# 2017 19th International **Conference on Electrical Drives and Power Electronics** (EDPE 2017)

**Dubrovnik, Croatia** 4-6 October 2017



**IEEE Catalog Number: CFP17EDQ-POD ISBN**:

978-1-5386-3381-6

# Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

 IEEE Catalog Number:
 CFP17EDQ-POD

 ISBN (Print-On-Demand):
 978-1-5386-3381-6

 ISBN (Online):
 978-1-5386-3380-9

# **Additional Copies of This Publication Are Available From:**

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633

E-mail: curran@proceedings.com Web: www.proceedings.com



# **Table of Contents**

- vii Foreword
- ix Committees

#### **Invited Lecture**

- 1 Functional Safety in the Power Electronics Converters Miro Milanovič, Miran Rodič, Mitja Truntič
- 15 Optimization of electric drives for traction applications Damir Žarko

#### **Power Electronics and Applications**

- 33 Comparative Analysis and Circuit Simulation of LCLC inverter with both Voltage and Current DC- Output using Correction Design Procedure Michal Frivaldsky, Michal Pridala, Branislav Dobrucký
- 37 Third Harmonic Elimination by SPWM for Filter Reduction in a Over-modulated Single-Phase Inverter Franc Mihalič, Miro Milanovič, Alenka Hren
- 46 Harmonics Compensation for Grid-Connected Inverter Caused by Local Nonlinear Load *Chanho Shin, Kyungbae Lim, Simatupang Desmon Petrus, Jaeho Choi*
- 53 A Novel Type of Bidirectional IPT with a Dual-Active Seamless Controlled Single-Ended Converter for Wireless V2H
  - Naoki Mukaiyama, Hideki Omori, Masahito Tsuno, Noriyuki Kimura, Toshimitsu Morizane
- 59 A New Super-Rapid Pulse Power Charging Electric Scooter System with Balancer-Less EDLC Stack Taisei Ando, Hideki Omori, Keiichi Kaneko, Noriyuki Kimura, Toshimitsu Morizane, Mutsuo Nakaoka
- 65 A New Large-gap Wireless EV Charger with a Power Superimposition Communication Minoru Inoue, Hideki Omori, Noriyuki Kimura, Toshimitsu Morizane, Mutsuo Nakaoka
- 70 Very Fast Real Time Symmetrical Coordinate Transformation applied for Fault Ride Through Akio Yoshida, Noriyuki Kimura, Toshimitsu Morizane, Hideki Omori
- 76 Optimum Design of a New Single-Ended Wireless EV Charger and Comparative Thermal Evaluation of SiC-MOSFET and Si-IGBT
  - Aoto Yamamoto, Hideki Omori, Kenji Fukuda, Hisato Michikoshi, Noriyuki Kimura, Toshimitsu Morizane, Mutsuo Nakaoka
- 82 Time-Domain Optimization of Current THD for a Single-Phase Three-Level Inverter Modulation Aidar Zhetessov, Alex Ruderman
- 88 Enhanced Single-Leg LC Matrix Converter by Switched Capacitor and LC Filter Slavomir Kaščák, Roman Konarik, Branislav Dobrucký, Michal Praženica, Miriam Jarabicová
- 94 Influence of the passive shielding on the transfer characteristics of the wireless power transfer systems Miroslav Pavelek, Michal Frivaldsky, Pavol Spanik
- 100 Calculation of Current Total Harmonic Distortion for a Three-Phase Two-Level Inverter with LCL-Filter Ramazan Abdikarimuly, Alex Ruderman, Boris Reznikov
- 106 Concept to Reduce the Ringing During the Discontinuous Mode of a DC/DC Converter Felix Himmelstoss, Karl Edelmoser
- 112 Hybrid Filter for a Multi-Cell Switch-Mode Power Amplifier Helmut Votzi, Felix Himmelstoss, Hans Ertl

- 118 Impact of luminaire's power supplies on quality of electrical grid Peter Drgona, Michal Taraba, Juraj Adamec, Matuš Danko
- 122 Control of a buck-boost DC-DC power converter for microgrid energy storage Mateja Car, Mario Vašak, Vinko Lešić
- 128 Active Power Filter with Sigma-Delta Modulator in Control Section Michal Gwozdz
- 133 L-L Multilevel Boost Converter Topology For Renewable Energy Applications: A New Series Voltage Multiplier L-L Converter of XY Family
  - Sagar Mahajan Bhaskar, Sanjeevikumar Padmanaban, Viliam Fedák, Frede Blaabjerg, Patrick Wheeler
- 139 New 2LC-Y DC-DC Converter Topologies for High-Voltage/Low-Current Renewable Applications: New Members of X-Y Converter Family

  Sagar Mahajan Bhaskar, Sanjeevikumar Padmanaban, Kiran Pandav Maroti, Viliam Fedák, Frede Blaabjerg, Aishwarya Taur
- 147 DC link voltage control of a back-to-back converter robust to grid conditions Mateja Car, Vinko Lešić, Mario Vašak
- 153 Wind Power Generation with Modified Trapezoidal Modulation Converter for DC connected Offshore Wind Farms *Kazuto Tatsumi, Noriyuki Kimura, Katsunori Taniguchi, Toshimitsu Morizane, Hideki Omori*
- 159 Application and Verification of an Electromagnetic Field Resonance Typed Wireless Power Transfer Method to Mixing Blade Heated by Induction Heating

  Hiroki Ishida, Kazushige Nakao, Noriyuki Kimura, Keisuke Kintsu
- 165 The Poincaré map features of the boost converter bifurcation behavior *Željko Stojanović*, *Denis Pelin*
- 170 Semiconductor loss distribution evaluation for three level ANPC converter using different modulation strategies Mateja Novak, Viktor Šunde, Neven Čobanov, Željko Jakopović
- 178 Novel Soft Switching DC/DC Converter with Active Rectifier and Improved Active Snubber Topology for Full Load Range Application

  \*Rôbert Žatkovič, Jaroslav Dudrik, Marek Pástor\*

#### **Electrical Machines and Drives**

- 188 Torque Feedback for Steer-by-Wire Systems with Rotor Flux Oriented PMSM Kris Scicluna, Cyril Spiteri Staines, Reiko Raute
- 194 Modelling of a Sensorless Rotor Flux Oriented BLDC machine Marco Mariano, Kris Scicluna, Jeremy Scerry
- 200 HIL System for EV Drives Testing Pavel Mindl, Pavel Mňuk, Zdeněk Čeřovský, Tomáš Haubert
- 205 Methodology for Efficiency Mapping of Permanent Magnet Synchronous Motors Martin Novak, Jaroslav Novak, Zdenek Novak
- 211 Operation of Induction Machine with Combined Star Delta Stator Winding Ludek Schreier, Jiri Bendl, Miroslav Chomat
- 218 Methods for Direct Torque Control of Induction Machines *Dubravko Krušelj*
- 226 Critical review on the benefits of C- and E-Core Flux-Switching-PM-Machines Daniel Dietz, Andreas Binder
- 235 Topology Selection for Low Voltage PMSM for In-Wheel Direct-Drive Application Kassem Roumani, Benedikt Schmuelling
- 242 Analysis of Outer Rotor Synchronous Reluctance Motor for Low-Speed Applications *Florin Jurca, Claudia Martis*

- 248 Torque ripple reduction of outer rotor synchronous reluctance machine with concentrated winding *Razvan-Alexandru Inte, Florin Jurca*
- 253 A servo-drive with an integral disturbance observer filter. Part 1: Speed control *Mikulaš Huba, Igor Bélai*
- 259 A servo-drive with an integral disturbance observer filter. Part 2: Position control *Igor Bélai, Mikulaš Huba*
- 265 Dynamics increasing of conventional turbocharger with electric servosystem Peter Drgona, Branislav Hanko, Branislav Dobrucký
- 269 Comparison of 3d printed vibrotactile actuator based on permanent magnet and convenient vibro actuator for prosthetic feedback devices Maksims Vorobiovs, Ilva Galkin
- 273 Torque Control of a Wind Power Permanent Magnet Generator in a Flux Weakening Region Luka Pravica, Tin Bariša
- 279 Concentrated versus Distributed Winding in Permanent Magnet Synchronous Motors Valeria Hrabovcova, Pavol Rafajdus, Pavel Lehocky, Pavol Makyš, David Moravčik
- 287 Measurement of Switched Reluctance Motor Parameters Želmíra Ferková, Luboš Suchý, Josef Černohorský
- 291 Comparison of Torque Estimation Methods for Interior Permanent Magnet Wind Power Generator Filip Jukić, Damir Sumina, Igor Erceg
- 297 Design of Load Torque and Mechanical Speed Estimator of PMSM with Unscented Kalman Filter An Engineering Guide
  - Karol Kyslan, Viktor Šlapák, Viliam Fedák, František Ďurovský, Krisztián Horváth
- 303 Motor Control of Skid Steered Robotic Vehicle *Róbert Üveges, František Ďurovský*
- 307 A Survey of Permanent Magnet Synchronous Machine Models Suitable for Computer Simulation Tino Jerčić, Damir Žarko

#### Control Systems

- 313 Cosimulation of Ansys Simplorer and MATLAB/Simulink Andraž Rihar, Peter Zajec, Dainjel Vončina
- 318 Three-Tank Virtual Laboratory for Dynamical Feedforward Control Based on Matlab Pavol Bisták, Mikulaš Huba
- 324 Comparing filtered PID and Smith Predictor Control of a Thermal Plant *Mikulaš Huba, Pavol Bisták, Tomaš Huba, Damir Vrančić*
- 330 Combining model based and data-driven approaches: First order nonlinear plants control *Mikulaš Huba, Pavol Bisták, Peter Ťapák*
- 336 CAN BUS analyzer using modular instrumentation Peter Drgona, Matuš Danko, Michal Taraba, Juraj Adamec
- 341 Sensorless Position Tracking for Steer-by-Wire Applications Kris Scicluna, Cyril Spiteri, Staines Reiko Raute
- 347 Robotic Bin-Picking System Based on a Revolving Vision System Aleš Pochyly, Tomaš Kubela, Vladislav Singule, Petr Čihák
- 353 Finite control set model predictive control of a grid connected two-level converter *Tamara Hadjina, Ivan Mišković, Mato Baotić*
- 359 Self-learning Model Predictive Control Based on the Sequence of Controllable Sets Luka Petrović, Šandor Ileš, Jadranko Matuško

# 365 Index of Authors