¹, Jinya Chen¹, Zhiwei Zhao¹, and Hongdong Wu³

¹Hunan University, China, ²University of Sheffield, UK, ³Hengtong Marine Cable Systems Co., Ltd., China

PS3-3-6

Optimization of Repulsion Cycloidal Magnetic Gear with Inset Radial Magnets

Pin-Hao Liao, Mi-Ching Tsai, Po-Wei Huang, and Tsung-Wei Chang

National Cheng Kung University, Taiwan

PS3-3-7

A Novel Model for Hybrid Stepper Motors Considering Magnetic Saturation

Yu-Chen Kuo and Min-Fu Hsieh

National Cheng Kung University, Taiwan

PS3-3-8

Comparative Analysis of Tangentially Magnetized Stator-permanent-magnet Hybrid Stepping Machines with Four, Five and Six-tooth

Xiaobao Chai, Jinglin Liu, Minglang Xiao, Zhiman Lu, and Ruizhi Guan

Northwestern Polytechnical University, China

PS3-3-9

Experimental Verification of Distribution Factors in Counter-rotating Twin Harmonic PM Machines

Michiel Desmedt, Thomas Hepsøe, and Robert Kristoffer Nilssen

NTNU, Norway

PS3-3-10

A Novel High-speed Solid Rotor Induction Motor with Equidirectional Toroidal Rectangular Winding

Peixin Wang, Yinjun Sun, Jikai Si, Rui Nie, and Shuai Xu

Zhengzhou University, China

Session PS3-4

Bearingless Machine 2

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Kyohei Kiyota

Institute of Science Tokyo, Japan

PS3-4-1

Analysis of Fundamental Electromagnetic Performance of Stator Permanent Magnet Bearingless Slice Motor Topology

Wenqing Hao, Zhiquan Deng, and Ying Xiong

Nanjing University of Aeronautics and Astronautics, China

PS3-4-2

Proposal of Pediatric Centrifugal Pump Type Ventricular Assist Device Using a Bearingless Motor

Yusuke Yatsu, Arisa Matsuo, Satoshi Murayama, and Kenji Suzuki

Tokyo City University, Japan

PS3-4-3

Reduction of Force Error Angle by Flux-strengthening Control in Two-axis Actively Positioned Bearingless PM Motor

Keita Kajino and Hiroya Sugimoto

Tokyo Denki University, Japan

PS3-4-4

Characteristics Analysis of Novel Permanent Magnet Biased Bearingless Switched Reluctance Motor

Zhenyao Xu¹, Yifan Sun¹, Cheng Huang¹, Guangwei Liu¹, Dong-Hee Lee², and Shuo Wang³

¹Shenyang University of Technology, China, ²Kyungsoong University, Republic of Korea, ³University of Nottingham Ningbo China, China

PS3-4-5

Variable Gain Control of Nonlinear Suspension Force for Bearingless Doubly Salient Electromagnetic Motor Under Magnetic Saturation

Haonan Zou, Li Yu, Wei Chen, Zhongshan Luo, and Zhuoran Zhang

Nanjing University of Aeronautics and Astronautics, China

PS3-4-6

Sensorless Control of PMA-BSynRM Based on ISWATS Adaptive Neural Network Left Inverse Soft-sensing Technique

Yichen Liu, Huangqiu Zhu, and Yizhou Hua

Jiangsu University, China

PS3-4-7

Calculation of Eddy Current Loss in Surface Permanent Magnet Rotor Due to Suspension Flux in High Power Bearingless Motors

Taichi Konno¹, Hiroya Sugimoto¹, Minoru Yoshida², Chiharu Sumiyama², and Tomoya Ishigami²

¹Tokyo Denki University, Japan, ²Maruwa Electronic Inc., Japan

PS3-4-8

Decoupling of Magnetic Circuits between Combined Radial-axial Magnetic Bearing and Permanent Magnet Bearingless Motor

Hisato Nakamura¹, Taichi Konno¹, Hiroya Sugimoto¹, Minoru Yoshida², Ryo Takashima², Chiharu Sumiyama², and Tomihiro Kinjo³

¹Tokyo Denki University, Japan, ²Maruwa Electronic Inc., Japan, ³Japan Aerospace Exploration Agency, Japan

PS3-4-9

Comparison and Design Optimization of Consequent-pole and Multi-monopole Surface Permanent Magnet Bearingless Motors

Shouma Kono¹, Hiroya Sugimoto¹, and Takahiro Noguchi²

¹Tokyo Denki University, Japan, ²University of Minnesota, USA

PS3-4-10

Optimization Design of Hybrid Excitation Bearingless Permanent Magnet Synchronous Generator

Yuchen Zhu, Xijun Hua, Yizhou Hua, and Yichen Liu

Jiangsu University, China

Session PS3-5

Parameter Estimation

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Yukinori Inoue

Osaka Metropolitan University, Japan

Program

PS3-5-1

Maximum Torque per Ampere Control of Variable Flux Memory Motor Based on Online Parameter Identification

Ziqiang Zhang, Ruiqing Ma, Weizhou Yang, Ping Fan, and Peng Chen

Northwestern Polytechnical University, China

PS3-5-2

Position Offset Injection Based Winding and Permanent Magnet Temperature Decoupled Estimation for PMSMs

Yuting Lu¹, Beichen Ding¹, and Guodong Feng^{1,2}

¹Sun Yat-sen University, China, ²Guangdong Provincial Key Laboratory of Fire Science and Intelligent Emergency Technology, China

PS3-5-3

Multi-objective Optimization Three-vector-based Model Predictive Current Control with Adaline Online Parameter Identification for PMSM Drives

Pengbo ZHAO, Zeyu ZAHNG, Jien MA, Lin QIU, and Youtong FANG

Zhejiang University, China

PS3-5-4

Fundamental Study of On-line Inductance Identification for IPMSM

Keita Ui and Yoshitaka Iwaji

Ibaraki University, Japan

PS3-5-5

The Full Rank Identification of DTP-PMSM Parameters

Xiang Li, Dajun Chen, Ruiwu Cao, Kai Wang, and Ning Jiang

Nanjing University of Aeronautics and Astronautics, China

PS3-5-6

Online Parameters Identification for an IPMSM Based on Extended Kalman Filter

Khanaphot Treebubpha, Sompob Polmai, and Supat Kittiratsatcha

King Mongkut's Institute of Technology Ladkrabang, Thailand

PS3-5-7

Position Offset and Current Angle Combined Injection Based Online Multiparameter Estimation of PMSM Considering Inverter Distortion

Yuheng Pei¹, Zhe Tong¹, and Guodong Feng^{1,2}

¹Sun Yat-sen University, China, ²Guangdong Provincial Key Laboratory of Fire Science and Intelligent Emergency Technology, China

Session PS3-6

Switched Reluctance Machine Control and Drives

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Yukinori Inoue

Osaka Metropolitan University, Japan

PS3-6-1

A Novel SMO Based Diagnosis Method for Interturn Short-circuits in SRM by Unaligned Inductance Identification

Qiyuan Cheng, Shoujun Song, Chenyi Yang, Chong Bao, and Qingkun Yang

Northwestern Polytechnical University, China

PS3-6-2

Levitation Displacement Control of Bearingless Switched Reluctance Motor with UDE-based Method

Qiang Cui and Xin Cao

Nanjing University of Aeronautics and Astronautics, China

PS3-6-3

Research on Direct Instantaneous Torque and Suspension Force Control Strategy for Stepped Rotor Bearingless Switched Reluctance Motor

Zhenyao Xu¹, Fengzhi Ning¹, Huijun Wang², Dong-Hee Lee³, and Shuo Wang⁴

¹Shenyang University of Technology, China, ²Beihang University, China, ³Kyungsoong University, Republic of Korea, ⁴University of Nottingham Ningbo China, China

PS3-6-4

Validation of Variable Voltage Control Method Using Z-source Inverter for SRM Drive

Satoshi Murayama, Yusuke Yatsu, and Kenji Suzuki

Tokyo City University, Japan

PS3-6-5

High-performance Starting Control Strategy for Switched Reluctance Starter/Generator

Qingkun Yang, Shoujun Song, Chenyi Yang, Qiyuan Cheng, and Chong Bao

Northwestern Polytechnical University, China

PS3-6-6

LADRC-based High Dynamic Control Strategy for SRM-based EMA System

Jiabao Bu¹, Jinhua Du¹, Yun Long¹, Guoqiang Zhang¹, Peng Kou¹, and Zhanqiang Luo²

¹Xi'an Jiaotong University, China, ²AVIC of China Qing'an Group Co, China

PS3-6-7

Research on Voltage Stabilizing System of Switched Reluctance Motor Based on Fuzzy PID Control

Tong Chang, Shuanghong Wang, and Zixin Li

Huazhong University of Science and Technology, China

PS3-6-8

Fault-tolerant Sensorless Control Method Based on Multiple Second Order Generalized Integrator for SRM Drives

Dexu Lv¹, Kai Wang², Wen Ding¹, and Yangfan Wang¹

¹Xi'an Jiaotong University, China, ²Hudong Heavy Machinery Co., Ltd., China

PS3-6-9

An Inductance-slope-based Sensorless Control Method for Switched Reluctance Motor

Fanyan Zeng, Shuanghong Wang, and Zixin Li

Huazhong University of Science and Technology, China.

Session PS3-7

Torque Ripple Suppression Control

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Yukinori Inoue

Osaka Metropolitan University, Japan

Program

PS3-7-1

Torque Ripple Suppression Strategy Based on Quasi-resonant Active Disturbance Rejection Control for PM/RHR-DSLSSM

Shukai Wen¹, Shi Jin¹, Wuhen Jin¹, Siyang Yu¹, and Zhaoyu Zhang²
¹Shenyang University of Technology, China, ²Dalian Zhiding Technology Co., Ltd., China

PS3-7-2

Torque Ripple Reduction Control of Axial Rotor-staggered Permanent Magnet Reluctance Motor Using Nonlinear Extend State Observer

Guoqiang Zhang and Jinhua Du
Xi'an Jiaotong University, China

PS3-7-3

A Novel Torque Ripple Mitigation Control Method for Single-phase PMSM Based on Virtual Multi-phase Algorithm

Lijian Wu¹, Yu Xia¹, Tao Wang¹, Xiubiao Yang², and Wenzhi Wang²
¹Zhejiang University, China, ²Jiaxipera Compressor Co., Ltd., China

PS3-7-4

Harmonic Injection-based Torque Ripple Suppression Strategy for Synchronous Reluctance Motor

Haina Sun, Chong Bao, Yu Sui, Chenyi Yang, Qiyuan Cheng, and Shoujun Song
Northwestern Polytechnical University, China

PS3-7-5

Torque Ripple Suppression Control Using Parallel Resonant Controller and ANN in Position and Acceleration Sensorless Control of Stepping Motor

Mizuki Miyata and Sari Maekawa
Meiji University, Japan

Session PS3-8

Power Converter 3 (WPT)

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

PS3-8-1

Bidirectional SP-type Wireless Power Transfer System Based on Parity-time Symmetry Condition

Ryota Aratani, Yuki Shimizu, and Yoshitaka Kawabata
Ritsumeikan University, Japan

PS3-8-2

Determination Scheme of Ferromagnetic Metal Objects Using Detection Coil in Wireless Power Transfer

Seung Ahn Chae¹, Min Seung Song¹, Dae Yong Um², and Gwan Soo Park¹
¹Pusan National University, Republic of Korea, ²Gyeongsang National University, Republic of Korea

PS3-8-3

Estimation of Transmitter Inductance on Foreign Object in Wireless Power Transfer

Min Seung Song, Seung Ahn Chae, and Gwan Soo Park
Pusan National University, Republic of Korea

PS3-8-4

Frequency-based Power Distribution via Virtual AC Bus for Dual-frequency Wireless Energy Router System

Mingkai Yang, Gang Wang, Liyuan Liu, and Xuemin Tan
Chengdu University of Information Technology, China

PS3-8-5

Power Factor Improvement Control of Variable Active Capacitor System for Wireless Power Transfer

Tomohiro Asari, Shin-ichi Hamasaki, and Tetsuji Daido
Nagasaki University, Japan

PS3-8-6

A Vehicle-to-vehicle (V2V) Mode in Multi-receiver WPT System Utilizing Transmitting Loop from Primary Compensation Circuit

Kan Voottipruex¹, Hatta Sawachan¹, Suriyotai Supanyapong¹, Supapong Nutwong², Nattapong Hatchavanich², and Ekkachai Mujjalinvimut²
¹King Mongkut's University of Technology, Thailand, ²King Mongkut's University of Technology Thonburi, Thailand

PS3-8-7

Wireless Power Transfer System for Multiple Drones In-flight Charging Applications under Wide Charging Tolerance with Constant Charging Current

Kasan Sukvanachaikul, Nattapong Hatchavanich, Supapong Nutwong, Sumate Naetiladdanon, Anawach Sangswang, and Ekkachai Mujjalinvimut
King Mongkut's University of Technology Thonburi, Thailand

Session PS3-9

Power Electronics of Mobility Applications

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

PS3-9-1

Time-efficient Power Loss Calculation for Battery-electric Powertrains Based on Harmonic Loss Models

Maximilian Hagedorn¹, Cornelius Rettner², Mathias Korn³, and Axel Mertens¹
¹Leibniz University Hannover, Germany, ²Volkswagen AG, Germany, ³Audi AG, Germany

PS3-9-2

Active Power Decoupling Strategy for Integrated Single-phase Charging System of EVs with Dual-battery

Yidi Meng¹, Jiadan Wei¹, Gaofeng Li¹, Zeyu Zhang¹, and Le Zhang²
¹Nanjing University of Aeronautics and Astronautics, China, ²Wuxi Taihu University, China

PS3-9-3

Modeling and Control of a Hybrid Power System for Electric Propulsion Aircraft

Siyang Liang¹, Hongwei Zhao¹, Tao Yang², Xin Wang², Yang Qi¹, and Weilin Li¹
¹Northwestern Polytechnical University, China, ²University of Nottingham, UK

PS3-9-4

A Capacity Planning Method for EV Charging Stations Based on Fuzzy C-means Clustering and Deep Extreme Learning Machine

Bohao LIANG¹, Xiangyu KONG¹, Jidong WANG¹, Mingxuan LU², Longyu ZHANG¹, and Mao LIU¹
¹Tianjin University, China, ²State Grid Liaoning Electric Power Company Economic and Technical Research Institute, China

Program

PS3-9-5

CFD Thermal Analysis of Axial-flux Permanent Magnet Synchronous Motor with Water Cooling Channels for Underwater Propulsion Applications

Jang-Hyun Park¹, Jae-Gil Lee¹, Yeon-Ho Jeong¹, Kwangdeok Kim², Ilhwan Park², and Do-Kwan Hong¹

¹Korea Electrotechnology Research Institute, Republic of Korea,

²Hyosung Heavy Industries Corporation, Republic of Korea

PS3-9-6

Design of a 100 kW SPMSM for Podded Propulsion and Multiphysics Analysis of Fault Operating Simulation

Da-Eun Kim^{1,2}, Jang-Hyun Park^{1,2}, Jae-Gil Lee^{1,2}, Yeon-Ho Jeong², and Do-Kwan Hong^{1,2}

¹University of Science and Technology, Republic of Korea, ²Korea

Electrotechnology Research Institute, Republic of Korea

PS3-9-7

Analysis of the Battery Capacity and Imbalanced Charging Ability for a Cascade H Bridge in Shinkansen Regeneration Energy Storage Application

Zhaoyang Jin¹, Keiichiro Kondo¹, Kentaro Nishi², and Rika Saito²

¹Waseda University, Japan, ²R&D Center of JR East Group, Japan

PS3-9-8

Mass Reduction of a PMSM through Segmented Stator and Material Mix by Holistic Drivetrain Consideration

Maximilian Clauer¹, David Bauer¹, and Nejila Parspour²

¹Dr. Ing. h.c. F. Porsche AG, Germany, ²University of Stuttgart,

Germany

PS3-9-9

Sliding Mode Control Method Based on FLC for Performance Improvement of PMD Battery Charger

Gyuri Kim and Yeongsu Bak

Keimyung University, Republic of Korea

PS3-9-10

Solution of Active Safety for Virtual Track Train Based on RRT* and MPC

Zhipeng Jing, Zhenggang Lu, Zehan Wang, Juyao Wei, and Zheng Yin

Tongji University, China

Session PS3-10

Control of Power Converter

Date: November 28

Time: 13:00-14:00

Venue: FIT Arena

Chair: Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

PS3-10-1

Improved Current Limiting Control for LVRT Strategy of Virtual Synchronous Generator

Hongwei Fang¹, Yuwei Yin¹, Zhaoxia Xiao², and Junjie Xiong³

¹Tianjin University, China, ²Tiangong University, China, ³State Grid

Jiangxi Electric Power Research Institute, China

PS3-10-2

Generic Algorithm Based Parameter Optimization for an S-SP Compensation Topology Based Inductive Power Transfer System

Yu Chen¹, Li Gao¹, Kan Liu¹, Pengfei Sang¹, Liang Han²,

Haozhe Luan¹, Kanglong He¹, and Hongdong Wu³

¹Hunan University, China, ²China Railway Rolling Stock Corporation, China, ³Hengtong Marine Cable Systems Co., Ltd., China

PS3-10-3

A Variable-frequency and Phase-shifted Based Current Sharing Control for Parallel LLC Resonant Converters with Parameter Differences

Kanglong He¹, Li Gao¹, Liang Han², Kan Liu¹, Haozhe Luan¹, Kaiqing Li¹, Wei Li¹, and Pengfei Sang¹

¹Hunan University, China, ²China Railway Rolling Stock Corporation, China

PS3-10-4

A Half Controlled Current Source Actively Commuted Converter with the Low Switching Frequency Modulation Strategy

Hang Zhang¹, Zixin Li¹, Fanqiang Gao¹, Xiangming Lyu², Cong Zhao¹, Fei Xu¹, and Yaohua Li¹

¹Chinese Academy of Sciences, China, ²Northeastern University at Qinhuangdao, China

PS3-10-5

Suppression of Second Harmonic Current by Active Power Decoupling Circuit Based on Bus Voltage Feedforward

Pan Li, Jianyong Su, Han Wang, and Guijie Yang

Harbin Institute of Technology, China

PS3-10-6

Investigation on Error Decomposition-based Feedback Control Strategy

YE Siwen, SHEN Yihe, WEI Mingou, YANG Xijun, and GAO Fei

Shanghai Jiao Tong University, China

PS3-10-7

Multi-objective Coordinated Control of Permanent Magnet Direct-drive Wind Power System Under Asymmetrical Grid Fault

Xingwei Zhou, Shuwen Xu, Shengming Chen, Zefeng Yang, and Tianyu Fang

Hohai University, China

PS3-10-8

Current Harmonic Suppression Strategy for Grid-connected NPC Converters at Low Switching Frequencies

Zexi Liang^{1,2}, Ruihua Zhang^{1,2}, Bo Zhang^{1,2}, and Qiongxuan Ge^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS3-10-9

Fault-tolerant Strategy for More Reliable Cascaded H-bridge Inverters

Min-Sol Kim¹, Ju-Yoen Baek², Kyo-Beum Lee², and Youngjong Ko³

¹Pukyong National University, Republic of Korea, ²Ajou University, Republic of Korea, ³Pukyong National University, Republic of Korea

Session OGS2

Organized Session 2: High Speed Motors and Drives

Date: November 28

Time: 14:30-16:10

Venue: Room: A

Chair: Junichi Asama

Shizuoka University, Japan

Program

OGS2-1 14:30-14:55

Adaptive Linear Neuron-based Active Disturbance Rejection Control System for Current Harmonics Suppression of PMSM Drives

Chenhao Zhao¹, Yuefei Zuo², Kailiang Yu¹, Huanzhi Wang¹, Tianyi Li¹, and Christopher H. T. Lee¹

¹Nanyang Technological University, Singapore, ²Nanjing University of Aeronautics and Astronautics, China

OGS2-2 14:55-15:20

MW-class Electric Propulsion: Geared or Direct Drive?

David Gerada¹, Zeyuan Xu¹, Fengyu Zhang¹, Jianan Jiang¹, Chris Gerada¹, Feng Cao², and Paul Langlois²

¹University of Nottingham, UK, ²Smart Manufacturing Technology Ltd., UK

OGS2-3 15:20-15:45

Evaluation of AC Copper Loss in High-speed & High-power Electric Machines

Takehiro Jikumaru¹ and Hiroyuki Taira²

¹IHI Corporation, Japan, ²IHI AEROSPACE Co., Ltd., Japan

OGS2-4 15:45-16:10

Impact of Current Sensor System Dynamics on Current Measurements and Novel Compensation Scheme on dq-Reference Frame

Sangwhhee Lee, Feida Chen, and Bulent Sarioglu

University of Wisconsin-Madison, USA

Session OS3B

Bearingless Machine 1

Date: November 28

Time: 14:30-16:30

Venue: Room: B

Chair: Osamu Ichikawa

Polytechnic University, Japan

Wolfgang Gruber

Johannes Kepler University Linz, Austria

OS3B-1 14:30-14:50

Homopolar Bearingless Slice Motor with Single-phase Suspension Windings

Ying Xiong, Zhiquan Deng, Xin Cao, and Wenqing Hao

Nanjing University of Aeronautics and Astronautics, China

OS3B-2 14:50-15:10

Combined Winding Design for Improving Suspension Force Characteristics of Bearingless Motors

Zikai Yang, Yu Hu, and Jiahao Chen

ShanghaiTech University, China

OS3B-3 15:10-15:30

Five-degree-of-freedom Active-suspended Axial Gap Self-bearing PMSM with Double Inner Stator

Satoshi Ueno, Kazuki Hara, and Chengan Zhao

Ritsumeikan University, Japan

OS3B-4 15:30-15:50

Proposal of 2-DOF Actively Controlled Consequent-pole-type Bearingless Single-phase Motor Using Zero-sequence Current

Kaito Tanaka, Yusuke Fujii, and Akira Chiba

Tokyo Institute of Technology, Japan

OS3B-5 15:50-16:10

Rotor Design Study for Exterior Rotor Bearingless Permanent Magnet Machines

Tengrui Shi¹, Xiaolin Wang¹, Xucong Bao¹, Qiang Ding², Zhenglong Li¹, and Zhenxue Fan¹

¹Nanjing University of Aeronautics and Astronautics, China,

²Nanjing Vocational University of Industry Technology, China

OS3B-6 16:10-16:30

Development of Asymmetrical Four-phase Bearingless Motor with Unequal-tooth-pitch Stator

Yoshinori Kamiya and Junichi Asama

Shizuoka University, Japan

Session OS3C

Multiphase Machines

Date: November 28

Time: 14:30-16:30

Venue: Room: C

Chair: Hiroyuki Kaimori

Science Solutions International Laboratory, Inc., Japan

Huanran Wang

Zhejiang University, China

OS3C-1 14:30-14:50

Operation Principle of a Novel Coaxial Triple-DOF Motor

Yiyang Xu¹, Jian Wang^{1,2}, Tingna Shi^{1,2}, Dong Yan¹, Hao Chen¹, and Yanfei Cao¹

¹Zhejiang University, China, ²Zhejiang University Advanced Electrical Equipment Innovation Center, China

OS3C-2 14:50-15:10

Minimization Copper Loss Full Range for Single-phase Open-circuit Fault Tolerant Control in Five-phase SPM with Non-sinusoidal Back EMF

Huanran Wang¹, Xiangqian Huang², Xiaoyan Huang¹, Zhuo Chen¹, Ang Liu¹, Hui Xu¹, Han Zhao³, and Chunyang Gu³

¹Zhejiang University, China, ²Hangzhou Three Phases Technology Co., Ltd., China, ³Yongjiang Laboratory, China

OS3C-3 15:10-15:30

Five-phase PMSM Fault-diagnostic Strategy Based on Symmetrical Component Method for Weak Inter-turn Short-circuit Fault

Qifan Xiao, Mingqiao Wang, Wei Liu, Ziyu Zhou, Xiaoying Qiu, and Ping Zheng

Harbin Institute of Technology, China

OS3C-4 15:30-15:50

Experimental Comparison of a Three- and Five-phase Squirrel Cage Induction Machine

Alexander Möller, Andreas Binder, and Yves Burkhardt

Technical University of Darmstadt, Germany

OS3C-5 15:50-16:10

Comparison of Electromagnetic and Vibration Performances of Dual Three-phase and Multiphase SPM Motors

Hironori Minegishi, Yusuke Fujii, and Akira Chiba

Tokyo Institute of Technology, Japan

OS3C-6 16:10-16:30

Reduction of Carrier Harmonic Iron Loss of Phase-shift Windings Dual Three-phase Motors by Phase Current-shift Control

Yoshihiro Miyama¹ and Kan Akatsu²

¹Mitsubishi Electric Corporation, Japan, ²Yokohama National University, Japan

Program

Session OS3D

Flux-Modulated Machines

Date: November 28
Time: 14:30-16:30
Venue: Room: D
Chair: Yuki Hidaka
Nagaoka University of Technology, Japan
Ronghai Qu
Huazhong University of Science and Technology, China

OS3D-1 14:30-14:50
Torque-to-weight Ratio Improvement of Large-scale Magnetic Gears for Offshore Wind Power Generation
Takanori Sumi¹, Akihiro Okazaki¹, Kenji Nakamura¹, Tomokazu Shinji², and Keiji Takeda²
¹Tohoku University, Japan, ²TDK Corporation, Japan

OS3D-2 14:50-15:10
Frequency Response Analysis of Magnetic Coupling and Magnetic Gear
Keigo Iwaki and Kenji Nakamura
Tohoku University, Japan

OS3D-3 15:10-15:30
Design and Analysis of Magnetic Gear for Advanced Air Mobilities
Emiri Asahina¹, Kenji Nakamura¹, Motoki Ohta², Mamoru Kimura², and Shin Kusase³
¹Tohoku University, Japan, ²Shimane University, Japan, ³MARC Institute Co., Ltd., Japan

OS3D-4 15:30-15:50
Design and Optimization of High Torque Permanent Magnet Vernier Machines with Fault Tolerance
Yunjiao Li¹, Jie Fu², Xiaobei Li², and Jing Zhao¹
¹Beijing Institute of Technology, China, ²Beijing Institute of Precision Mechatronics and Controls, China

OS3D-5 15:50-16:10
A Novel Efficient and High-capacity Permanent Magnet Vernier Machine for Urban Intelligent Wind Power Systems
Yongtao Liang¹, Zaixin Song¹, Yidan Ma^{1,2}, and Xiaoyu Lang¹
¹The Hong Kong Polytechnic University, China, ²Xi'an Jiaotong University, China

OS3D-6 16:10-16:30
High-torque Rotor Structure with Flux Collection Iron Core in Small Spoke Array Permanent Magnet Vernier Motor
Yasuhiro Kataoka, Takeru Kobayashi, and Yoshihisa Anazawa
Akita Prefectural University, Japan

Session OS3E

PM Motor Control 3

Date: November 28
Time: 14:30-16:30
Venue: Room: E
Chair: Shunsuke Noguchi
Japan Aerospace Exploration Agency, Japan
Spasoje Miric
University of Innsbruck, Austria

OS3E-1 14:30-14:50
Optimized Full-speed Range Current Trajectory Control for Permanent Magnet Synchronous Motor System
Qingguo Sun, Shenglong He, Feng Niu, Wenjing Xu, and Shanhu Li
Hebei University of Technology, China

OS3E-2 14:50-15:10
Efficiency Optimization Control of Surface Permanent Magnet Synchronous Motor Based on Virtual Sinusoidal Signal Injection
Zhiwei Chen, Shubin Jin, and Yongpeng Shen
Zhengzhou University of Light Industry, China

OS3E-3 15:10-15:30
An MTPA Control Strategy for IPMSM Based on Virtual Signal Injection Considering the Inverter Nonlinearity
Jiaxiang Li¹, Yan Yan¹, Chen Li¹, Jian Wang¹, Xuefeng Jin², and Hao Chen¹
¹Zhejiang University, China, ²Tiangong University, China

OS3E-4 15:30-15:50
A Reference Flux Calculation Method Using Local Search Algorithm for Maximum Efficiency Operation in Direct Torque Controlled IPMSM Drives
Taishin Yamashita, Atsushi Shinohara, and Kichiro Yamamoto
Kagoshima University, Japan

OS3E-5 15:50-16:10
Super-twisting Algorithm Sliding Mode Observer-based Multi-vector Model-free Predictive Control Method for PMSM
Ran Tao, Yufeng Jiang, and Wei Wang
Southeast University, China

OS3E-6 16:10-16:30
A Current Observer for Interior Permanent-magnet Synchronous Motor with Single DC-Link Current Sensor
Pengcheng Zhu, Jiming Zou, and Yongxiang Xu
Harbin Institute of Technology, China

Session OS3F

Sensorless Control 2

Date: November 28
Time: 14:30-16:30
Venue: Room: F
Chair: Hisao Kubota
Meiji University, Japan
Gia Minh Thao Nguyen
Shimane University, Japan

OS3F-1 14:30-14:50
Position Sensorless Control of CHB Converter Fed Three-phase PMSM Drives Using Collaborative High-frequency Square-wave Voltage Injection
Minrui Gu¹, Zheng Wang¹, Qian Sha¹, Bolun Zhang¹, Haotian Chang², and Haiyong Zhu²
¹Southeast University, China, ²NR Electric Co., Ltd., China

OS3F-2 14:50-15:10
Sensorless Noise Reduction Strategy for Permanent Magnet Synchronous Motor Based on Random High-frequency Sinusoidal Injection
Sisi Li, Binxing Li, Guoqiang Zhang, Siqi Wang, Gaolin Wang, and Dianguo Xu
Harbin Institute of Technology, China

Program

OS3F-3 15:10-15:30

Extraction of the Sampled High-frequency Current Trajectory with a Novel Synchronous Minor Sampling Process in IPMSM using PWM Carrier-synchronized Voltage Injections

Tetsuji Daido, Muam Aaron, and Shin-ichi Hamasaki
Nagasaki University, Japan

OS3F-4 15:30-15:50

Study of Direct Torque Control with Reference Flux Vector Calculation for Position Sensorless IPMSM Drives with High-frequency Signal Injection

Atsushi Shinohara and Kichiro Yamamoto
Kagoshima University, Japan

OS3F-5 15:50-16:10

Artificial Intelligence-based Sensorless Control of Non-sinusoidal Seven-phase PMSM

Youxi HUANG¹, Ngac ky NGUYEN¹, Eric SEMAIL¹, and Jinlin GONG²
¹Univ. Lille, France, ²Shandong University, China

OS3F-6 16:10-16:30

A Novel Sensorless Sliding-mode Control of PMSM with VSI Nonlinearity Compensation

Shaoshan Jin, Yongxiang Xu, Jinbao Zhang, Pan Wang, and Jibin Zou
Harbin Institute of Technology, China

Session SS2

Special Session 2: Current Pulse Driven Motor and Its Driving Circuit

Date: November 28

Time: 14:30-16:10

Venue: Room: G

Chair: Kan Akatsu

Yokohama National University, Japan

SS2-1 14:30-14:55

High Pulse Current IGBT Power Module for MRM Drive

Honoka Shiotsu¹, Bayarkhuu Battuvshin², Du He¹, Keiji Wada³, Makoto Takamiya⁴, Akatsu Kan⁵, and Ichiro Omura¹

¹Kyushu Institute of Technology, Japan, ²National University of Mongolia, Mongolia, ³Tokyo Metropolitan University, Japan, ⁴Tokyo University, Japan, ⁵Yokohama National University, Japan

SS2-2 14:55-15:20

A Novel Magnet Reversal Motor (MRM) Driven by High Pulse Current for Copper Loss Reduction

Kan Akatsu¹, Yudai Okajima¹, Keiji Wada², Ichiro Omura³, and Makoto Takamiya⁴

¹Yokohama National University, Japan, ²Tokyo Metropolitan University, Japan, ³Kyushu Institute of Technology, Japan, ⁴The University of Tokyo, Japan

SS2-3 15:20-15:45

High Pulse and Sinusoidal Current Output Inverter for MRM Drive

Koumei Yamashita¹, Keiji Wada¹, Makoto Takamiya², Ichiro Omura³, and Kan Akatsu⁴

¹Tokyo Metropolitan University, Japan, ²The University of Tokyo, Japan, ³Kyushu Institute of Technology, Japan, ⁴Yokohama National University, Japan

SS2-4 15:45-16:10

Gate Driver IC with Fully Integrated Overcurrent Protection for Driving Magnet Reversal Motor with High Pulse Current

Yohei Sukita¹, Haifeng Zhang¹, Dibo Zhang¹, Katsuhiko Hata², Keiji Wada³, Kan Akatsu⁴, Ichiro Omura⁵, and Makoto Takamiya¹
¹The University of Tokyo, Japan, ²Shibaura Institute of Technology, Japan, ³Tokyo Metropolitan University, Japan, ⁴Yokohama National University, Japan, ⁵Kyushu Institute of Technology, Japan

Session OS3H

Fault diagnosis & Fault-tolerant Control

Date: November 28

Time: 14:30-16:30

Venue: Room: H

Chair: Yukinori Inoue

Osaka Metropolitan University, Japan

Xiaojun Zhang

Zhejiang University, China

OS3H-1 14:30-14:50

A Diagnostic Method for Inter-turn Short Circuit Faults Based on High Frequency Park Vectors

Xiaobao Feng¹, Dewen Tian², Bo Wang¹, Rongxin Wang¹, and Zihan Wei¹

¹Southeast University, China, ²China North Vehicle Research Institute, China

OS3H-2 14:50-15:10

Interturn Short-circuit Fault Diagnosis Method of Permanent Magnet Synchronous Motor Based on Phase Current Residuals

Yao Rao¹, Jie Fu², Peijuan Cui², Zaiping Zheng², and Wei Wang¹

¹Southeast University, China, ²Beijing Institute of Precision Mechatronics and Controls, China

OS3H-3 15:10-15:30

Multireference-frame Based Model Predictive Fault-tolerant Control for Dual Three-phase Permanent Magnet Synchronous Machines

Jingheng Zhu, Wenlong Li, Baojian Ji, Lei Li, and Qingle Wu
Nanjing University of Science & Technology, China.

OS3H-4 15:30-15:50

Natural Fault-tolerant Control Strategy of Dual Three-phase PMSM Drives with a Common Neutral Point under Open-circuit Fault

Kailiang Yu¹, Zheng Wang², Chenhao Zhao¹, Huanzhi Wang¹, Shengdao Zhu¹, and Christopher H. T. Lee¹

¹Nanyang Technological University, Singapore, ²Southeast University, China

OS3H-5 15:50-16:10

A Fault-tolerant Control Strategy for Multiphase Motor Based on MPC Modulation

Wangtong Liu¹, Zhen Ye², Lieyong Wang², Zhe Chen¹, and Guangzhao Luo¹

¹Northwestern Polytechnical University, China, ²Lanzhou Wanli Aviation Electromechanical Co., Ltd., China

OS3H-6 16:10-16:30

An Improved Fault-tolerant Control for PMSM with Current Sensor Fault

Zhirong Zhu, Tingna Shi, Zhichen Lin, Chen Li, and Hao Chen
Zhejiang University, China

Program

Session OS3I

Power Converter 2 (DC-AC)

Date: November 28
Time: 14:30-16:30
Venue: Room: I
Chair: Koji Orikawa
Hokkaido University, Japan
Xinhong Yu
Haixi Institutes Chinese Academy of Sciences, China

OS3I-1 14:30-14:50
A Hybrid Modulation Strategy and Loss Modeling of Si/SiC Seven-level Converter for Aircraft Electric Propulsion
Yiming Sun, Chengming Zhang, Zihao Zhu, Jiabin Li, and Liyi Li
Harbin Institute of Technology, China

OS3I-2 14:50-15:10
An Improved Si/SiC Hybrid Three-level ANPC Inverter with Optimized Thermal Distribution-based Modulation Scheme
Bolun Zhang, Zheng Wang, and Minrui Gu
Southeast University, China

OS3I-3 15:10-15:30
An Octal-switch Redundant Submodule for MMC to Tolerate Open-circuit Faults
Mei-Fang Wang, Chen-Han Lin, Pei-Wen Lee, and Tzung-Lin Lee
National Sun Yat-sen University, Taiwan

OS3I-4 15:30-15:50
A Coupling-transformerless Voltage-fed Active EMI Filter for Two-stage PV Inverters
Pawaret Ampai and Surapong Suwankawin
Chulalongkorn University, Thailand

OS3I-5 15:50-16:10
Improvement and Analysis of 3-phase DCLA with Unequally Divided Source Voltage for Actual Implementation
Tomohiko Igarashi^{1,2}, Kohei Nomoto², and Hirohito Funato²
¹*Polytechnic University of Japan, Japan*, ²*Utsunomiya University, Japan*

OS3I-6 16:10-16:30
Loss Equalization of Unbalanced Three-phase Inverter by Pulse-voltage-injection Two-phase PWM using Variable Switching Pause Period
Yuki Hanai¹, Masataka Minami², Shin-ichi Motegi¹, and Masakazu Michihira¹
¹*Kobe City College of Technology, Japan*, ²*Kindai University, Japan*

Session OS3J

Control of Power Converter

Date: November 28
Time: 14:30-16:30
Venue: Room: J
Chair: Ravi Nath Tripathi
Kyushu Institute of Technology, Japan
Hailiang Xu
China University of Petroleum (East China), China

OS3J-1 14:30-14:50
Experimental Verification of Discontinuous Current Mode for Boost Inverters

Makoto Ishii and Shohei Komeda
Tokyo University of Marine Science and Technology, Japan

OS3J-2 14:50-15:10
High-robustness Capacitor Voltage Active Damping based on Model Free Predictive Current Control for ANPC GCI with LCL Filter
Xiaoxue Tang¹, Xinhong Yu¹, Longxiang Chen¹, Marcelo Lobo Heldwein², Jose Rodriguez³, and Fengxiang Wang¹
¹*Haixi Institutes Chinese Academy of Sciences, China*, ²*Technical University of Munich, Germany*, ³*Universidad San Sebastian, Chile*

OS3J-3 15:10-15:30
A New Control Method and Power Response of Power Compensator with Low Switching Frequency
Joungjin Seo and Hanju Cha
Chungnam National University, Republic of Korea

OS3J-4 15:30-15:50
Evaluation of Automatic Adjustment Methods for Voltage Reference to Compensate Dead-time Distortion using Machine Learning
Hideki Ayano¹, Makoto Ohmi¹, Yuto Omae², and Yoshihiro Matsui³
¹*National Institute of Technology, Japan*, ²*Nihon University, Japan*, ³*Fukuoka Institute of Technology, Japan*

OS3J-5 15:50-16:10
A Survey of Lifetime Extension Techniques for High-reliability Power Electronics
Min Zhang¹, Yongxing Yang¹, Yukai Wen¹, Wei Jiang¹, Dan Zhao², and Ke Shen¹
¹*Northwestern Polytechnical University, China*, ²*Xi'an University of Technology, China*

OS3J-6 16:10-16:30
Fault Diagnosis Method of Servo Motor Bearing Installation Misalignment Based on CSFF-CNN
Jing Wang¹, Jianye Li¹, Ming Yang¹, and Xinmei Zhang²
¹*Harbin Institute of Technology, China*, ²*Ningbo Anson CNC Technology Co., Ltd, China*

Session OS3K

Power Converters of Renewable Energy Systems 2

Date: November 28
Time: 14:30-16:30
Venue: Room: K
Chair: Takaharu Takeshita
Nagoya Institute of Technology, Japan
Wanning Zheng
Wuhan University of Science and Technology, China

OS3K-1 14:30-14:50
Low Frequency AC Transmission for Offshore Wind Power
Yi LU¹, An Wei CHEN¹, Guo Liang ZHAO², Xiu Li WANG³, Nian Wen XIANG⁴, and Jian Gang BI⁵
¹*Country State Grid Zhejiang Electric Power Co., Ltd., China*, ²*Global Energy Interconnection Research Institute Co., Ltd., China*, ³*Xi'an Jiaotong University, China*, ⁴*Hefei University of Technology, China*, ⁵*China Electric Power Research Institute Co., Ltd., China*

Program

OS3K-2 14:50-15:10

Improved Damping Control Based on Hamiltonian Control Law for Low-carbon Hydrogen Production Systems

Burin Yodwong¹, Pongsiri Mungporn¹, Yaowaret Maiket¹, Damien Guilbert², Matheepot Phattanasak³, Uthen Kamnarn³, Melika Hinaje⁴, Gianpaolo Vitale⁵, and Phatiphat Thounthong¹
¹King Mongkut's University of Technology North Bangkok, Thailand, ²Université Le Havre Normandie, France, ³Rajamangala University of Technology Lanna, Thailand, ⁴Université de Lorraine, France, ⁵Italian National Research Council, Italy

OS3K-3 15:10-15:30

Sensorless Control Strategy of Remote Area Autonomous PMSG-based Microgrids for Improving Redundancy

Xi Luo¹, Xinghao Wang¹, Dehui Luo¹, Huayu Ji¹, Jiani Luo¹, Xijian Lin¹, and Dianxun Xiao^{1,2}
¹The Hong Kong University of Science and Technology (Guangzhou), China, ²HKUST Shenzhen-Hong Kong Collaborative Innovation Research Institute, China

OS3K-4 15:30-15:50

Autonomous Passivity Model Predictive Control for Fixed-time Feedforward Decoupling of DC Microgrids with Constant Power Loads

Zehua Zhang, Panbao Wang, Dongxin Guo, Sibao Ding, Wei Wang, and Dianguo Xu
Harbin Institute of Technology, China

OS3K-5 15:50-16:10

Impact Analysis of the Distribution and Installation Proportions of Grid-forming and Grid-following Converters on the Stability of a 100% Renewable Energy System

Lixing Tian¹, Shiwei Chen¹, Wanning Zheng¹, Dan Liu², Chang Ye², and Kezheng Jiang²
¹Wuhan University of Science and Technology, China, ²State Grid Hubei Electric Power Research Institute, China

OS3K-6 16:10-16:30

Power Control Using Sub-Battery for Electric Motorcycle

Momoe Sakai and Takaharu Takeshita
Nagoya Institute of Technology, Japan

Session OS3L

AI Application for Electric Machine and Drive

Date: November 28

Time: 14:30-16:30

Venue: Room: L

Chair: Nobukazu Hoshi

Tokyo University of Science, Japan

Ying Liu

Harbin Institute of Technology, China

OS3L-1 14:30-14:50

An Online Auto-tuning Method for PID Controllers Based on Back Propagation Neural Network

Liwen Bao, Fei Peng, Yunkai Huang, and Yunlu Du
Southeast University, China

OS3L-2 14:50-15:10

Evaluation of Feasibility for Optimal Motor Design using Deep Q-network

Ji-Hoon Han, Eui-Jin Choi, Jong-Hoon Park, and Sun-Ki Hong
Hoseo University, Republic of Korea

OS3L-3 15:10-15:30

A Study of Motor Fault Condition Classification Using an Unsupervised Learning-based Ensemble Model

Eui-Jin Choi, Seung-Min Song, Ji-Hoon Han, and Sun-Ki Hong
Hoseo University, Republic of Korea

OS3L-4 15:30-15:50

Comparison of Recurrent Neural Networks on Dry-type Transformer Thermal Models under Various Conditions

Junlaphat Jarasureechai, Chanantorn Sophon, Chankit Promrat, Ekkachai Mujjalinvimut, Piyasawat Navaratana Na Ayudhya, Tirasak Sapaklom, Jakkrit Kunthong, and Atip Doolgindachbaporn
King Mongkut's University of Technology Thonburi, Thailand

OS3L-5 15:50-16:10

Gear Fault Diagnosis in Geared Motors based on Frequency Adaptation Graph Prototype Network with Limited Data

Yidan Ma^{1,2}, Zaixin Song¹, Yongtao Liang¹, and Jianfu Cao²
¹The Hong Kong Polytechnic University, China, ²Xi'an Jiaotong University, China

OS3L-6 16:10-16:30

Heuristic Investigation of the Required Amount of Data as Part of the Scalable Data-based Diagnostic Concept

Andreas Schmitz^{1,2}, Felix Heimann², Marco Decker², Clemens Gühmann¹, and Roland Serway²
¹Technische Universität, Germany, ²IAV GmbH, Germany

Program

Session OGS3

Organized Session 3: Power conversion technology for multiple objectives in motor drives

Date: November 29

Time: 9:30-11:35

Venue: Room: A

Chair: Hitoshi Haga

Shizuoka University, Japan

Shohei Komeda

Tokyo University of Marine Science and Technology, Japan

OGS3-1 9:30-9:55

Buck-boost Operation by Zero-sequence Current Control for Negative-point-connected Dual Inverter with Variable Voltage Capacitor

Akihito Mizukoshi¹, Yushi Araki², Tatsuki Kashihara², and Koji Kobayashi²

¹Kisarazu College, Japan, ²Sanden Corporation, Japan

OGS3-2 9:55-10:20

Transition and Latest Technology of Power Electronics for Air Conditioners

Shinya Shimizu¹, Masaki Kanamori¹, Keiichi Ishida¹, Takahisa Endo¹, Yutaro Sugiyama¹, and Masaya Nogi²

¹Carrier Japan Corporation, Japan, ²Carrier Air Conditioning (Thailand) Co., Ltd., Thailand

OGS3-3 10:20-10:45

A Novel Single-Phase AC Power Supplied Dual-Inverter Topology with Integrated Rectifier

Taiju Sakurai and Hitoshi Haga

Shizuoka University, Japan

OGS3-4 10:45-11:10

Zero-sequence Current Ripple Reduction Control in Open-end Winding Interior Permanent-magnet Synchronous Motor Using Negative-point-connected Dual Inverter with Variable Voltage Capacitor

Yushi Araki, Tatsuki Kashihara, and Koji Kobayashi

Sanden Corporation, Japan

OGS3-5 11:10-11:35

[JIA-to-ICEMS]

Online Cell Capacitance and ESR Monitoring Using Switching Frequency in a Modular Multilevel Converter

Takumi Yasuda¹, Kazunori Hasegawa², and Jun-ichi Itoh¹

¹Nagaoka University of Technology, Japan ²Kyushu Institute of Technology, Japan

Session OS4B

Linear Drives and Magnetic Levitations 2

Date: November 29

Time: 9:30-11:50

Venue: Room: B

Chair: Shunsuke Ohashi

Kansai University, Japan

Victor Tedesco V

The Texas Heart Institute, USA

OS4B-1 9:30-9:50

Evaluation of Support Stiffness of a Permanent Magnet Attractive Force Type Passive Magnetic Bearing

Yanbo Dong, Satoshi Ueno, and Chengyan Zhao

Ritsumeikan University, Japan

OS4B-2 9:50-10:10

Multi-objective Parameter Optimization Design of Radial Magnetic Levitation Bearing

Yanbo Wang¹, Jiwei Cao¹, Bin Chen², Xi Chen³, Jiayi Liu¹, and Liyi Li¹

¹Harbin Institute of Technology, China, ²Guangdong Provincial Key Laboratory of High-Performance Servo System, China, ³Shanghai Academy of Spaceflight Technology, China

OS4B-3 10:10-10:30

A Mixed Sensitivity H_∞ Control Method Based on Active Magnetic Bearing

Sen Yan¹, Xi Chen², Jiayi Liu¹, Jiwei Cao¹, and Liyi Li¹

¹Harbin Institute of Technology, China, ²Shanghai Academy of Spaceflight Technology, China

OS4B-4 10:30-10:50

Topology Optimization of an Alternate Permanent Magnet Electrodynamic Suspension Using a 3-d Hybrid Analytical Model

Louis Beauloye and Bruno Dehez

UCLouvain, Belgium

OS4B-5 10:50-11:10

Thrust Analysis of a Reluctance-based Magnetic Lead Screw with Flux-concentrating Structure

Hayate Ayuzawa¹, Akira Heya¹, Yoshihiro Nakata², Hisaaki Mamiya³, and Tsuyoshi Inoue¹

¹Nagoya University, Japan, ²The University of Electro-Communications, Japan, ³Nabeya Bi-tech Kaisha, Japan

OS4B-6 11:10-11:30

Basic Consideration of Topology Optimization for Eddy Current Dampers

Kodai Watanabe¹, Akira Heya¹, Shinsaku Nakamura², and Tsuyoshi Inoue¹

¹Nagoya University, Japan, ²Ebara Corporation, Japan

OS4B-7 11:30-11:50

Proposal for Estimation of Modal Damping Ratio in Electromagnetic Bone Conduction Devices

Takaya Furui, Wataru Kitagawa, Takaharu Takeshita,

Akehiro Masuda, Ryohei Masuda, and Masahiro Nakashima

¹Nagoya Institute of Technology, Japan, ²SANKO MOLD Co., Ltd., Japan

Session OS4C

Permanent Magnet Machines 3

Date: November 29

Time: 9:30-11:50

Venue: Room: C

Chair: Yukihiro Yoshida

Akita University, Japan

Guoyu Chu

UNSW Sydney, Australia

OS4C-1 9:30-9:50

Structural Study of IPMSMs Achieving Both High Torque and Wide Constant Power Operating Range

Yosuke Hakamata¹, Masayuki Sanada¹, Shigeo Morimoto¹, Yukinori Inoue¹, Ikuto Homma², Yusuke Muto², Shuhei Tamamura³, and Masashi Sonoda³

¹Osaka Metropolitan University, Japan, ²Sanden Corporation, Japan, ³WOLONG Motor Control Technology Co., Ltd., Japan

OS4C-2 9:50-10:10

Research on the Optimization of Power Density and Its Influencing Factors of the YASA Motor

Jiaxin Li, Chengming Zhang, Liyi Li, Yiming Sun, and Jiangwen Liu

Harbin Institute of Technology, China

Program

OS4C-3 10:10-10:30

AC Copper Loss Separation and Reduction in IPMSM using Finite Element Analysis

Kenya Naruse^{1,2}, Kayano Masahiro¹, Hironari Mitarai¹, Kazuki Tamura², and Kenji Nakamura²

¹AICHI STEEL Corporation, Japan, ²Tohoku University, Japan

OS4C-4 10:30-10:50

Design and Analysis of Permanent Magnet Synchronous Machine with High Power Density for Aircraft Starter-generator

Zhen Zhang, Qunjian Lou, Peidong Hu, Jian Wang, and Yan Yan Zhejiang University, China

OS4C-5 10:50-11:10

Characterization of a High Torque Density Halbach Motor in UAV Application

Chao Zhi^{1,2}, Yangyang Huang¹, Haotian Wu^{1,2}, Qian Zhao¹, Lijun Xu¹, and Yinian Mao^{1,2}

¹Meituan Technology, China, ²Meituan Academy of Robotics Shenzhen, China

OS4C-6 11:10-11:30

Design and Analysis of In-wheel Flux Reversal Motor for Compact EV

Shotaro Tsunoda and Kenji Nakamura

Tohoku University, Japan

OS4C-7 11:30-11:50

Multi-objective Robust Optimization of a Low-cost and Efficient IPMSM for Battery Electric Vehicle

Andrew Botham¹, Bipana KC¹, M. Hossain Mohammadi², Reza Nasirizarandi², and Narayan C. Kar¹

¹University of Windsor, Canada, ²R&D Americas, Schaeffler, Canada

Session OS4D

Loss, Thermal and Cooling of Electric Machines

Date: November 29

Time: 9:30-11:50

Venue: Room: D

Chair: Yanhui Gao

Oita University, Japan

OS4D-1 9:30-9:50

Research on Immersion Evaporative Cooling under Different Pressure Conditions in High Power Density Motor

Yuqing Liu¹, Jiwei Cao¹, Bin Chen², Jiayi Liu¹, Yuchen Song¹, and Liyi Li¹

¹Harbin Institute of Technology, China, ²Guangdong Provincial Key Laboratory of High-Performance Servo System, China

OS4D-2 9:50-10:10

A Baseline Thermal Model for Liquid-cooled Multi-megawatt Scale Direct-drive Permanent Magnet Wind Turbine Generators

Fergus Hall and Alasdair McDonald

The University of Edinburgh, Scotland

OS4D-3 10:10-10:30

Computationally Efficient Estimation of Thermally Induced Stresses in Motorette Using Numerical Homogenization Techniques and Experimental Validation

Faezeh Hosseini^{1,2}, Guillaume Crevecoeur^{1,2}, and Hendrik Vansompel^{1,2}

¹Ghent University, Belgium, ²MIRO Corelab, Belgium

OS4D-4 10:30-10:50

Experimental Investigation of Windage Loss Impacts on Electrical Machine with Oil Jet Cooling

Sen Zhang^{1,2}, Zeyuan Xu¹, Fengyu Zhang¹, Chuan Liu¹, Yuling He³, He Zhang⁴, Chris Gerada¹, and David Gerada¹

¹University of Nottingham, U.K., ²University of Nottingham Ningbo China, China, ³North China Electric Power University, China,

⁴Yongjiang Laboratory, China

OS4D-5 10:50-11:10

Loss Evaluation in a Ductile Cast Iron Frame of a Permanent Magnet Synchronous Motor

Shunpei Goto¹, Yasuhito Takahashi¹, Koji Fujiwara¹, Makoto Matsushita², and Katsutoku Takeuchi²

¹Doshisha University, Japan, ²Toshiba Infrastructure Systems & Solutions Corporation, Japan

OS4D-6 11:10-11:30

Evaluation of Inverter Topologies and Switching Frequencies Regarding Harmonic Losses in PMSM

Eike Christian Krüger^{1,2}, Janine Ebersberger^{1,2}, Axel Mertens^{1,2}, and Bernd Ponick^{1,2}

¹Technische Universität Braunschweig, Germany, ²Leibniz University Hannover, Germany

OS4D-7 11:30-11:50

Measurement of Magnetic Parameters with Focus on Eddy Current Losses in Permanent Magnets of Electrical Machines using Flexible Matrix Sensors

Nijan Yagal¹, Christian Lehrmann¹, and Markus Henke²

¹Physikalisch-Technische Bundesanstalt, Germany, ²Technische Universität Braunschweig, Germany

Session OS4E

Superconducting & Special Machines

Date: November 29

Time: 9:30-11:50

Venue: Room: E

Chair: Yusuke Fujii

Institute of Science Tokyo, Japan

CHAO ZHI

Meituan Corporation, China

OS4E-1 9:30-9:50

Superconductive GdBaCuO 3-phase High Speed Outrunner Motor for High Load Cargo Drones

Andreas Greifelt¹, Moritz Berrenberg², and Niels Peder Harkes²

¹MAXMORE Germany GmbH, Germany, ²MAXMORE Technology Ltd., China

OS4E-2 9:50-10:10

Study on AC Loss Reduction in HTS Motors for Electrified Aircraft Propulsion

Enze Ma, Yulong Li, Yuan Gao, Huaqi Lian, and Heng Yu

Beihang University, China

OS4E-3 10:10-10:30

Analysis on the Characteristics of the Decompression Cooling System Used in the Superconducting Motor

Yuan Gao, Yulong Li, Enze Ma, Huaqi Lian, Zuoxia Wang, and Caiyu Yang

Beihang University, China

OS4E-4 10:30-10:50

Dynamic Non-linear Numerical-analytical Model for Synchronous Homopolar Machines

Amedeo Vannini¹, Mauro Di Nardo², Alessandro Marfoli¹, Antonino La Rocca¹, and Chris Gerada¹

¹University of Nottingham, UK, ²Politecnico di Bari, Italy

Program

OS4E-5 10:50-11:10
Design and Evaluation of a Flat PCB-based Axial Flux Motor

Haotian Wu^{1,2}, Chao Zhi^{1,2}, Han Gao¹, Lijun Xu¹, and Yinian Mao¹
¹Meituan Technology, China, ²Meituan Academy of Robotics Shenzhen, China

OS4E-6 11:10-11:30
A Double-feed Magnetic Resonant Coupling Machine with Air-gap Windings for High Power Density and Efficiency

Kazuto Sakai, Takaaki Toda, and Ryo Shimizu
Toyo University, Japan

OS4E-7 11:30-11:50
Transmission Torque Characteristics of Strain Wave Gear with 16-poles Magnet

Fumiya Kitayama and Ryou Kondo
Ibaraki University, Japan

Session OS4F

Synchronous Machine Control and Drives 2

Date: November 29

Time: 9:30-11:50

Venue: Room: F

Chair: Yoshitaka Iwaji

Ibaraki University, Japan

Shuo Wang

University of Nottingham Ningbo, China

OS4F-1 9:30-9:50
Online MTPA Angle Search Method Using Flux Linkage Plane Estimation of SynRM

Souya Arakawa, Shigeo Morimoto, Yukinori Inoue, and Masayuki Sanada
Osaka Metropolitan University, Japan

OS4F-2 9:50-10:10
Position Estimation and Parameter Identification of SynRM at Standstill

Masahiro Oyanagi, Shigeo Morimoto, Yukinori Inoue, and Masayuki Sanada
Osaka Metropolitan University, Japan

OS4F-3 10:10-10:30
Maximum Torque Per Ampere Control Implemented Hardware System for Synchronous Reluctance Motor

Yu Nabeshima and Tsuyoshi Hanamoto
Kyushu Institute of Technology, Japan

OS4F-4 10:30-10:50
Voltage Angle Regulated Field Weakening Control Based on Overmodulation Strategy for PMA-synRM Drives

Runze Jing¹, Dawei Ding¹, Qiwei Wang¹, Zhaoqiang Fu², Wenlong Liu², Li Ding¹, Gaolin Wang¹, and Dianguo Xu¹
¹Harbin Institute of Technology, China, ²Guangdong Midea Air-Conditioning Equipment Co., Ltd., China

OS4F-5 10:50-11:10
Dual Inverter Controlled Third Harmonic Current Injection Scheme for an Open-end Winding Brushless Wound Rotor Synchronous Machine

Ghulam Jawad Sirewal, Eungjae Kim, and Gilsu Choi
Inha University, Republic of Korea

OS4F-6 11:10-11:30
Acoustic Noise Reduction in Resolver-based PMSM Servo Drives using NLMS Adaptive Filtering

Tao Li, Chaohui Liang, and Duhuang Su
Spinrol Technology (Shenzhen) Co., Ltd., China

OS4F-7 11:30-11:50
Applying Partial PAM Method Suitable for Robot Motor Drive

Hideki Jonokuchi¹, Yoshihiro Okumatsu², and Yoh Sato²
¹Nagoya Institute of Technology, Japan, ²TOYOTA MOTOR CORPORATION, Japan

Session OS4G

PM Motor Control 4

Date: November 29

Time: 9:30-11:50

Venue: Room: G

Chair: Sari Maekawa

Meiji University, Japan

Binxing Li

Harbin Institute of Technology, China

OS4G-1 9:30-9:50
Implementation and Validation of a LUT-based Model of an IPMSM Considering Saturation and Spatial Harmonics

Daniel. C. Rodriguez Pinto, Achref Douiri, and Rik W. de Doncker
Institute for Power Electronics and Electrical Drives, Germany

OS4G-2 9:50-10:10
Impact of Voltage Modulation Module on Negative Input Impedance and DC-link Stability in Permanent Magnet Synchronous Motor Drives

Zhen Jin¹, Wei Xu¹, Jiyao Wang¹, Shuhua Fang¹, and Xiping Liu²
¹Southeast University, China, ²Jiangxi University of Science and Technology, China

OS4G-3 10:10-10:30
Influence of d -axis Current on Torque and Transformer Secondary-side Power in Power Superposition System for Position Sensor of Surface-mounted PMSM

Haruki Sazanami¹, Takeshi Kiribuchi², Yukinori Inoue¹, Shigeo Morimoto¹, and Masayuki Sanada¹
¹Osaka Metropolitan University, Japan, ²OMRON, Japan

OS4G-4 10:30-10:50
Improvement Performance of FOC for PMSM Based on Reinforcement Learning TD3 Agent Current Controller

Kittithuch Paponpen and Tanpisit Atipasaworn
Silpakorn University, Thailand

OS4G-5 10:50-11:10
Torque Control Characteristics of Simple Controller-based Direct Torque Control for PMSM Drive System

Hiroshi Enokura¹, Yukinori Inoue², Shigeo Morimoto², Masayuki Sanada², Toshimitsu Aizawa³, Takashi Takagi³, and Taichi Kawakami¹

¹Osaka Metropolitan University College of Technology, Japan, ²Osaka Metropolitan University, Japan, ³Toshiba Corporation, Japan

OS4G-6 11:10-11:30
Modulation Signal Optimized Synchronous PWM

Tetsuya Kojima, Tomoya Tachibana, Shota Kondo, Junji Kitao, and Tomohira Takahashi
Mitsubishi Electric Corporation, Japan

Program

OS4G-7 11:30-11:50

An Accurate Measurement Method for Iron Loss Resistance of Permanent Magnet Synchronous Motor

Yongpeng Shen, Yakai Ge, Zhiwei Chen, and Bo Zhou
Zhengzhou University of Light Industry, China

Session OS4H

Sensorless Control 3

Date: November 29

Time: 9:30-11:50

Venue: Room: H

Chair: Yoshiyasu Takase

YASKAWA Electric Corporation, Japan

Adrish Bhaumik

National University of Singapore, Singapore

OS4H-1 9:30-9:50

Torque Ripple Suppression Control in Medium to High-speed Ranges with Position Sensorless Vector Control

Taiki MIKAMI, Keitaro KAWARAZAKI, and Nobukazu HOSHI
Tokyo University of Science, Japan

OS4H-2 9:50-10:10

A Mutual Inductance Estimation Based Sensorless Control for IPMSM with Complex-coefficient Filter in Low-speed Range

Yuhan Chen¹, John Xu¹, Jing Li¹, Dunant Halim¹, and Huanran Wang²

¹University of Nottingham Ningbo China, China, ²Zhejiang University, China

OS4H-3 10:10-10:30

Robust Deadbeat Predictive Current Control for High-speed Synchronous Machine Sensorless Drive with Instant Inductance Identification

Yinfeng Hu¹, Wei Hua¹, and Mingjin Hu²

¹Southeast University, China, ²The Hong Kong Polytechnic University, China

OS4H-4 10:30-10:50

Sensorless Control for IPM with Adaptive Resistance Estimation Using Flux Norm Correction

Zeqiang He and Tadahiko Shinshi

Tokyo Institute of Technology, Japan

OS4H-5 10:50-11:10

Suppression of Velocity Pulsations with Resonant Controllers in Sensorless Vector Control of Permanent Magnet Synchronous Motors

Naohiko Sekine and Hisao Kubota

Meiji University, Japan

OS4H-6 11:10-11:30

Efficient I-f Startup Method for Refrigeration Compressors

Morten Milton Bleshø¹, Kaiyuan Lu¹, Kresten Kjær Sørensen², John-Josef Leth¹, and Jan Dimon Bendtsen¹

¹Aalborg University, Denmark, ²Bitzer Electronics, Denmark

OS4H-7 11:30-11:50

Vibration Suppression Method using Disturbance Observer in Sensorless 120-degree Conduction Compressor Motor Drive

Yusuke Omi, Takumi Yasuda, Hiroki Watanabe, and Jun-ichi Itoh

Nagaoka University of Technology, Japan

Session OS4I

Linear Motor Control and Drives

Date: November 29

Time: 9:30-11:50

Venue: Room: I

Chair: Takayuki Miyajima

Daikin Industries, Ltd., Japan

Ruiwu Cao

Nanjing University of Aeronautics and

Astronautics, China

OS4I-1 9:30-9:50

Design for Bidirectional Movement of Bendable Tubular Linear Motor

Kaito Yamamoto and Seiichiro Katsura

Keio University, Japan

OS4I-2 9:50-10:10

Research on the Influence Mechanism and Stability Control Method of Composite Disturbance on Double-end Power Supply of High Speed Maglev Traction System

Bo Zhang^{1,2,3}, Zhanming Zhang^{2,3}, Qiongxuan Ge^{2,3}, Weixin Chen^{2,3}, Ke Wang^{2,3}, and Yaohua Li^{2,3}

¹National Railway Administration of P. R. C, China, ²Chinese Academy of Sciences, China, ³Shijingshan District, China

OS4I-3 10:10-10:30

A Novel Segment Switching Method for Dual Three-phase Linear Motors with Stator Segmented Powered

Yanfei Li^{1,2}, Zixin Li^{1,2}, Cong Zhao¹, Fei Xu^{1,2}, Liming Shi^{1,2}, and Yaohua Li^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

OS4I-4 10:30-10:50

A Smooth Power Supply Switching Method of Segmented Long Primary Linear Motors for High-speed Applications

Cong Zhao^{1,2}, Zixin Li^{1,2}, Farui Zhang³, Fanqiang Gao^{1,2}, Fei Xu^{1,2}, and Hang Zhang¹

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China, ³Institute of Electrical Engineering and Advanced Electromagnetic Drive Technology Qilu Zhongke, China

OS4I-5 10:50-11:10

Full-decoupled Two-degree-of-freedom Position Controller for PMSLM Based on ADRC

Yiwei Zhang, Xuzhen Huang, and Jian Xu

Nanjing University of Aeronautics and Astronautics, China

OS4I-6 11:10-11:30

Friction Compensation Method with Iterative Learning Based Bang-bang Compensator in PMLSM system

Kai Kang, Mingyi Wang, Jianxin Cui, Chengming Zhang, and Liyi Li

Harbin Institute of Technology, China

OS4I-7 11:30-11:50

Adaptive Feedforward Control Based on Recursive Least Squares Algorithm for the Biaxial Maglev Planar-motor-driven Gantry System

Minghong Liu, Mingyi Wang, Junchi Li, Qinwei Sun, Chengming Zhang, and Liyi Li

Harbin Institute of Technology, China

Program

Session OS4J

Power Converter 3 (WPT)

Date: November 29

Time: 9:30-11:50

Venue: Room: J

Chair: Hirohito Funato

Utsunomiya University, Japan

OS4J-1 9:30-9:50

High Distance to Diameter Ratio Wireless Power Transfer System

Jiantao Zhang¹, Zhan Gao¹, Jianyu Lan², Dean Wang¹, Ying Liu¹, Fuze Chen¹, Wenbo Zhao¹, and Chunbo Zhu¹

¹Harbin Institute of Technology, China, ²Shanghai Institute of Space Power-Sources, China

OS4J-2 9:50-10:10

Analysis of Low-eddy Current WPT Applied in Underground Coal Mines

Yingying Wang, Jiahui Yu, and Shuangli Chen

China University of Mining and Technology, China

OS4J-3 10:10-10:30

A Novel Capacitive Power Transfer System with Embedded Coupler for Rotary Application

Ying Liu, Liangyi Pan, Shunyu Yao, Jiantao Zhang, and Chunbo Zhu

Harbin Institute of Technology, China

OS4J-4 10:30-10:50

Characteristic Analysis of Coupling Mechanism for Wireless Power Transfer System with Transparent Window Used in Coal Mine

Yingying Wang, Shuangli Chen, Jiahui Yu, and Zuhuo Liang

China University of Mining and Technology-Beijing, China

OS4J-5 10:50-11:10

WPT Coil Position for Minimizing SOC Fluctuations in Battery-powered Trains

Eita Sato and Keiichiro Kondo

Waseda University, Japan

OS4J-6 11:10-11:30

Coupling Coefficient Estimation Method for SP-type Wireless Power Transfer System

Hiroki Sugihara, Yuki Shimizu, and Yoshitaka Kawabata

Ritsumeikan University, Japan

OS4J-7 11:30-11:50

Hybrid Closed-form Modulation Scheme for Three-phase Dual-active Bridge with Reduced RMS Current

Lukas Leucker, Daniel von den Hoff, and Rik W. De Doncker

RWTH Aachen University, Germany

Session OS4K

Power Converter (general)

Date: November 29

Time: 9:30-11:50

Venue: Room: K

Chair: Shotaro Takahashi

Akita University, Japan

Yi Lu

State Grid Zhejiang Electric Power Research Institute, China

OS4K-1 9:30-9:50

Simulation Platform for GaN-based Three-phase Voltage Source Inverter Analysis: Switching Frequency and Deadtime

Vijay Kumar Singh¹, Ravi Nath Tripathi², and Manoj Badoni³

¹Rajiv Gandhi Institute of Petroleum Technology Jais, India, ²Kyushu Institute of Technology, Japan, ³Thapar Institute of Engineering and Technology, India

OS4K-2 9:50-10:10

Application of Mn-zn Ferrite to Passive Common-noise Canceller Placed on Inverter DC Side

Jinxing Zhou and Koji Orikawa

Hokkaido University, Japan

OS4K-3 10:10-10:30

Passive Cancellation for Reducing Input- and Output-side Common-mode Currents in Three-phase PWM Inverter-fed Motor Drive Systems

Shotaro Takahashi, Matoi Ono, and Ryosuke Kanbayashi

Akita University, Japan

OS4K-4 10:30-10:50

Efficient and Compact 400-v, 100-a Solid-state Circuit Breaker Using SiC Devices

Taro Takamori^{1,2}, Taiki Hirai², and Keiji Wada²

¹The University of Tokyo, Japan, ²Tokyo Metropolitan University, Japan

OS4K-5 10:50-11:10

An Energy-saving Strategy for Permanent Magnet Synchronous Motors System

Hao Yang, Zhichao Huang, Song Qiu, and Qingxiang Liu

Southwest Jiaotong University, China

OS4K-6 11:10-11:30

Improved Sliding Mode Control Method Using a Hyperbolic Function for Battery Charger of PMDs

Junhyeok Choi and Yeongsu Bak

Keimyung University, Republic of Korea

OS4K-7 11:30-11:50

Parallel Grid-forming Inverters for 100% Inverter-based Resources RE100 Microgrid -emphasis on Secondary Control-

Phimnaphat Phonthani, Preenapan Panya,

and Surapong Suwankawin

Chulalongkorn University, Thailand

Session OS4L

Power Converter 3 (AC-DC)

Date: November 29

Time: 9:30-11:50

Venue: Room: L

Chair: Hiroaki Yamada

Yamaguchi University, Japan

Xinhong Yu

Haixi Institutes Chinese Academy of Sciences, China

OS4L-1 9:30-9:50

An Improved Super-twisting Sliding Mode Controller over Totem-pole Power Factor Corrector

Yihe SHEN, Siwen YE, Mingou WEI, Zhibin LING, and YANG Xi-jun

Ministry of Education (Shanghai Jiao Tong University), China

Program

OS4L-2 9:50-10:10
Low Harmonic 24-pulse Rectifier Based on Square-wave Voltage Injection

Bin wang, Manlei huang, Jingfang wang, Chen nie, and Changbao wang
Harbin Engineering University, China

OS4L-3 10:10-10:30
A Synchronous Rectification Strategy Driven by Current and Digital for Three Phase LLC Resonant Converter

Xinghong Luo¹, Xuliang Yao¹, Yannan Gao², and Jingfang Wang¹
¹Harbin Engineering University, China, ²Guangdong Ocean University, China

OS4L-4 10:30-10:50
Simplified Linear Kalman Filter for Sensorless Oriented Control of PWM Rectifiers

F. Centi, A. Credo, G. Fabri, A. Fioravanti, and M. Tursini
University of L'Aquila, Italy

OS4L-5 10:50-11:10
Fault-tolerant Strategy of Flying-capacitor Boost Three Level Converter

Da Zhang¹, YuGu¹, Donglai Zhang¹, Hao Yang¹, Tangpei Jiao², and Hui Li²
¹Harbin Institute of Technology (Shenzhen), China, ²Space Microwave Technology Institute(Xi'an), China

OS4L-6 11:10-11:30
Evaluation of The Impact of Power Quality on Each Home Appliance

Tomoaki Shoji and Masahiko Hasegawa
Tokyo Electric Power Company Holdings, Inc., Japan

OS4L-7 11:30-11:50
Power Balancing Control of Sub Modules with Battery Units in Single-phase Grid-tied MMC Under Unbalanced Generated Power

Ryo Yoshimura and Hiroaki Yamada
Yamaguchi University, Japan

Session PS4-1

Numerical Analysis and Modeling 2

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Shohei Komeda

Chair: Sho Sakurai

Akita University, Japan

PS4-1-1
Fast Steady-state Analysis Method for Cage Induction Motors Based on Polyphase TP-EEC Method in a Rotational Reference Frame

Hiroyuki Kaimori¹, Yasuhito Takahashi², and Shinji Wakao³
¹Science Solutions International Laboratory, Inc., Japan, ²Doshisha University, Japan, ³Waseda University, Japan

PS4-1-2
Analysis of Electromagnetic Force and Power Consumption in Magnetic Levitation Planar Motor with Dual-layer Coil Array

Kai Liu, Fuxiang Chen, Yingtong Wu, Aoqi Hu, Xinpeng Wei, and Lizhan Zeng
Huazhong University of Science and Technology, China

PS4-1-3
Dynamic Behavior of Levitated Flexible Steel Plate in Bending Electromagnetic Levitation System during Disturbance Input

Yamato Uchida¹, Kazuki Ogawa², Ikkei Kobayashi^{1,1}, Jumpei Kuroda^{1,1}, Daigo Uchino³, Keigo Ikeda⁴, Taro Kato⁵, Ayato Endo⁶, Takayoshi Narita¹, and Hideaki Kato¹
¹Tokai University, Japan, ²Aichi University of Technology, Japan, ³Numazu National College of Technology, Japan, ⁴Hokkaido University of Science, Japan, ⁵Tokyo University of Technology, Japan, ⁶Fukuoka Institute of Technology, Japan

PS4-1-4
Magnetic Properties of Iron Core Materials Based on the Creep Model and Dynamic Observation of Magnetic Domains

Shiyu Wang, Zhen Wang, Yanli Zhang, and Xiuke Yan
Shenyang University of Technology, China

PS4-1-5
Improvement of a Magnetostrictive Model Considering Applied Stress and Magnetic Fields Including Hysteresis Effects

Ming Cai, Yanli Zhang, Zhen Wang, and Xiuke Yan
Shenyang University of Technology, China

PS4-1-6
A Novel Electromagnetic Analysis Method of Spoke-type Permanent Magnet Machine with Overhang Structure

Yunlu Du^{1,2}, Yunkai Huang¹, Fei Peng¹, Baocheng Guo³, Liwen Bao¹, and Hajime Igarashi²
¹Southeast University, China, ²Hokkaido University, Japan, ³Nanjing Normal University, China

PS4-1-7
Simulation Analysis of Air Cooling System Flow Field Characteristics for Generator-motor in Pumped Storage Power Stations

Zhao Yifeng¹, Zhao Sheng², Lu Weifu¹, Gui Zhonghua¹, Zhang Fei¹, and Chen Jinxiu²
¹Pumped-storage Research Institute, China, ²Institute of Electrical Engineering CAS, China

PS4-1-8
Electromagnetic-structural Coupled Analysis of Magnetic-elastic Power Generation System with High Load and Small Deformation Characteristics

Yun-Jung Hwang, Jong-Oh Park, Seung-Eun Rho, Eun-Chae Jung, Kyung-Sik Seo, and Il-Han Park
Sungkyunkwan University, Republic of Korea

PS4-1-9
Frequency Response Analysis for Transformer Winding with Improved Equivalent Circuit

Rongjie Wei¹, Xiuke Yan¹, Yanbing Li², Yanli Zhang, and Zhen Wang¹
¹Shenyang University of Technology, China, ²Pera Corporation Ltd, China

Session PS4-2

Noise, Vibration and Reliability of Electric Machines 2

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Sho Sakurai

Akita University, Japan

Program

PS4-2-1

Probabilistic Analysis of Partial Discharges in the Stator Winding Insulation for Electrified Aviation

Norman Blanken, Labassi Younes Laajouzi, and Bernd Ponick
Leibniz University Hannover, Germany

PS4-2-2

Fast and Accurate Radial-flux PMSM Step-skewing Computation Methodology for NVH Improvements Across the Machine Full Operation Range

Sebastian Ciceo¹, Raluca Raia², Flavius Paduraru², and Kohta Sugiura³
¹Siemens Digital Industry Software, Belgium, ²Siemens Digital Industry Software, Romania, ³Siemens Digital Industry Software, Japan

PS4-2-3

Investigation of Measurement Method for Thickness of Hot Springs Scale Using Electromagnetic Force Vibration

Hiroyuki Ikusada¹, Ryota Takasugi¹, Shinya Shiota¹, Yuji Gotoh¹, and Teruyoshi Sasayama²
¹Oita University, Japan, ²Kyushu University, Japan

PS4-2-4

A Negative Stiffness Injection Method for PMSM in the Five-DoF Magnetic Levitation System to Suppress the Vibration

Qiang Yu, Xin Cao, and Zhiquan Deng
Nanjing University of Aeronautics and Astronautics, China

PS4-2-5

Novel Online Non-invasive Measurement Approach for PMSM-transmission Chain Radial Natural Frequency Based on Driving PMSM Radial Force Injection

Juntao Wang, Zhiyuan Wang, and Pinjia Zhang
Tsinghua University, China

PS4-2-6

A Novel Partial Slot Unwounded Method for Electromagnetic Vibration Reduction of Large Electric Machines

Xiaolong Zhao¹, Jianjun Liu², Longhui Liu¹, Yong Yang², Jian Xiao², Wanhai Zhao³, Haoyu Kang¹, Lu Sun¹, Jin Wang¹, and Libing Zhou¹
¹Huazhong University of Science and Technology, China, ²Dongfang Electric Machinery Co., Ltd., China, ³Nanyang Power Supply Company, China

PS4-2-7

A Motor Vibration Suppression Method Based on Vibration Reduction Coils

Yanshuo Jia, Yuanzhi Zhang, Yihang Luan, and Jianjun Sun
Wuhan Universities, China

PS4-2-8

Multi-mode Vibration Suppression for Electric Machines using Passive Dynamic Vibration Absorbers Mounting on Stator Outer Peripheral

Naho Funasaka, Makoto Isobe, and Takashi Kosaka
Nagoya Institute of Technology, Japan

PS4-2-9

Vibration Reduction by Grooving on Magnets for PMSMs

Xinbang Wang, Qiang Tan, Junhao Pian, and Jing Li
Nanjing University, China

PS4-2-10

Combined Fault Diagnosis of Stator and Rotor Windings in a PWM Inverter-fed Induction Motor Using Frequency Spectrum of Estimated Air-gap Torque

Keita Takehana, Hideaki Hirahara, and Shu Yamamoto
Polytechnic University, Japan

Session PS4-3

Transformers and Power Apparatus

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Sho Sakurai

Akita University, Japan

PS4-3-1

Study on the Design Optimization of Cast-resin Transformer using Permutation with Repetition and Python's Scipy Method

JongGun Lee, WoongHee Lee, and KyoungHoon Lee
HD HYUNDAI ELECTRIC, Republic of Korea

PS4-3-2

Optimal Design of Three-phase Transformer using Genetic Algorithm and FEMM

Peter Nkwocha Harmony, Junki Park, Yujin Lee, and Jaihoon Baek
Koreatech University, Republic of Korea

PS4-3-3

Additive Manufacturing Lightweight Inductor

Tsung-Wei Chang, Po-Wei Huang, Huan-Hsuan Yeh, Cheng-Hsin Shih, and Mi-Ching Tsai
National Cheng Kung University, Taiwan

PS4-3-4

Influence of Distorted Voltage and Harmonics on High-frequency Transient Model of Transformers

Yingying Wang, Jindi Pang, Bolin Jin, Zuhuo Liang, and Shuangli Chen
China University of Mining and Technology, China

PS4-3-5

Core Loss Calculation of Nanocrystalline High-frequency Transformer under Non-sinusoidal Excitation

Zhiwei Sui, Wenliang Zhao, Minglei Dou, Haibo Ding, and Li Zhang
Shandong University, China

PS4-3-6

Analysis of Inter-turn Short-circuit Characteristics in Single-phase Traction Transformers Based on Digital Twin

Yikesha Halimulati^{1,2}, Lu Zhao¹, Yuang Luo^{1,2}, Qiongxuan Ge¹, Shi Cheng^{1,2}, and Yuhang Chi^{1,2}
¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

PS4-3-7

The Basic Study on the Optimization of Mutual Induction Circuit that Separates Zero Energy into Positive and Negative Energy

Yoshiaki Yoshida¹ and Yukio Suzuki²
¹Hiroshima Institute of Technology, Japan, ²SEMITEC Corporation, Japan

PS4-3-8

A Proposal of a New Temperature Rise Test Method for Filter Reactors — Middle-frequency Test —

Hiroaki Maeji^{1,2}, Minoru Kuwata^{1,2}, and Koji Fujiwara²
¹Sumitomo Electric Industries, Ltd., Japan, ²Doshisha University, Japan

Program

Session PS4-4

Other Related Topics in Electric Machines

Date: November 29
Time: 12:00-13:00
Venue: FIT Arena
Chair: Sho Sakurai
Akita University, Japan

PS4-4-1

Investigation on the Torque to Mass Ratio of Synchronous Magnetic Couplings

Yusuf Akcay¹, Oliver Tweedy², Paolo Giangrande³, and Michael Galea⁴

¹University of Sheffield, UK, ²University of Nottingham, UK,

³University of Bergamo, Italy, ⁴University of Malta, Malta

PS4-4-2

A Hybrid Spiral Stepper Motor with Staggered Punching Structure

Wei Hao¹, Rui Zhang¹, Yuchao Shi², and Liwei Song¹

¹College of Harbin Institute of Technology, China, ²Harbin Institute of Technology, China

PS4-4-3

Design and Optimization of Non-insulated Pipe Wall Electromagnetic Flowmeter for High-temperature Liquid Metal Flow Measurement

Yikun LI, Jien MA, Sixian ZHU, Wenxiao WU, Lin QIU, and Youtong FANG

Zhejiang University, China

PS4-4-4

Parameter Optimization Design of Magnetic Levitation Centrifugal Blood Pump Based on Parameter Sensitivity Analysis

Kun Wang¹, Ji Min Chen¹, Yun Le¹, Shi Qiang Zheng¹, and Yin Zhang²

¹Beihang Univ, China, ²Hangzhou Kuntai Maglev Technology Co., Ltd.

PS4-4-5

Energy-saving Power Transmission Device for CNC

Baek-Ju Sung¹, Jong-Bae Lee¹, Do-Sik Kim¹, Yong-Seon Yun², and Yong-Hyun Kim²

¹KIMM, Republic of Korea, ²KHANSTN, Republic of Korea

PS4-4-6

Detection of Slot Discharges by using On-line PD Monitoring System with a Non-contact Sensor

Takashi Harakawa, Akira Fujimoto, Tomoaki Takahashi, and Hirotaka Tsubakihara

Toshiba Energy Systems & Solutions Corporation, Japan

PS4-4-7

Analysis and Control Strategy Study of Large-scale Pumped Storage Power Station Phase Modulation Operation

Zhangbin Yang^{1,2}, Jiaxon Huang^{1,2}, Daixiao Peng³, Xi Cai³, Xueguang Lian³, Hang Cai³, and Jinxiu Chen¹

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China, ³China Three Gorges Corporation, China

PS4-4-8

Model Predictive Control with Disturbance Compensation for Trajectory Tracking of Three-degree-of-freedom Spherical Joint Actuator

Yan Wen, Ziyang Chen, Guoli Li, Qunjing Wang, Qian Zhang, and Lufeng Ju

Anhui University, China

PS4-4-9

Efficiency Improvement of Induction Motors with Novel Magnetic Slot Wedges

Shin Noguchi, Keiko Kikuchi, Kyohei Aimuta, and Hirohisa Sano

Proterial, Ltd., Japan

PS4-4-10

Improvement of Shape Memory Alloy (NiTi) Actuation Frequency Using Highly Thermally Conductive Metal Layer

Marjan Ghorbani¹, Xinxin Liao¹, Sean Thomas², Thomas Martinez¹, and Yves Perriard¹

¹École Polytechnique Fédérale de Lausanne, Switzerland,

²Pennsylvania State University, USA

Session PS4-5

Sensorless Control 2

Date: November 29
Time: 12:00-13:00
Venue: FIT Arena
Chair: Junichi Asama
Shizuoka University, Japan

PS4-5-1

Improved Synchronous Demodulation Method for Three-stage Synchronous Machine Based on D-axis Response High-frequency Voltage

Zhihui Wang, Jiadan Wei, and Le Zhang

Nanjing University of Aeronautics and Astronautics, China

PS4-5-2

Improved Sensorless Control of IPMSM Drives Using Complex Bandpass Filter and Pseudolinear Enhanced PLL

Haoyuan Yu¹, Wang Bo¹, Jun Huang¹, and Dewen Tian²

¹Southeast University, China, ²China North Vehicle Research Institute, China

PS4-5-3

Model Predictive Sensorless Control with High-frequency Square-wave-type Voltage Synchronized with Carrier

Takashi Mitsunaga¹, Sari Maekawa¹, Ryosuke Saito², Yuki Kumakiri², and Akira Nakazawa²

¹Meiji University, Japan, ²Toshiba Infrastructure Systems & Solutions Corp., Japan

PS4-5-4

Position Sensorless Control in Low-speed Regions for Non-saliency and Concentrated Winding Motors

Kohei Hayashi and Yoshitaka Iwaji

Ibaraki University, Japan

PS4-5-5

Position Sensorless Control of Dual Three-phase PMSM Based on Improved Sliding Mode Observer

Anchen Yang¹, Mingyao Lin¹, and Keman Lin²

¹Southeast University, China, ²Hohai University, China

Program

PS4-5-6

A Precise Rotor Flux Estimator for a Sensorless Dual Three-phase SPMSM

Yilong Wang¹, Bing Tian¹, Cong Guo¹, and Qiming Bai²

¹Nanjing University of Aeronautics and Astronautics, China,

²Saisheng Information Technology Research Institute Jiangsu Co., Ltd., China

Session PS4-6

Sensorless Control 3

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Junichi Asama
Shizuoka University, Japan

PS4-6-1

Effects of d -axis Inductance Change for Position Sensorless Control of SynRM at Low Velocities by Using an Extended EMF caused by High-frequency Current Superposition

Yuto Yamamori¹, Yuki Miki¹, Mutuwo Tomita¹, Masaru Hasegawa², and Shinji Doki³

¹Natl. Inst. of Tech., Gifu Coll., Japan, ²Chubu Univ.Japan., ³Nagoya Univ., Japan

PS4-6-2

Inductance Linearization Region-based Initial Rotor Position Estimation Method for Doubly Salient Electromagnetic Motor

Wenjing Fang, Bo Zhou, Yijun Zhang, Xie Xie, and Xiaodong Yu
Nanjing University of Aeronautics and Astronautics, China

PS4-6-3

Position Estimation for Sinusoidal Doubly Salient Electromagnetic Machine by Injecting High-frequency Current Signal into Excitation Winding

Yang Huang, Bo Zhou, Xiaodong Yu, and Yaotian Shi
Nanjing University of Aeronautics and Astronautics, China

PS4-6-4

Research on Initial Rotor Position Estimation for DSEM Based on Excitation Field Building

Xie Xie, Bo Zhou, Wenjing Fang, Yijun Zhang, and Wenbo Zhou
Nanjing University of Aeronautics and Astronautics, China

PS4-6-5

Position Sensorless Control Method for Doubly Salient Electromagnetic Machine Based on Non-conduct Phase Current Injection

Qianqian Zhang, Zhuoran Zhang, Li Yu, Xu Chen, and Yao Sun
Nanjing University of Aeronautics and Astronautics, China

PS4-6-6

Reciprocating Drive of Position Sensorless Linear Switched Reluctance Motor Based on Mathematical Model of Magnetization Curves

Tadashi Hirayama
Kogakuin University, Japan

Session PS4-7

Motion Control and Maglev Control Systems

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Junichi Asama
Shizuoka University, Japan

PS4-7-1

Design of a Dynamic Compensator for Load-side Speed and Torsional Torque Controls of a Two-inertia System

Wen Li¹, Yongdan Chen², Dong Wei¹, Kan Liu¹, Jing Zhou¹,

Tao Peng¹, Wenrui Liu¹, and Cong Huang¹

¹Hunan University, China, ²China North Vehicle Research Institution, China

PS4-7-2

Simple Design Method of Two-degree-of-freedom PID Position Controller Specifying Disturbance Response for Linear Servo Motors

Hideaki Hirahara¹, Kenjiro Kuroki², and Shu Yamamoto¹

¹Polytechnic University, Japan, ²Okinawa Polytechnic College, Japan

PS4-7-3

Modeling and Optimal Control for 2-DOF Differential Robot Joint Based on Cascade Extended State Observer

Yuheng Wang, Deliang Liang, Zhe Liang, and Yang Liang

Xi'an Jiaotong University, China

PS4-7-4

Dual-redundant Electro-mechanical Actuators Force Fight Reduction Control Based on Position Sensor Fault-tolerant

Wenrui Liang, Shoujun Song, and Xiaocan Huang

Northwestern Polytechnical University, China

PS4-7-5

Vibration Suppression Method in Flexible Loads Motor Drives System based on Speed Feedback Resonance Filter

Qiyang Zeng¹, Ming Yang¹, Chaoyi Shang¹, Ruizhe Zhou¹, Pengcheng Lan¹, and Xinmei Zhang²

¹Harbin Institute of Technology, China, ²Ningbo Anxin CNC Technology Co., Ltd., China

PS4-7-6

Servo System End-of-system Oscillation Suppression Based on Acceleration Limiting and Notch Filtering

Zhiyuan Wang, Juntao Wang, and Pinjia Zhang

Tsinghua University, China

PS4-7-7

Speed Regulation Strategy of Blood Pump Motor used in Hypothermic Therapy

Kun Wang¹, Shiyi Xu¹, Mohan Hao¹, Shiqiang Zheng¹, and Yin Zhang²

¹Beihang University, China, ²Hangzhou Kuntai Maglev Technology Co., Ltd., China

PS4-7-8

Servo Motor Control System Design Based on EtherCAT Real-time Communication

Fengyang Liu, Dianguo Xu, and Qiang Gao

Harbin Institute of Technology, China

PS4-7-9

Study of Robust Control Strategy for the Levitation Subsystem of Bilateral Long Primary Permanent Magnet Linear Synchronous Motor

Shuntian Yan¹, Qiang Tan¹, Yingzhen Li², and Jing Li¹

¹Nanjing University of Aeronautics and Astronautics, China, ²China Industrial Control Systems CERT, China

PS4-7-10

Vibration Suppression Based on Phase Shift Notch Filter for Bearingless Motor Rotor Mass Unbalance System

Zhenglong Li, Xiaolin Wang, and Xucong Bao

Nanjing University of Aeronautics and Astronautics, China

Program

Session PS4-8

Power Converters of Renewable Energy Systems 2

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Hitoshi Haga

Shizuoka University, Japan

PS4-8-1

A Novel Day-ahead Probability Prediction Method for PV Station Based on Improved CNN-autoformer Network

Wenzhi Zhu¹, Yixin Liu¹, Li Guo¹, Yanrong Li¹, Xiliang Li², and Cuigu Wu²

¹Tianjin University, China, ²Xinte Energy Company Limited, China

PS4-8-2

Flexible Resource Data Acquisition and Dynamic Characterization Techniques for Virtual Power Plants with a High Percentage of New Energy Access

Peirong Zhang¹, Xiangyu Kong¹, Yuan Ren¹, Qingrong Zheng², and Zhuofan Tang²

¹Tianjin University, China, ²State Grid Shanghai Electric Power Company, China

PS4-8-3

Research on Reserve Capacity Planning Method for Distribution Systems Considering Uncertainty of Temperature-controlled Loads

Longyu Zhang¹, Xiangyu Kong¹, Yue Guo², Yi Song², and Xuyang Wang²

¹Tianjin University, China, ²State Grid Economic and Technological Research Institute Co., Ltd., China

PS4-8-4

A Novel Method for Optimal Capacity Configuration of the Grid-connected Wind-solar Complementary Power Generation

Yuan Zhu and Kazuhiro Ohyama

Fukuoka Institute, Japan

PS4-8-5

A Study of Dynamic Characteristics of Series-connected Wind Farm Using a Simulation Model That Can Reduce Computational Load

Fujio Tatsuta and Shoji Nishikata

Tokyo Denki University, Japan

PS4-8-6

Multi-time Scale Optimization Scheduling Model for Over-matched PV Station with Energy Storage

Wenzhi Zhu¹, Yixin Liu¹, Li Guo¹, Yanrong Li¹, Xiliang Li², and Cuigu Wu²

¹Tianjin University, China, ²Xinte Energy Company Limited, China

PS4-8-7

A Coupled Analysis of Nonlinear Vibration Energy Harvester Based on Predictor-corrector Approach

Takahiro Sato

Muroran Institute of Technology, Japan

PS4-8-8

Machine Learning based Methodology for Fast Assessment of Battery Health Status

Younggill Son and Woongchul Choi

Kookmin University, Republic of Korea

PS4-8-9

Fleet Management on Inland Waterways for Electric Boat Ferry System

Ma. Leonora Elizabeth O. Borromeo, Luis Jarod De Luna,

Rovinna Janel C. Tayo, and Lew Andrew R. Tria

University of the Philippines, Philippines

PS4-8-10

A Two-stage Sorting Method based on Deep Clustering for Retired Lithium-ion Battery Considering Static and Dynamic Consistency

Liangliang Wei, Yiwen Sun, Hongzhang Xu, and Han Yi

Shenzhen Campus of Sun Yat-sen University, China

Session PS4-9

Power Converters of Renewable Energy Systems 3

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Hitoshi Haga

Shizuoka University, Japan

PS4-9-1

Design of the Hydroelectric Turbine Unit's Evaporative Cooling Automatic Control System

Zhonghua Gui¹, Fucheng Han², Weifu Lu¹, Jinxiu Chen², Hongkui Qiao¹, Fei Zhang¹, and Shiyue Du¹

¹Pumped-storage Research Institute, China, ²Institute of Electrical Engineering CAS, China

PS4-9-2

Optimized Configuration Method for Intelligent Terminals Based on Improved Bat Optimization Algorithm

Yanyu Yan¹, Xiangyu Kong¹, Xudong Wang², Yuying Ma¹, and Longyu Zhang¹

¹Tianjin University, China, ²State Grid Tianjin Electric Power Company, China

PS4-9-3

A Distributionally Robust Optimization Scheduling Method for Cascaded Hydro-PV-storage Complementary Power System Based on Deep Learning

Mao Liu, Xiangyu Kong, Bohao Liang, and Longyu Zhang

Tianjin University, China

PS4-9-4

Advanced Method for Electricity Theft Detection: A Case Study in Low-voltage Station

Bixuan Gao, Xiangyu Kong, and Bohao Liang

Tianjin University, China

PS4-9-5

A Multi-microgrid Energy Trading Strategy to Achieve Carbon Neutrality

Jin Gao¹, Mohammadreza Lak¹, and Zhenguo Shao²

¹Yuan Ze University, Taiwan, ²Fuzhou University, China

PS4-9-6

Online Location Approach for Aged Segment of HVDC Cables Using Insertion Index Perturbation and Reflection Analysis

Ziyu Wei¹, Yang Wu², Qiuqiong Lin¹, and Pinjia Zhang¹

¹Tsinghua University, China, ²Aalborg University, Denmark

Program

PS4-9-7

A Chance-constrained Multi-stage Planning Method for Rural Microgrids Considering Energy Self-sustained ability under Extreme Off-grid Scenarios

Yixin Liu¹, Yanrong Li¹, Shigong Jiang², Peng Li³, Zhongjian Liu², and Huixuan Li³

¹Tianjin University, China, ²State Grid Economic and Technical Research Institute Co., Ltd., China, ³State Grid Henan Electric Power Company, China

Session PS4-10

Power Electronic Devices and Applications

Date: November 29

Time: 12:00-13:00

Venue: FIT Arena

Chair: Hitoshi Haga

Shizuoka University, Japan

PS4-10-1

Design and Implementation of Online IGBT Junction Temperature Measurement System for Practical Application in DC/AC Converter

Yuanxin Zhang¹, Shiqi Ji¹, Haoyu Wang¹, Zhengming Zhao¹, Jiayang Zheng¹, Chunchen Li¹, Chao Sheng², and Weitao Yang²

¹Tsinghua University, China, ²China Southern Power Grid Technology Co., Ltd., China

PS4-10-2

Thyristor-based Multi-port DC Solid-state Circuit Breaker Capable of Bidirectional Operation

Boseung Kwak, Sunghyeon Park, Juwon Kim, and In-Dong Kim
Pukyong National University, Republic of Korea

PS4-10-3

Development of a New Hybrid Switch with Larger DC Current Breaking Capacity and Longer Lifetime

Daisuke Shiojima¹, Takayuki Kawaguchi¹, and Shuhei Kato²

¹Sigma Energy Co., Ltd, Japan, ²Nihon University, Japan

PS4-10-4

Emulation of an Inter-turn Short Circuit with a Variable Fault Resistor

Lukas Braun, Tim Becker, Enno Wagenaar, Xinyi Yu, Duc Pham, and Rik W. de Doncker

RWTH Aachen University, Germany

PS4-10-5

Loss Analysis of Hybrid Switch with Minimum SiC MOSFET Conduction Modulation

Sibao Ding, Panbao Wang, Zehua Zhang, Wei Wang, and Dianguo Xu

Harbin Institute of Technology, China

PS4-10-6

Characterization of Commercial High-power SiC Modules for Loss Performance in Continuous Operational DAB Applications

Yikang Xiao¹, Shiqi Ji¹, Zhengming Zhao¹, Bochen Shi¹, Wenhao Xie¹, Mingyu Yang¹, Yuanxin Zhang¹, Chao Sheng², and Weitao Yang²

¹Tsinghua University, China, ²China Southern Power Grid Technology Co., Ltd., China

PS4-10-7

Reliability Analysis of Three-phase Transformer-less UPS Using SiC devices

Tae-Ju Lee¹, Dong-Ju Lee¹, and Rae-Young Kim²

¹Kukje Electric Mfg. Co., Ltd., Republic of Korea, ²Hanyang University, Republic of Korea

PS4-10-8

Non-contact Measurement of Defect in the Backside of Steel Plate by Electromagnetic Force Vibration

S. Niwa, Y. Gao, and Y. Gotoh

Oita University, Japan

Session CL

Closing/Award Ceremony

Date: November 29

Time: 13:15-13:45

Venue: Room: A

Chair: Kenji Nakamura

Tohoku University, Japan