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#### A Novel Full-Bridge Converter Achieving ZVS over Wide Load Range with a Passive Auxiliary Circuit

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*Nikolay Lopatkin, Gennadiy Zinoviev and Leonid Zotov*

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*Alberto Rodriguez, Javier Sebastian, Diego G. Lamar, Marta M. Hernando and Aitor Vazquez*

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*Yushi Miura, Masato Kaga, Yasuhisa Horita and Toshifumi Ise*

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*Lei Zhu, Shan Xue, Xuhui Wen, Yaohua Li and Liang Kong*

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*Gianmario Pellegrino, Radu Bojoi and Paolo Guglielmi*

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*David Reed and Heath Hofmann*

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*Neal Clements, Giri Venkataramanan and Thomas Jahns*

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*Gustavo Gamboa, Christopher Hamilton, John Elmes, Michael Pepper and John Shen*

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*Sanzhong Bai, Srdjan Lukic and Du Yu*

Dual Converter Active Filter and Balance Compensation on Electric Railway Systems using the Open Delta Transformer Connection

*Alexander Bueno, Jose Aller, Jose Restrepo and Thomas Habetler*

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*Luis Nodari, Marcello Mezaroba, Leandro Michels and Cassiano Rech*

Accurate Mode Boundary Detection in Digitally Controlled Boost Power Factor Correction Rectifiers

*Sungwoo Moon, Luca Corradini and Dragan Maksimovic*

A Simple Digital DCM Control Scheme for Boost PFC Operating in Both CCM and DCM

*Shu Fan Lim and Ashwin M Khambadkone*

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*Chia-An Yeh, Kung-Min Ho and Yen-Shin Lai*

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*Fang Luo, A. Carson Baisden, Dushan Boroyevich, Luisa Coppola, Yong Kang, Paolo Mattavelli, Khai Ngo, Nicolas Gazel and Fred Wang*



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*Gamal Dousoky, Masahito Shoyama and Tamotsu Ninomiya*

## Common Mode EMI Characteristics of Resonant Converters

*Pengju Kong, Daocheng Huang, Dianbo Fu and Fred C. Lee*

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*Dianbo Fu, Pengju Kong, Fred C. Lee and Shuo Wang*

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*Patrick Schneider, Masafumi Horio and Robert Lorenz*

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*Timothe Simonot, Jean-Christophe Crebier, Nicolas Rouger and Gaude Victor*

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*Ivan Josifovic, Jelena Popovic-Gerber, Braham Ferreira and Dolf van Casteren*

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*Rafal Wrobel, Phil Mellor and Derrick Holliday*

### Influence of the End-Winding Cooling Methods on the Thermal Behavior of Induction Machines

*Mircea Popescu, David Staton, Aldo Boglietti, Andrea Cavagnino and Douglas Hawkins*

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*Pinjia Zhang, Yi Du, Thomas Habetler and Bin Lu*

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*Ayman EL-Refaie, Manoj Shah, James Alexander, Steven Galioto and Kum-Kang Huh*

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*Wai Man Ng, Deyan Lin and S.Y.R. Hui*

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*Nan Chen and Henry Chung*

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*Efren Flores, Mario Ponce, Luis Vela, Mario Juarez and Ismael Araujo*

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*Mariethoz Sebastien, Almer Stefan and Morari Manfred*

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*Jean-Luc Kotny and Nadir Idir*

**Three Phase VSI with Reduced Output Voltage Distortion using FPGA based Multisampled Space Vector Modulation**

*Alexander Julian and Giovanna Oriti*

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*Joseph Ojo and Sosthenes Karugaba*

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*Emanuele Fornasiero, Luigi Alberti, Nicola Bianchi and Silverio Bolognani*

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*Katsumi Yamazaki and Kazuya Kitayuguchi*

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*Min-Fu Hsieh, Yao-Min Lien and David Dorrell*

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*Mihail V. Cistelecan, Fernando FJTE Ferreira and Mihail Popescu*

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*Miguel Rodriguez, Diego Gonzalez, Manuel Arias, Javier Sebastian and Roberto Prieto*

#### A Comparison of the Series-Parallel Compensation Type DC-DC Converters using both a Fuel Cell and a Battery

*Koji Orikawa and Jun-ichi Itoh*

#### Forward-Flyback Converter with Snubber-Feedback Network for Contactless Power Supply Applications

*Ray-Lee Lin and Yu-Hau Huang*

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*Satoshi Miyawaki, Jun-ichi Itoh and Kazuki Iwaya*

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*Mario Cacciato, Alfio Consoli, Vittorio Crisafulli, Nunzio Abbate and Giovanni Vitale*

#### Adaptive Dynamic Control of a Bi-Directional DC-DC Converter

*Dinesh Segaran, Brendan Peter McGrath and Donald Grahame Holmes*

#### Preventing Transformer Saturation in Bi-Directional Dual Active Bridge Buck-Boost DC/DC Converters

*Sangtaek Han, Imayavaramban Munuswamy and Deepak Divan*

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*Hengsi Qin and Jonathan Kimball*

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*Yongsug Suh and Kyungsub Jung*

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*Zhijun Qian, Osama Abdel-Rahman, Haibing Hu and Issa Batarseh*

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*Zheng Zhao, Ming Xu, Qiaoliang Chen, Jih-Sheng Lai and Younghoon Cho*

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*Anand Ramamurthy, Subhashish Bhattacharya and Shailesh Notani*

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*Rajesh Tyagi, Jason Black and Jon Petersen*

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*Xi Lu, Craig Rogers and Fang Zheng Peng*

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*Frans Dijkhuizen and Markus Goedde*

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*Ming Li, Yue Wang, Xiong Fang, Ke Wang, Wanjun Lei, Zhaoan Wang and Jinjun Liu*

**Design of Single-Phase Shunt Active Filter for Three-Phase Four-Wire Distribution Systems**

*Chung-Chuan Hou and Yung-Fu Huang*

**Application of Electrical Variable Transmission in Wind Power Generation System**

*Xikai Sun, Ming Cheng, Wei Hua and Longya Xu*

**The Design of an LCL-Filter for the Three-Parallel Operation of a Power Converter in a Wind Turbine**

*Yoon Dong-Keun, Jeong Hea-Gwang and Lee Kyo-Beum*

**Analysis and Specification of DC Side Voltage in Parallel Active Power Filter with SVM Control Regarding Compensation Characteristics**

*Guopeng Zhao and Jinjun Liu*

**Design Considerations of High Voltage and High Frequency 3 Phase Transformer for Solid State Transformer Application**

*Chun-kit Leung, Seunghun Baek, Sumit Dutta and Subhashish Bhattacharya*

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*Janusz Buchta, Maciej Pawlik and Rafal Szubert*

**Model for Optimal Balancing Single-Phase Traction Load based on Steinmetz's Method**

*Wan Qingzhu, Chen Jianye, Wu Mingli and Zhu Guiping*

**Integrated Dynamic Voltage Restorers with Reduced Semiconductor Count**

*Lei Zhang, Poh Chiang Loh and Feng Gao*

## **A Model-Based Controller in Rotating Reference Frame for Hybrid HVDC**

*Raymundo Torres-Olguin, Marta Molinas and Tore Undeland*

## **Efficiency Improvement in Soft-Switching Three-Level Converters for High Power UPS**

*Corentin Rizet, Philippe Delarue, Philippe Le Moigne, Alain Lacarroy and Jean-Paul Ferrieux*

## **Design Consideration of Self-Oscillating Full-Bridge Electronic Ballast for Metal Halide Lamp at 2.65MHz Operating Frequency**

*Lin Ray-Lee, Chen Yong-Fa and Chen Yan-Yu*

## **On-Line Electric Vehicle using Inductive Power Transfer System**

*Sungwoo Lee, Jin Huh, Changbyung Park, Nam-Sup Choi, Gyu-Hyeoung Cho and Chun-Taek Rim*

## **Optimal Resonant Tank Design Considerations for Primary Track Compensation in Inductive Power Transfer Systems**

*Zeljko Pantic, Subhashish Bhattacharya and Srdjan Lukic*

## **PEM Fuel Cell System Model Predictive Control and Real Time Operation on a Power Emulator**

*Angelo Accetta, Maurizio Cirrincione, Giuseppe Marsala, Marcello Pucci and Gianpaolo Vitale*

## **Comprehensive Research on Compound-Structure Permanent-Magnet Synchronous Machine System Used for HEVs**

*Yong Liu, Chengde Tong, Ranran Liu, Jing Zhao, Jingang Bai and Ping Zheng*

## **Particle Swarm Optimization for Efficient Selection of Hybrid Electric Vehicle Design Parameters**

*Chirag Desai and Sheldon Williamson*

## **Flatness based Control of a Hybrid Power Source with Fuel Cell/Supercapacitor/Battery**

*Majid Zandi, Alireza Payman, Jean-Philippe Martin, Serge Pierfederici and Bernard Davat*

## **State of Charge Modeling of Arbitrary Cell Connection**

*Jiucui Zhang and Song Ci*

## **High Voltage Matrix Converter Topology for Multi-System Locomotives**

*Pavel Drabek, Martin Pittermann and Marek Cedral*

## **Closed Loop AC Voltage Generation using Harmonic Cancellation Technique**

*Isabel Quesada, Carlos Lucena, Carlos Martinez, Antonio Lazaro and Andres Barrado*

## **Design of Low-Voltage High-Current Rectifier with High-Efficiency Output Side for Electrolytic Disinfection of Ballast Water**

*In-Dong Kim, Won-Woo Cho, Jin-Young Kim, Eui-Cheol Nho, Gang-Woo Goh, Sang-Bum Bae and Bu-Nyung Kang*

## **Integrated Modelling of a Synchronous Generator and a Twelve Phase Transformer**

*Alexander Julian and Giovanna Oriti*

## **Study of Heat Dissipation for HXD2 Locomotive's Auxiliary Converter**

*Xianjin Huang, Liwei Zhang, Hu Sun, Xiaojie You and Trillion Zheng*

**Radial Flux and Axial Flux PM Machines Analysis for More Electric Engine Aircraft Applications**

*Radu Bojoi, Andrea Cavagnino, Alessio Miotto, Alberto Tenconi and Silvio Vaschetto*

**The Estimation of the Induction Motor Parameters by the GeTLS EXIN Neuron**

*Maurizio Cirrincione, Giansalvo Cirrincione, Marcello Pucci and Alain Jaafari*

**Study of Various Slanted Air-Gap Structures of Interior Permanent Magnet Synchronous Motor with Brushless Field Excitation**

*Seong Taek Lee and Leon Tolbert*

**A Novel Middle-Point Current-Injection Type Bearingless Motor for Vibration Suppression**

*Yuto Iiyama, Kazuki Soutome and Akira Chiba*

**Torque Ripples and Estimation Performance of High-Frequency Signal Injection based Sensorless PMSM Drive Strategies**

*Yi Wang, Zhu Jianguo, Guo Youguang, Li Yongjian and Xu Wei*

**Comparison and Evaluation of Different Compound-Structure Permanent-Magnet Synchronous Machine used for HEVs**

*Ping Zheng, Jing Zhao, Ranran Liu, Chengde Tong and Qian Wu*

**Permanent Magnet Flux Switching Integrated-Starter-Generator with Different Rotor Configurations for Cogging Torque and Torque Ripple Mitigations**

*Weizhong Fei, Patrick Luk, Bing Xia, Jianxin Shen and Yu Wang*

**Design and Performance Analysis of an Outer-Rotor Flux-Switching Permanent Magnet Machine for Traction Applications**

*Yu Wang, Meng-Jia Jin, Jianxin Shen, Weizhong Fei and Patrick Luk*

**Experimental Comparison between Wound Rotor and Permanent Magnet Synchronous Machine for Integrated Starter Generator Applications**

*Guy Friedrich*

**Analytical Prediction of Open-Circuit Eddy-Current Loss in Series Double Excitation Synchronous Machines**

*Adel Bellara, Habiba Bali, Yacine Aamara, Georges Barakat and Pascal Reghem*

**Vibration Reduction of IPM Type BLDC Motor using Negative Third Harmonic Elimination Method of Air-Gap Flux Density**

*Jin-Wook Reu, Jin Hur, Byeong-Woo Kim and Gyu-Hong Kang*

**Influence of Stator Slot Shape on Temperature in Surface Mounted Permanent Magnet Machines**

*Andy Knight, Yang Zhan, Dave Staton and Douglas Hawkins*

**Inter-Turn Short Circuit Fault Detection of Wound Rotor Induction Machines using Bispectral Analysis**

*Amine Yazidi, Humberto Henao, Gerard-Andre Capolino, Franck Betin and Laurent Capocchi*

**Direct Measuring Position Encoder for Axial Transversal Flux Machine**

*Philip Bockerhoff and Martin Schulz*

## **Sensorless Control of BLDC Motors at Low Speed based on Differential BEMF Measurement**

*Carlo Concari and Fabrizio Troni*

## **A New Type Single Phase Switching Voltage Regulator**

*Ilknur Colak and Sukru Ertike*

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*Edison da Silva, Euzeli Santos Jr., Antonio Lacerda, Frederico Azevedo and Cursino Jacobina*

## **A New Bidirectional Isolated Converter for Grid Connection**

*Myoungho Kim, Anno Yoo and Seung-Ki Sul*

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*Yoshiya Ohnuma and Jun-ichi Itoh*

## **AC Chopper Topology with Multiple Steps Switching Capability**

*Julio C. Rosas-Caro, Fernando Mancilla-David, Juan M. Ramirez-Arredondo, Aaron Gonzalez-Rodriguez, Eduardo Nacu Salas-Cabrera and Pablo A. Rojas-Molina*

## **Two-Switch AC-Link Voltage Regulator**

*Julio C. Rosas-Caro, Fernando Mancilla-David, Juan M. Ramirez-Arredondo, Juan M. Gonzalez-Lopez, Ruben Salas-Cabrera and Samuel Mar-Baron*

## **Novel Capacitor-Isolated Power Converter**

*Jingpeng Zhu, Ming Xu, Julu Sun and Chuanyun Wang*

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*Teck Chiang Goh and Itoh Jun-ichi*

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*Hao L. Li, Patrick A. Hu and Grant A. Covic*

## **A Practical Multiphase IPT System for AGV and Roadway Applications**

*Michael Kissin, Hao Hao and Grant Covic*

## **Vector Control of Induction Motor based on Output Voltage Compensation of Matrix Converter**

*She Hongwu, Lin Hua, Wang Xingwei and Yue Limin*

## **A New Combined Adaptive Flux Observer with HF Signal Injection for Sensorless Direct Torque and Flux Control of Matrix Converter Fed IPMSM over a Wide Speed Range**

*Dan Xiao, Gilbert Foo and Muhammed Fazlur Rahman*

## **A Novel Modulation Strategy to Minimize the Number of Commutation Processes in the Matrix Converter**

*Keyhan Kobravi and Reza Iravani*

## **Space Vector PWM Technique for a Novel Three-to-Five Phase Matrix Converter**

*SK Moin Ahmmed, Atif Iqbal, Haitham Abu-Rub and Mohammad Rizwan Khan*

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*Takaharu Takeshita*

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*Joseph Ojo, Mihret Melaku, Abreham Meharegzi and Karugaba Sosthenes*

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*Masatoshi Uno, Akio Kukita and Koji Tanaka*

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*Yu Chen, Songsong Nie, Xuejun Pei and Yong Kang*

A DSP-Based Diagnostic System for DC-DC Converters using the Shape of Voltage across the Magnetic Components

*Songsong Nie, Yu Chen, Xuejun Pei and Yong Kang*

Multiple-Output DC-DC Converters with the Shared Leg Structure: Basic Topologies, ZVS Analysis and Experimental Results

*Yu Chen, Songsong Nie, Xuejun Pei and Yong Kang*

The Multiple-Output DC-DC Converter with the Shared Leg Chain

*Yu Chen, Songsong Nie, Xuejun Pei and Yong Kang*

A Novel Clamping Diode Current Reset Scheme for ZVS PWM Full-Bridge Converter

*Wu Chen, Xinbo Ruan, Qianhong Chen and Junji Ge*

A Double-Input Flyback DC/DC Converter with Single Primary Winding

*Qin Wang, Jie Zhang, Xinbo Ruan and Ke Jin*

An Inductorless Asymmetrical ZVS Full Bridge Converter for Step-Up Applications with Wide Input Voltage Range

*Pyosoo Kim, Sewan Choi and Jeonggeun Kim*

Dynamic Response Improvement in a Three-Level Buck Type Converter

*Lisheng Shi, Mehdi Ferdowsi and Mariesa Crow*

An Improved Two-Switch Buck-Boost Converter with Reduced Reverse-Recovery Losses

*Chen Yang, Huafeng Xiao and Shaojun Xie*

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*Yingyi Yan and Fred C. Lee*

Low-Frequency Modeling of Three-Phase, Four-Core, Strip-Wound Transformers in High-Power DC-DC Converters

*Robert Lenke, Bernard Szymanski and Rik De Doncker*



**Derivation of a Nonlinear Output Capacitor Current Programming Technique Applicable for a Buck Converter Operating in CCM and DCM**

*Victor Cheung, Henry Chung and Alan Lo*

**Evaluating the Confidence of Frequency Response Function of a Switched-Mode Converter using Distributional Models**

*Tomi Roinila, Tomi Helin, Matti Vilkkko, Mikko Hankaniemi and Hannu Koivisto*

**Adaptive Frequency Modulation Method for Synchronous Buck Converters at Light Loads**

*In-Ho Cho, Il-Oun Lee and Gun-Woo Moon*

**An Efficient Communication Protocol for Single- and Multi-Module Isolated Digital Power Supplies using a Single Pulse-Transformer**

*Zhiyuan Hu, Yan-Fei Liu and Tet Yeap*

**A Resonant, Frequency-Tracking, Step-Down Piezoelectric Transformer based Converter**

*Marco Pinto, Beatriz Borges, Hugo Ribeiro and Marcelino Santos*

**Achieving Constant Frequency Operation in DC-DC Resonant Converters through Magnetic Control**

*J. Marcos Alonso, Marina Perdigao, David Gacio, Lidia Campa and Eduardo Saraiva*

**Discrete Time Domain Small Signal Modeling of Full Bridge Phase Shifted Series Resonant Converter**

*A. A. Aboushady, K. H. Ahmed, S. J. Finney and B. W. Williams*

**Performance Analysis of Isolated ZVT Interleaved Converter with Winding-Cross-Coupled Inductors and Switched-Capacitors**

*Rui Xie, Wuhua Li, Yi Zhao, Jing Zhao, Xiangning He and Fengwen Cao*

**Constant On-Time Digital Peak Voltage Control for Buck Converter**

*Yanyan Jin, Jianping Xu and Guohua Zhou*

**A New Digital Capacitor Charge Balance Control Algorithm for Boost DC/DC Converter**

*Fang Wei, Qiu Yajie, Liu Xiaodong and Liu Yanfei*

**A New Digital Control Algorithm to Improve the Dynamic Response of Dual-Transistors Forward Converter**

*Fang Wei, Qiu Yajie, Liu Xiaodong and Liu Yanfei*

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*Rolando Burgos, Dushan Boroyevich, Fred Wang, Kamiar Karimi and Gerald Francis*

**Power Factor Correction using Projected Cross Point Control (PCPC)**

*Mostafa Khazraei, Hossein Sepahvand and Mehdi Ferdowsi*

**A Novel Neutral Point Potential Balance Control Strategy based on Vector Controlled VIENNA Rectifier**

*Li-gao He and Xin-bing Chen*

**Three-Phase Three-Level Boost Rectifier based on Three-Switching Cells for UPS Applications using FPGA**

*Raphael da Camara, Paulo Praca, Cicero Cruz, Rene Bascope and Luiz Henrique Barreto*

**Three-Phase Rectifier with an Active Current Injection and a Single High-Frequency Inductor**

*Rima Abi Rached, Hadi Kanaan and Kamal Al-Haddad*

**Input Resonance Investigation and LC Filter Design for PWM Current Source Rectifiers**

*Hua Zhou, Yunwei Li, Navid Zargari, Zhongyuan Cheng and Jinwei He*

**Large Power Three-Level Voltage Source Inverter with IGCTs and the Experiment**

*Chengsheng Wang, Chongjian Li, Yaohua Li, Chunyi Zhu and Zhiming Lan*

**Analysis and Design Optimization of Brushless DC Motor's Driving Circuit Considering the Cdv/dt Induced Effect**

*Shen Xu, Weifeng Sun and Daying Sun*

**An Improved Control Strategy for Input-Series and Output-Parallel Inverter System at Extreme Conditions**

*Wu Chen and Xinbo Ruan*

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*Xuesong Wang, Zhengming Zhao and Liqiang Yuan*

**A Current Decoupling Parallel Control Strategy of Single Phase Inverter with Voltage and Current Dual Closed-Loop Feedback**

*Shungang Xu and Jianping Xu*

**Characteristics of Two Induction Motor Independent Drives Fed by a Four-Leg Inverter**

*Nobutaka Kezuka, Kazuo Oka and Kouki Matsuse*

**New Control Strategy Applied to a CSI Inverter with Amplified Sinusoidal Output Voltage: Analysis, Simulation and Experimental Results**

*Lucas Sampaio, Natalia Morais, Luiz Carlos Gomes Freitas, Joao Batista Vieira Jr. and Valdeir Jose Farias*

**Novel Proposal of Multilevel Inverter using Buck EIE Converter**

*Natalia M. A. Costa, Luiz C. G. Freitas, Joao B. Vieira Jr., Ernane Antonio Alves Coelho and Valdeir J. Farias*

**Model Predictive Control of a Cascaded H-Bridge StatCom**

*Christopher Townsend, Terrence Summers and Robert Betz*

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*Arthur Barnes and Juan Carlos Balda*

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*Dimosthenis Pefitsis, Georg Tolstoy, Antonios Antonopoulos, Jacek Rabkowski and Jang-Kwon Lim*

**A Simplified Space Vector based Current Controller for Any General N-Level Converter**

*Jun Li, Xiaohu Zhou, Zhigang Liang, Subhashish Bhattacharya and Alex Huang*

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*Rui Li, Zhiyuan Ma and Dehong Xu*

**An Automatic Half-Bridge Resonant Inverter with Three-Phase Three-Switch Buck-Type Rectifier**

*Yachiangkam Samart, Chakkuchan Panithan, Saichol Chudjuarjeen, Anawach Sangswang and Chayant Koompai*

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*Yi Wang, Sjoerd W.H. de Haan and J.A. Ferreira*

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*Samuel Cove, Martin Ordonez and John Quaioco*

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*Zen-nosuke Ariga, Keiji Wada and Toshihisa Shimizu*

**IGBT Modules Optimized for Three Level Inverters**

*Eric Motto and John Donlon*

**Single Die Multiple 600V Power Diodes with Vertical Voltage Terminations and Isolation**

*Kremena Vladimirova, Jean-Christophe Crebier, Yvan Avenas, Christian Schaeffer and Timothe Simonot*

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*Timothe Simonot, Nicolas Rouger and Jean-Christophe Crebier*

**An Investigation into the Utilisation of Power MOSFETs at Cryogenic Temperatures to Achieve Ultra-Low Power Losses**

*Kennith Leong, Benedict Donnellan, Angus Bryant and Philip Mawby*

**Power SiC DMOSFET Model Accounting for JFET Region Nonuniform Current Distribution**

*Ruiyun Fu, Alexander Grekov, Jerry Hudgins, Alan Mantooth and Enrico Santi*

**Hardware Laboratories for Power Electronics and Motor Drives Distance Learning Courses**

*Giovanna Oriti, Alexander Julian, Daniel Zulaica and Roberto Cristi*

**Improving Light Load Efficiency of High Frequency DC/DC Converters with Planar Nonlinear Inductors**

*Laili Wang, Yunqing Pei, Xu Yang and Zhaoan Wang*

**Design Issues of Interleaved Critical Conduction Mode Boost PFC Converter with Coupled Inductor**

*Fei Yang, Xinbo Ruan, Yang Yang and Zhihong Ye*

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*Pascal Meyer, Paolo Germano, Miroslav Markovic and Yves Perriard*

**Magnetic Properties Measurement of Soft Magnetic Composite Materials Over Wide Range of Excitation Frequency**

*Yongjian Li, Jianguo Zhu, Qingxin Yang, Zhiwei Lin, Yi Wang and Wei Xu*

## Comprehensive Optimization Method for Thermal Properties and Parasitics in Power Modules

*Ole Muehlfeld and Friedrich W. Fuchs*

## EMC Behavior of the Internal Supply of Industrial Power Converters

*Sebastian Schulz and Andreas Lindemann*

## Automatic Layout Design for Power Module

*Puqi Ning, Fred Wang and Khai Ngo*

## Method to Detect Line-to-Ground Faults in High-Resistance-Ground Networks

*Carlos Rodriguez and Russel Kerkman*

## Reliability Assessment on Power MOSFETs Working in Energy Absorption Mode

*Antonio Testa, Salvatore De Caro, Salvatore Patane', Saverio Panarello, Sebastiano Russo, Davide Patti and Santo Poma*

## Application of Gate-Controlled Series Capacitors (GCSC) for Reducing Stresses Due to Sub-Synchronous Resonance in Turbine-Generator Shaft

*B. S. Umre, J. B. Helonde, J. P. Modak and Sonali Renkey (Rangari)*

## Design and Implementation of a High Resolution DPWM based on a Low-Cost FPGA

*Ge Lusheng, Chen Zongxiang, Chen Zhijie and Liu Yanfei*

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#### Multi-Carrier Interleaved PWM Strategies for a New Five-Level NPC Inverter Using a 3-Phase Coupled Inductor

*Behzad Vafakhah, Jeffrey Ewanchuk and John Salmon*

#### Improvement of EMI Behavior of NPC Multilevel Inverter Without Balancing the Voltage Bondaries of DC Bank Capacitors

*Ignace Rasoanarivo, Jean-Philippe Martin and Serge Pierfederici*

#### Improving the Performance of Protection Schemes in Three Level IGCT-Based Neutral Point Clamped Converters

*Anderson Rocha, Gleisson Franca, Manoel Santos, Helder de Paula and Braz Cardoso*

#### A Five/Nine-Level Twelve-Switch Neutral Point Clamped Inverter for High Speed Electric Drives

*Jeff Ewanchuk, Behzad Vafakhah and John Salmon*

### **Session 54: AC-DC Converters: Control of Three Phase PFC**

#### Direct Power Control for Three-Level Neutral Point Clamped PWM Rectifier based on Virtual Flux

*Yingchao Zhang, Zhengming Zhao, Ting Lu and Liping Jin*

## Full Discrete Sliding Mode Controller for Three Phase PWM Rectifier based on Load Current Estimation

*Jin Ye, Xu Yang, Haizhong Ye and Xiang Hao*

## A Novel Control Method using Two DC Link Current Sensors in Two Parallel Three-Phase Boost Converters

*Chang-Soon Lim, Kui-Jun Lee, Rae-Young Kim and Dong-Seok Hyun*

## Voltage Sensorless Bidirectional Three-Phase Unity Power Factor AC-DC Converter

*Ajit Ghodke and Kishore Chatterjee*

## **Session 55: Sustainable Energy Applications: Ocean Wave Energy Systems**

### Analysis of Power Extraction from Irregular Waves by All Electric Power Take Off

*Elisabetta Tedeschi, Marta Molinas, Matteo Carraro and Paolo Mattavelli*

### Grid Power Integration Technologies for Offshore Ocean Wave Energy

*Katsumi Nishida, Tarek Ahmed and Mutsuo Nakaoka*

### Self-Synchronous Control of Doubly-Fed Linear Generators for Ocean Wave Energy Applications

*Jennifer Vining, Thomas Lipo and Giri Venkataramanan*

### Low-Power Autonomous Wave Energy Harvesting Device for Remote Sensing and Communications Applications

*Deanelle Symonds, R. Cengiz Ertekin and Edward Davis*

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### Optimal Selection of Excitation Capacitor for 6/3-Phase Dual Stator-Winding Induction Generator with the Static Excitation Controller Applied in Wind Power

*Feifei Bu, Wenxin Huang, Yuwen Hu and Kai Shi*

### Design of New Concept Permanent Magnet Induction Wind Generator

*Johannes Potgieter and Maarten Kamper*

### Design and Control of a High-Efficiency Doubly-Fed Brushless Machine for Wind Power Generator Application

*Longya Xu, Bo Guan, Huijuan Liu, Le Gao and Kaichien Tsai*

### Condition Monitoring of Wind Turbines based on Amplitude Demodulation

*Yassine Amirat, Vincent Choqueuse and Mohamed Benbouzid*

## **Session 57: Enabling Technologies: Power Device Gate Drive techniques**

### **A New Inductorless Bipolar Gate Driver for Control FET of High Frequency Buck Converters**

*Jizhen Fu, Zhiliang Zhang, Liang Jia, Yan-Fei Liu and Paresh Sen*

### **An Integrated Segmented Gate Driver with Adjustable Driving Capability**

*Armin Akhavan Fomani, Andrew Shorten and Wai Tung Ng*

### **Comparison of Continuous and Discontinuous Current Source Drivers for High Frequency Applications**

*Zhiliang Zhang, Jizhen Fu, Yan-Fei Liu and P.C. Sen*

### **A Special High-Frequency Soft-Switched High-Voltage Isolated DC/DC Power Supply for Six GCT Gate Drivers**

*Jahangir Afsharian, Bin Wu and Navid Zargari*

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### **High Frequency Bus Converter with Integrated Matrix Transformers for CPU and Telecommunications Applications**

*David Reusch and Fred Lee*

### **High Power Density Interleaved DC/DC Converter using a 3-Phase Integrated Close-Coupled Inductor Set Aimed for Electric Vehicles**

*Mitsuaki Hirakawa, Masao Nagano, Yasuto Watanabe, Keigo Andoh, Satoshi Hashino, Somei Nakatomi and Toshihisa Shimizu*

### **Trans-Linked Multi-Phase Boost Converter for Electric Vehicle**

*Masayuki Nakahama, Masayoshi Yamamoto and Yuki Satake*

### **Core-Less Multiphase Converter with Transformer Coupling**

*M. Carmen Gonzalez, Narciso Ferreros, Pedro Alou, Oscar Garcia, Jesus Angel Oliver, Jose Antonio Cobos and Horacio Visairo*

## **Session 59: Electric Machines: Condition Monitoring and Fault Analysis I**

### **A Comparative Study of Permanent Magnet – Synchronous and Permanent Magnet – Flux Switching Machines for Fault Tolerant Drive Systems**

*Tsarafidy Raminosoa and Chris Gerada*

### **Online Broken Rotor Bar Detection of Inverter-Fed Induction Motors Operating Under Arbitrary Load Conditions**

*Sung-Kuk Kim and Jul-Ki Seok*

## Automated Monitoring of Airgap Eccentricity for Inverter-Fed Induction Motors under Standstill Conditions

*Doosoo Hyun, Jongman Hong, Sang Bin Lee, Kwonhee Kim, Ernesto Wiedenbrug, Mike Teska, Subhasis Nandi and Ilamparithi Thirumarai Chelvan*

## Evaluation of the Detectability of Broken Rotor Bars for Double Squirrel Cage Rotor Induction Motors

*Jongbin Park, Byunghwan Kim, Jinkyu Yang, Sang Bin Lee, Ernesto Wiedenbrug, Mike Teska and Seungoh Han*

## **Session 60: Sustainable Energy Applications: Wind Energy Systems I**

### Design and Implementation of STATCOM Combined with Series Dynamic Breaking Resistor for Low Voltage Ride-Through of Wind Farms

*Linyuan Zhou, Jinjun Liu and Fangcheng Liu*

### Low Voltage Ride-Through of Wind Turbine based on Interior Permanent Magnet Synchronous Generators Sensorless Vector Controlled

*Mario Rizo, Ana Rodriguez, Emilio Bueno, Santiago Cobreces, Francisco Rodriguez and Carlos Giron*

### Fault Ride-Through Enhancements of Wind Turbine with Doubly-Fed Induction Generator using the Robust Variable Structure System Control

*Chia-Chi Chu, Yuan-Zeng Lin, Jian-Hung Liu and Se-Kang Ho*

### Control of an Unbalanced Stand-Alone DFIG-Based Wind System using Predictive Current Control Method

*Phan Van-Tung and Lee Hong-Hee*

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### Performance Evaluation of a New Hybrid-Modulation Scheme for High-Frequency-AC-Link Inverter: Applications for PV, Wind, Fuel-Cell, and DER/Storage Applications

*Sudip K. Mazumder and Akshay K. Rathore*

### Performance Enhancement for Digital Implementations of Resonant Controllers

*Alejandro G. Yepes, Francisco D. Freijedo, Pablo Fernandez-Comesana, Jano Malvar, Oscar Lopez and Jesus Doval-Gandoy*

### A Fast Space-Vector Algorithm for Multilevel Converters Without Coordinates Transformation

*Luis Gustavo Castro, Mauricio Correa, Cursino Jacobina and Dushan Boroyevich*

### Application of a Hybrid Discharge Reactor with D-A Mixed Control in Phenol Degradation

*Rui Xie, Chao Chen, Wuhua Li, Jing Zhao and Xiangning He*

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Stability Studies of a Mixed Islanded Power Network with Varspeed Units using Simplified Models of the Converters

*Yves Pannatier, Basile Kawkabani, Gokhan Sari and Jean-Jacques Simond*

Composite Energy Storage System with Flexible Energy Management Capability for Micro-Grid Applications

*Tanmoy Bhattacharya, Haihua Zhou, Ashwin M. Khambadkone, Duong Tran and Siew Tuck Sing, Terence*

A New Half-Bridge based Inverter with the Reduced-Capacity DC Capacitors for DC Micro-Grid

*Toshihiko Tanaka, Tsukasa Sekiya, Yusuke Baba, Masayuki Okamoto and Eiji Hiraki*

Integration of Battery Energy Storage Element in a CERTS Microgrid

*Micah Erickson and Robert Lasseter*

## **Session 64: DC-AC Inverters: Motor Drive Inverters**

Bidirectional Rectifier-Inverter Multilevel Topology without DC-link Passive Components

*Georgios Konstantinou and Vassilios G. Agelidis*

A Square-Wave Controller for a High Speed Induction Motor Drive using a 3 Phase Floating Inverter Bridge

*Jeff Ewanchuk and John Salmon*

Interaction Between the Filter and PWM Units in the Sine Filter Configuration Utilizing Three-Phase AC Motor Drives Employing PWM Inverters

*Onur Cetin and Ahmet Hava*

Loss Evaluation of a Two-Stage Boost Converter using the Neutral Point of a Motor

*Jun-ichi Itoh and Daisuke Ikarashi*

## **Session 65: AC-DC Converters: PFC Modeling and Control**

A Unified Practical Approach to Analyze the Stability of the Pre-Regulator and Complete Two-Stage PFC Power Supplies Under Average-Current-Mode Control

*Mohamed Orabi and Abdelali Elaroudi*

Small-Signal Modeling of DCVM Cuk Converter Operating in both DC Input Voltage Source and PFC Applications

*Yaser Karimi, Vahidreza Nasirian, Mahdi Ahmadian, Jalil Yaghoobi, Mohammad Reza Zolghadri and Mehdi Ferdowsi*

Energy-Based Digital Control of a Ripple Correction Circuit of an Unity-Power-Factor AC/DC Converter

*Toshiji Kato, Kaoru Inoue and Koji Higashiyama*



## A Fourier based PLL for Single Phase Grid Connected Systems

*Claudio Santos, Sidelmo Silva and Braz Cardoso*

### **Session 66: Sustainable Energy Applications: Photovoltaics Converters I**

#### Multiple-Input Boost Converter to Minimize Power Losses Due to Partial Shading in Photovoltaic Modules

*Sairaj Dhople, Jonathan Ehlmann, Ali Davoudi and Patrick Chapman*

#### A High Efficiency Current Fed Multi-Resonant Converter for High Step-Up Power Conversion in Renewable Energy Harvesting

*Bo Yuan, Xu Yang and Donghao Li*

#### An Interleaving Double-Switch Buck-Boost Converter for PV Grid-Connected Inverter

*Huafeng Xiao, Ruhai Huang, Shaojun Xie and Wenming Chen*

#### Improved MPPT Performance of a Grid Connected Photovoltaic Power Conditioning System under Partially Shaded Conditions

*Young-Ho Park, Myung-Ho Woo, Se-Bong Jeon and Seung-Pyo Ryu*

### **Session 67: Electric Machines: Reluctance Machines**

#### Torque Density and Efficiency Improvements of a Switched Reluctance Motor for Hybrid Vehicles without Rare Earth Material

*Yuichi Takano, Motoki Takeno, Takashi Imakawa, Akira Chiba and Nobukazu Hoshi*

#### Position Estimation at Starting and Lower Speeds in Three-Phase Switched Reluctance Machines using Pulse Injection and Two Thresholds

*Gregory Pasquesoone and Iqbal Husain*

#### A New Excitation Scheme for Polyphase Segmented Switched Reluctance Motor

*Vandana Rallabandi, Saikrishna K. and B.G. Fernandes*

#### Design and Optimization of a Synchronous Reluctance Machine with Salient Poles and Flux Barriers

*Remy Constancias, Ignace Rasoanarivo, Nouredine Takorabet and Francois-Michel Sargos*

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#### Automatic Layout Optimization of an EMC Filter

*Thomas de Oliveira, Jean-Michel Guichon and Jean-Luc Schanen*

#### Reduction of Stray Inductance in Power Electronic Modules using Basic Switching Cells

*Shengnan Li, Leon Tolbert, Fred Wang and Fangzheng Peng*

## Power-CAD: A Novel Methodology for Design, Analysis and Optimization of Power Electronic Module Layouts

*Naveed Hingora, Xiangyu Liu, Brice McPherson, Yongfeng Feng and Alan Mantooth*

## Separation Measurement of Parasitic Impedance on a Power Electronics Circuit Board using TDR

*Satoshi Hashino and Toshihisa Shimizu*

### **Session 69: DC-DC Converters: Integrated Power Converters**

#### A Multi-Modes Charge-Pump based High Efficiency Wide Input Range DC-DC Converter

*Rong Guo, Zhigang Liang and Alex Huang*

#### A Monolithic Reconfigurable SC Power Converter with Adaptive Gain Control and On-Chip Capacitor Sizing

*Ling Su and Dongsheng Ma*

#### Switching Losses Analysis in MHz Integrated Synchronous Buck Converter to Support Optimal Power Stage width Segmentation in CMOS Technology

*Xiaopeng Wang, Jinseok Park, Edward Robert Brunt Van and Alex. Q. Huang*

#### Interleaved Switched-Capacitor Converters with Adaptive Control

*Slew Chong Tan, Kiratipongvoot Sitthisak, Svetlana Bronshtein, Adrian Ioinovici and Yuk Ming Lai*

### **Session 70: Electric Machines: Condition Monitoring and Fault Analysis II**

#### Investigation of Influence of Bearing Load and Bearing Temperature on EDM Bearing Currents

*Oliver Magdun, Andreas Binder and Yves Gemeinder*

#### Influence of Motor Operating Parameters on Discharge Bearing Current Activity

*Annette Muetze, Jussi Tamminen and Jero Ahola*

#### New Concepts for Online Surge Testing for the Detection of Winding Insulation Deterioration

*Stefan Grubic, Thomas Habetler and Jose Restrepo*

#### Forces and Vibrations Analysis in Industrial PM Motors having Concentric Windings

*Alain Cassat, Christophe Espanet, Ralph Coleman, Emmanuel Leleu, Luc Burdet, Dimitri Torregrossa, Jeremy M'Boua and Abdellatif Miraoui*

### **Session 71: Sustainable Energy Applications: Wind Energy Systems II**

#### Improvement of Power Quality for PMSG Wind Turbine Systems

*Thanh Hai Nguyen, Dong-Choon Lee, Seung-Ho Song and Eel-Hwan Kim*

## Fault Ride through of DFIG Wind Turbines during Symmetrical Voltage Dip with Crowbar or Stator Current Feedback Solution

*Christian Wessels and Friedrich W. Fuchs*

## Converter Structure-Based Power Loss and Static Thermal Modeling of the Press-Pack IGBT-Based Three-Level ANPC and HB VSCs Applied to Multi-MW Wind Turbines

*Osman S. Senturk, Lars Helle, Stig Munk-Nielsen, Pedro Rodriguez and Remus Teodorescu*

## Induction Generator Model for Unbalanced Distribution Power-Flow Analysis

*Karar Mahmoud, Mamdouh Abdel-Akher and Orabi Mohamed*

## **Session 72: DC-AC Inverters: Special Topics II**

### An Improved Soft-Switching Inverter with an Unidirectional Auxiliary Switch

*Se-Jin Sohn, Kui-Jun Lee, Rae-Young Kim and Dong-Seok Hyun*

### Control and Implementation of a High Voltage Series Resonant Power Supply for Industrial Electrostatic Precipitators

*Carastro Fabio, Clare Jon, Goodman Andrew, Wheeler Patrick and Leach John*

### High-Efficiency Inverter for Photovoltaic Applications

*David Perreault, Brandon Pierquet, Aleksey Trubitsyn, Alexander Hayman, Garet Gamache and Charles Sullivan*

### A Single-Phase Photovoltaic Inverter Topology with a Series-Connected Power Buffer

*Brandon Pierquet and David Perreault*

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### An Adaptive Predictive Current Control Technique for Permanent Magnet Synchronous Motors

*Yilmaz Sozer, David Torrey and Erkan Mese*

### Comparative Study of Conventional PI-Control, PI-Based State Space Control and Model based Predictive Control for Drive Systems with Elastic Coupling

*Soenke Thomsen, Nils Hoffmann and Friedrich W. Fuchs*

### A Comparison of Control and Modulation Schemes for Medium-Voltage Drives: Emerging Predictive Control Concepts versus Field Oriented Control

*Tobias Geyer*

### Control Method for IPMSM based on PTC and PWM Hold Model in Overmodulation Range – Study on Robustness and Comparison with Anti-Windup Control

*Takayuki Miyajima, Hiroshi Fujimoto and Masami Fujitsuna*

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Distribution Voltage Control for DC Microgrid by Converters of Energy Storages Considering the Stored Energy

*Hiroaki Kakigano, Atsuo Nishino, Yushi Miura and Toshifumi Ise*

Analysis and Design of Interfacing Inverter Output Virtual Impedance in a Low Voltage Microgrid

*Jinwei He and Yunwei Li*

A Medium-Voltage DC (MVDC) System with Series Active Injection for Shipboard Power System Applications

*Hesam Mirzaee, Sumit Dutta and Subhashish Bhattacharya*

An Adaptive Controller for Inverter-Interfaced DGs Connected to Grids with a Wide Range of Unknown Impedances

*Xiaolin Mao and Raja Ayyanar*

## **Session 75: DC-AC Inverters: Z-Source Topology I**

Optimal Design of the Inductor in Z-Source Inverter with Single Phase Shoot-Through SVPWM Strategy

*Jiudong Ding, Shaojun Xie and Yu Tang*

Power Loss Analysis of Current-Fed Quasi-Z-Source Inverter

*Qin Lei, Fangzheng Peng, Liangzong He and Shuitao Yang*

Hybrid Pulse Width Modulation for Z-Source Inverters

*Euzeli Cipriano dos Santos Jr, Eugenio P. X. Pimentel Filho, Alexandre Cunha Oliveira and Edison R. Cabral Silva*

A Z-Source Sparse Matrix Converter under Voltage Sag Condition

*Park Kiwoo and Lee Kyo-Beum*

## **Session 76: AC-DC Converters: PFC Converters**

Bridgeless Single-Stage Full-Bridge Converter with One Cycle Control in the Output Voltage

*Hugo Ribeiro, Fernando Silva, Sonia Pinto and Beatriz Borges*

A Magnetically Coupled Passive Lossless Snubber with Low Voltage Stress for Continuous Current Mode (CCM) Boost Converter

*Kyu-Min Cho, Ki-Bum Park, Young-Do Kim and Gun-Woo Moon*

An AC/DC Power Conversion based on Series-Connected Universal Link Converter

*Anno Yoo, Myoung-ho Kim and Seung-Ki Sul*

## Three-Phase Single-Switch Boost PFC Converter with High Input Power Factor

*Kai Yao, Xinbo Ruan, Chi Zou and Zhihong Ye*

### **Session 77: Sustainable Energy Applications: Photovoltaics Converters II**

#### Transformerless Split-Inductor Neutral Point Clamped Three-Level PV Grid-Connected Inverter

*Huafeng Xiao, Shaojun Xie and Chen Yang*

#### A New Wide Input Range High Efficiency Photovoltaic Inverter

*Zhigang Liang, Rong Guo, Gangyao Wang and Alex Huang*

#### Design and Implementation of a 5 kW Photovoltaic System with Li-Ion Battery and Additional DC/DC-Converter

*Michael Bragard, Nils Soltau, Armin Schmiegel and Rik De Doncker*

#### Digital Controller Development for Grid-Tied Photovoltaic Inverter with Model based Technique

*Zhigang Liang, Larry Alesi, Xiaohu Zhou, Jun Li and Alex Huang*

### **Session 78: Electric Machines: Special Machines I**

#### Different Arrangements for Dual-Rotor Dual-Output Radial-Flux Motors

*Yu-Han Yeh, Min-Fu Hsieh and David Dorrell*

#### New Concept Motor that uses Compound Magnet Motive Forces for EV Application

*Tomoaki Shigeta, Kan Akatsu and Takashi Kato*

#### Improvement of a Non-Contact Elevator Guiding System by Implementation of an Additional Torsion Controller

*Benedikt Schmuelling, Peter Laumen and Kay Hameyer*

#### Analysis of a Concentric Planetary Magnetic Gear with Strengthened Stator and Interior Permanent Magnet (IPM) Inner Rotor

*Nicolas Frank and Hamid Toliyat*

### **Session 79: Enabling Technologies: Thermal Management**

#### Seawater based Cold Plate for Power Electronics Cooling

*Juan Marcelo Gutierrez Alcaraz, S.W.H. de Haan and J.A. Ferreira*

#### Dynamic Electro-Thermal Modeling in PEBB Applications

*Huan huan Wang, Ashwin M. Khambadkone and Xiaoxiao Yu*

#### High Power Density Design of High-Current DC-DC Converter with High Transient Power

*Yi Wang, Sjoerd W.H. de Haan and J.A. Ferreira*

## Thermal Modeling and Management of the Integrated HID Ballast

*Yan Jiang, Shuo Wang and Fred Lee*

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#### A Comprehensive Multi-Mode Performance Analysis of Interleaved Boost Converters

*Biswajit Ray, Hiroyuki Kosai, Seana McNeal, Brett Jordan and James Scofield*

#### Current Sharing in Multiphase ZVT Boost Converter

*Esther de Jodar, Jose Villarejo, Jacinto Jimenez and Miguel Moreno*

#### Fixed Frequency Controlled Piezoelectric 10W DC/DC Converter

*Yuan-Ping Liu, Dejan Vasic, Francois Costa and Wen-Jong Wu*

#### Improving the Light-Load Efficiency of VRMs using Parallel Inductors

*Christina Collins and Maeve Duffy*

### **Session 81: Transportation Applications: Diagnostics and Fault Tolerance**

#### Real-Time Fault Diagnostics for a Permanent Magnet Synchronous Motor Drive for Aerospace Applications

*Milijana Odavic, Mark Sumner, Pat Wheeler and Jing Li*

#### Fault Location in a Zonal DC Marine Power System using Active Impedance Estimation

*Mark Sumner, Edward Christopher, David Thomas, Xiaohui Wang and de Wildt Frans*

#### Robust Absolute Position Sensing for Maglev

*Raymond Sepe, Steven Bastien, Anton Steyerl and Bogdan Borowy*

#### Characteristic Analysis of IPM type BLDC Motor Considering the Demagnetization of PM by Stator Turn Fault

*Hyung-Kyu Kim, Jin Hur, Gyu-Hong Kang and Byeong-Woo Kim*

### **Session 82: Sustainable Energy Applications: Wind Energy Systems III**

#### Balance and Unbalance Voltage Dips Impacts on Full Scale Converter Wind Turbines

*Ivan Gabe and Humberto Pinheiro*

#### Analysis of IGBT Power Cycling Capabilities used in Doubly Fed Induction Generator Wind Power System

*Lixiang Wei, Haihui Lu, Zhenhuan Yuan, Russ J Kerkman and Richard A Lukaszewski*

#### Novel Rotor Side Control Scheme for Doubly Fed Induction Generator to Ride through Grid Faults

*Zhendong Zhang, Longya Xu, Yuan Zhang and Bo Guan*

## Flexible Control of DC-Link Voltage for Doubly Fed Induction Generator during Grid Voltage Swell

*Changjin Liu, Xiaobo Huang, Min Chen and Dehong Xu*

### **Session 83: DC-DC Converters: Control Techniques I**

#### Self-Tuning Mixed-Signal Optimal Controller with Improved Load Transient Waveform Detection and Smooth Mode Transition for DC-DC Converters

*Aleksandar Radic, Aleksandar Prodic and Robert de Nie*

#### Comparison between Ramp Pulse Modulation (RPM) and Constant Frequency Modulation for the Beat Frequency Oscillation in Voltage Regulators

*Kisun Lee and Han Zou*

#### Investigation of the Steady-State and Dynamic Characteristics of a Buck Converter with Nonlinear Output Capacitor Current Programming

*Victor Cheung, Henry Chung and Alan Lo*

#### Design Oriented Model for V2 Constant On-Time Control

*Feng Yu and Fred C. Lee*

### **Session 84: Electric Drives: Sensorless Drives I**

#### Temperature Issues in Saliency-Tracking based Sensorless Methods for PM Synchronous Machines

*David Reigosa, Fernando Briz, Michael Degner, Juan Manuel Guerrero and Pablo Garcia*

#### HF Injection-Based Sensorless Technique for Fault-Tolerant IPMSM Drives

*Alfio Consoli, Alberto Gaeta, Giuseppe Scarcella, Giacomo Scelba and Antonio Testa*

#### Model based Design of a Sensorless Control Scheme for Permanent Magnet Motors using Signal Injection

*Francesco Cupertino, Gianmario Pellegrino, Paolo Giangrande and Luigi Salvatore*

#### Sensorless Control for Induction Machines using Square-Wave Voltage Injection

*Young-Doo Yoon and Seung-Ki Sul*

### **Session 85: Sustainable Energy Applications: Microgrid III**

#### DC Micro-Grid Operational Analysis with Detailed Simulation Model for Distributed Generations

*Ji-Heon Lee, Byung-Moon Han and Num-Sub Choi*

#### A Hybrid Control Architecture for Low Voltage Microgrid

*Xiaoxiao Yu, Ashwin M Khambadkone, Huan Huan Wang and Tuck Sing Siew*

#### Voltage Quality Improvement of Microgrids under Islanding Mode

*Gustavo Azevedo, Pedro Rodriguez, Joan Rocabert, Marcelo Cavalcanti and Francisco Neves*

## Decentralized LQG Control with Online Set-Point Adaptation for Parallel Power Converter Systems

*Junqi Liu, Dragan Obradovic and Antonello Monti*

### **Session 86: DC-AC Inverters: Z-Source Topology II**

#### Bi-Directional AC-AC Z-Source Inverter with Active Rectifier and Feedforward Control

*Moritz von Zimmermann, Sebastian Labusch and Bernhard Piepenbreier*

#### Controller Design for Quasi-Z-Source Inverter in Photovoltaic Systems

*Yuan Li, Fang Zheng Peng, Jorge G. Cintron-Rivera and Shuai Jiang*

#### Modulation of Three-Level Z-Source Indirect Matrix Converter

*Xiong Liu, Poh Chiang Loh, Fang Zheng Peng, Peng Wang and Feng Gao*

#### A Matrix Converter Utility Interface for Grid Resources with a High-Frequency Bus

*Joseph Carr, Juan Balda and Alan Mantooth*

### **Session 87: AC-DC Converters: Single Phase PFC**

#### Inductive Idling Boost Converter with Low Inductor Current-Ripple and Improved Dynamic Response for Power Factor Correction

*Fei Zhang, Jianping Xu, Haikun Yu and Guohua Zhou*

#### A Front-End Converter with High Reliability and High Efficiency

*Kazuaki Mino, Hiroyuki Matsumoto, Yuji Nemoto, Satoru Fujita and Daisuke Kawasaki*

#### High-Efficiency Bidirectional AC-DC Converter for Energy Storage Systems

*Hao Qian, Jih-Sheng Lai, Jianhui Zhang and Wensong Yu*

#### A New Bridgeless Single-Stage Three-Level PFC AC/DC Converter

*Woo-Young Choi*

### **Session 88: Sustainable Energy Applications: Photovoltaics Converters III**

#### Power Decoupling Techniques for Micro-Inverters in PV Systems

*Haibing Hu, Harb Souhib, Nasser Kutkut, Issa Batarseh and John Shen*

#### PV Fed Boost Type Switched Capacitor Power Supply for a Nano Satellite

*Pradeep Peter and Vivek Agarwal*

#### Ground Current Suppression for Grid Connected Transformerless PV Inverter with Unbalanced Output Filter Inductors

*Na Su, Dehong Xu and Junbing Tao*



## Multiple-Input Modified Inverse Watkins-Johnson Converter without Coupled Inductors

*Seung Choung and Alexis Kwasinski*

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#### Modelling of Linear Motor End-Effects for Saliency based Sensorless Control

*Paolo Giangrande, Francesco Cupertino and Gianmario Pellegrino*

#### A Multi-Motor Drive based on Five-Phase Tubular PM Actuators

*Luca Zarri, Giovanni Serra, Angelo Tani, Domenico Casadei, Fiorenzo Filippetti and Michele Mengoni*

#### Design and Electromagnetic Analysis of a Prototype HTS Linear Induction Motor

*Jia Zhao, Wei Zhang, Jin Fang, Zhongping Yang and Trillion Q Zheng*

#### Fast Optimization of a Linear Actuator by Space Mapping using Unique Finite Element Model

*Stephane Vivier, Didier Lemoine and Guy Friedrich*

### **Session 90: Enabling Technologies: Wide Bandgap Power Semiconductors**

#### Comparison of 10-kV SiC Power Devices in Solid-State Transformer

*Jun Wang, Gangyao Wang, Subhashish Bhattacharya and Alex Huang*

#### An Investigation of SiC-SIT DC Circuit Breakers for Higher Voltage Direct Current Distribution Systems

*Yukihiko Sato, Syunsuke Tobayashi, Yasunori Tanaka, Akiyoshi Fukui and Mikio Yamasaki*

#### A High-Efficiency, High-Frequency Boost Converter using Enhancement Mode GaN DHFETs on Silicon

*Jordi Everts, Jo Das, Jeroen Van den Keybus, Jan Genoe, Marianne Germain and Johan Driesen*

#### Performance of a Dual, 1200 V, 400 A, Silicon-Carbide Power MOSFET Module

*Damian Urciuoli, Ronald Green, Aivars Lelis and Dimeji Ibitayo*

### **Session 91: DC-DC Converters: Resonant Converters**

#### Multiple Output Class E Isolated DC-DC Converter

*Zoran Pavlovic, Jesus Angel Oliver, Pedro Alou and Jose Antonio Cobos*

#### PWM Positive Buck-Boost Converter with Reduced Switching Loss Employing Quasi-Resonant Operation

*Han-Shin Youn, Ki-Bum Park, Hyun-Wook Seong, Gun-Woo Moon and Myung-Joong Youn*

## Analysis of Asymmetrical Duty Controlled LCC Converter with Voltage Triple Rectifier for High Voltage Power Supply

*Keun-Wook Lee, Ki-Bum Park, Young-Do Kim and Gun-Woo Moon*

## Analysis and Design of a Resonant LCC Converter for Low-Profile Applications

*Alexander Pawellek, Markus Schmid, Alexander Bucher and Thomas Duerbaum*

### **Session 92: Transportation Applications: Drivetrains**

#### Application of PM Type DMPM in Hybrid Electric Vehicle

*Xuhui Wen, Feng Zhao, Xinhua Guo, Tao Fan, Longya Xu and Qiongquan Ge*

#### Comparative Evaluation of Machines for Electric and Hybrid Vehicles based on Dynamic Operation and Loss Minimization

*Ali Bazzi and Philip Krein*

#### Comparison of Different Motor Design Drives for Hybrid Electric Vehicles

*David Dorrell, Mircea Popescu, Andrew Knight, Lyndon Evans and David Staton*

#### Comparison of Si and SiC Inverters for IPM Traction Drive

*Madhu Sudhan Chinthavali, Pedro J. Otaduy and Burak Ozpineci*

### **Session 93: Sustainable Energy Applications: Wind Energy Systems IV**

#### Advanced Power Conditioning System for Grid Integration of Direct-Driven PMSG Wind Turbines

*Marcelo G. Molina, Euzeli C. dos Santos Jr and Mario Pacas*

#### Development of Grid-Connected Wind Energy System Employing Interior PM Synchronous Generator and Multi-Pulse Rectifier

*Katsumi Nishida, Tarek Ahmed and Mutsuo Nakaoka*

#### Comparison of SMES and SFCL for Transient Stability Enhancement of Wind Generator System

*Mohd. Hasan Ali and Roger A. Dougal*

#### A Low Voltage Ride-Through Technique for Grid-Connected Converters of Distributed Energy Resources

*Che-Wei Hsu, Chia-Tse Lee and Po-Tai Cheng*

### **Session 94: DC-DC Converters: Control Techniques II**

#### Fast Control Technique Based on Peak Current Mode Control of the Output Capacitor Current

*Miriam del Viejo, Pedro Alou, Jesus A. Oliver, Oscar Garcia and Jose A. Cobos*

#### A Low Ripple Series-Parallel Resonant Converter based on Robust H-Infinity Control Approach

*Majid Pahlevaninezhad, Navid Shafiei, Suzan Eren, Alireza Bakhshai and Praveen Jain*

## Active Stabilization of DC-DC Converters with Input LC Filters via Current-Mode Control and Input Voltage Feedback

*Ryan Weichel, Guanghui Wang, Jeffrey Mayer and Heath Hofmann*

## An Active Current Reconstruction and Balancing Strategy with DC Link Current Sensing for a Multi-Phase Coupled-Inductor Converter

*Young-Hoon Cho, Ahmed Koran, Hidekazu Miwa, Ben York and Jih-Sheng Lai*

### **Session 95: Electric Dives: Sensorless Drives II**

#### Impact of Saturation and Current Command Selection on the Performance of Sensorless Controlled Three-Pole Active Magnetic Bearings

*Pablo Garcia, Juan M. Guerrero, Islam El-Sayed, Fernando Briz and David Reigosa*

#### Optimal Design and Sensorless Position Control of a Piezoelectric Motor Integrated into a Mechatronic Cylinder Lock

*Markus Flueckiger, William Zogg and Yves Perriard*

#### Modeling and Compensation of Inverter Nonlinearity Effects in Carrier Signal Injection-Based Sensorless Control Methods from Positive Sequence Carrier Current Distortion

*L.M. Gong and Z.Q. Zhu*

#### Spectral Overlap of Saliency Signal Components in Injection based Sensorless Controlled Induction Machines

*Thomas Wolbank and Mohamed Metwally*

### **Session 96: Sustainable Energy Applications: Microgrid IV**

#### On the Choice of Voltage Regulators for Droop-Controlled Voltage Source Converters in Microgrids to Ensure Stability

*Sandeep Bala and Giri Venkataramanan*

#### Design of D-STATCOM for Voltage Regulation in Microgrids

*Tzung-Lin Lee, Shang-Hung Hu and Yu-Hung Chan*

#### Fast Architecture Generation and Evaluation Techniques for the Design of Large Power Systems

*Leonardo Laguna, Roberto Prieto, Jesus Angel Oliver, Jose Antonio Cobos and Horacio Visairo-Cruz*

#### A Hybrid Synchronous/Fixed Reference Frame PLL for Phase Synchronization with Unbalanced Three-Phase Grid Conditions

*A. W. Krieger and J. Salmon*

## **Session 97: Electric Machines: Permanent Magnet Machines I**

Influence of Slot Opening on Optimal Stator and Rotor Pole Combination and Electromagnetic Performance of Flux-Switching PM Brushless AC Machines

*J.T. Chen, Z.Q. Zhu, S. Iwasaki and R. Deodhar*

Impact of the Rotor Yoke Geometry on Rotor Losses in Permanent Magnet Machines

*Luigi Alberti, Emanuele Fornasiero and Nicola Bianchi*

Surface Permanent Magnet Synchronous Machine Design for Self-Sensing Position Estimation at Zero and Low Speeds

*Shih-Chin Yang, Takahiro Suzuki, Robert Lorenz and Thomas Jahns*

Study of Iron Saturation in Brushless Doubly-Fed Induction Machines

*Ehsan Abdi, Paul Malliband and Richard McMahon*

## **Session 98: DC-DC Converters: Special Topics I**

An Accurate Loss Model for Current-Source Gate Driver with Interleaving BUCK Converter

*Zongxiang Chen, Lusheng Ge, Qi Hui and Yanfei Liu*

An Integrated SIDO Boost Power Converter with Adaptive Freewheel Switching Technique

*Yi Zhang, Rajdeep Bondade, Dongsheng Ma and Siamak Abedinpour*

Novel Zero-Current Switching Current-Fed Half-Bridge Isolated DC/DC Converter for Fuel-Cell Based Applications

*Akshay K. Rathore and Sudip K. Mazumder*

General Law of Non-Isolated Interleaved High Step-Up Topologies with Winding-Cross-Coupled Inductors Deduced from Isolation Counterparts

*Rui Xie, Wuhua Li, Yi Zhao, Jing Zhao, Xiangning He and Fengwen Cao*

## **Session 99: Sustainable Energy Applications: Flexible Renewable/Alternative Energy System I**

A Novel Five-Level Single Phase Grid Connected Converter for Renewable Distributed Systems

*Giampaolo Buticchi, Giovanni Franceschini and Emilio Lorenzani*

A High Frequency Link Multiport Converter Utility Interface for Renewable Energy Resources with Integrated Energy Storage

*Joseph Carr, Juan Balda and Alan Mantooth*

Control of a Modular Multilevel Cascade BTB System using Bidirectional Isolated DC/DC Converters

*Hirofumi Akagi and Ryohei Kitada*

## Seamless Transfer Strategy with Outer Current Loop for Three Phase Inverter in Distributed Generation

*Zeng Liu and Jinjun Liu*

### **Session 100: Electric Machines: Turbine Generators**

#### Structural Mass Minimization of Large Direct-Drive Wind Generators using a Buoyant Rotor Structure

*Deok-Je Bang, Henk Polinder, Jan Abraham Ferreira and Seung-soo Hong*

#### A Generic Synchronous Machine Model for Real Time Training Simulators

*Jorge Garcia-Garcia, Ivan Galindo-Garcia and Saul Rodriguez-Lozano*

#### Advanced Signal Processing Techniques for Fault Detection and Diagnosis of a Wind Turbine Induction Generator Drive Train: A Comparative Study

*Elie AL-Ahmar, Vincent Choqueuse, Mohamed Benbouzid, Yassine Amirat, Joseph El-Assad, Rabih Karam and Farah Sarkis*

#### The Magneto Motive Force of a Novel Dual Stator-Winding Induction Generator

*Wenxin Huang, Yuwen Hu, Feifei Bu and Kai Shi*

### **Session 101: Transportation Applications: EV/PHEV Battery Chargers**

#### A High-Performance Single-Phase AC-DC Power Factor Corrected Boost Converter for Plug In Hybrid Electric Vehicle Battery Chargers

*Fariborz Musavi, Wilson Eberle and William G. Dunford*

#### The Issue of Plug-In Hybrid Electric Vehicles' Grid Integration and Its Control Solution

*Xiaohu Zhou, Jun Li, Zhigang Liang, Alex Huang and Subhashish Bhattacharya*

#### Control Scheme Optimization for a Low-Cost, Digitally-Controlled Charger for Plug-In Hybrid Electric Vehicles

*Lixin Tang and Gui-Jia Su*

#### A High Power, Current Sensorless, Bi-Directional, 16 Phase Interleaved, DC-DC Converter for Hybrid Vehicle Application

*Liqin Ni, Dean Patterson and Jerry Hudgins*

### **Session 102: Sustainable Energy Applications: Smart Grid Interface**

#### Increasing Inter-Area Available Transfer Capacity using Controllable Network Transformers

*Debrup Das, Divan Deepak and Harley Ronald*

Active Smart Wires: An Inverter-Less Static Series Compensator

*Frank Kreikebaum, Munuswamy Imayavaramban and Deepak Divan*

Islanding Detection in Smart Grids

*Adrian Timbus, Alexandre Oudalov and Carl N.M. Ho*

Real-Time Dynamic Thermal Rating Evaluation of Overhead Power Lines based on Online Adaptation of Echo State Networks

*Yi Yang, Ronald Harley, Deepak Divan and Thomas Habetler*

### **Session 103: Electric Machines: Design Optimization**

An Electromagnetic-Thermo-Mechanical Integrated Design and Optimization Method for Surface Mount Permanent Magnet Machines Considering Load Profiles

*Andrew Semidey, Duan Yao, James Mayor and Ronald Harley*

Maximum Torque Control for Optimal Design to Reduce Cogging Torque in Spoke Type Interior Permanent Magnet Synchronous Motor

*Yul-kyu Son, Kyu-yun Hwang and Byung-il Kwon*

FEA-Based Multi-Objective Optimization of IPM Motor Design including Rotor Losses

*Gianmario Pellegrino and Francesco Cupertino*

Investigation of Torque and Iron Loss Characteristics of Optimized Spoke type IPMSM Considering Motor Modeling and Motor Drive Circuit

*Kyu-yun Hwang and Byung-il Kwon*

### **Session 104: DC-AC Inverters: Multi-Level Inverters I**

An Investigation of Voltage Balancing Circuit for DC Capacitors in Diode-Clamped Multilevel Inverters to Realize High Output Power Density Converters

*Takumi Ito, Masamu Kamaga, Yukihiko Sato and Hiromichi Ohashi*

Re-regenerative Asymmetrical Multi-Level Converter for Multi-Megawatt Variable Speed Drives

*Joseph Song-Manguelle, Tobias Thurnherr, Stephan Schroeder, Alfred Rufer and Jean-Maurice Nyobe-Yome*

Voltage Balancing Control and Experiments of a Novel Modular Multilevel Converter

*Kui Wang, Yongdong Li and Zedong Zheng*

A Modulation Technique for High Power AC/DC Multilevel Converters for Power System Integration

*Stefano Bifaretti, Pericle Zanchetta, Alan Watson, Luca Tarisciotti, Jon Clare and Armando Bellini*

## **Session 105: DC-DC Converters: Soft Switching Techniques I**

### **Soft-Switching Self-Driven Buck Converter with Three-Switch Cell Structure**

*Qiang Li, Fred C. Lee, Douglas Sterk and Ke Jin*

### **A New Concept of High Input Voltage to Low Load Voltage (1500 V- 48V) DC-DC Conversion with Hybrid ZVS-ZCS and Asymmetrical Voltage Distribution**

*Huai Wang, Henry Chung and Adrian Ioinovici*

### **Novel DC-DC Architecture for High Efficiency SMPS with Multiple Outputs**

*Zhanghe Nan, Ming Xu, Sun Julu, Han Wenchang and Yao Yuan*

### **Zero-Voltage-Switching Interleaved Two-Switch Forward Converter with Phase-Shift Control**

*Hyoung-Suk Kim, Hyun-Wook Seong, Ki-Bum Park, Han-Shin Youn, Gun-Woo Moon and Myung-Joong Youn*

## **Session 106: Sustainable Energy Applications: Power Quality I**

### **Malfunction Mechanism of Semiconductor Circuit Breaker in HVDC Power Supply System**

*Seiya Abe, Kentaro Fukushima, Sihun Yang, Mariko Ogawa, Kosuke Nomura, Masahito Shoyama, Tamotsu Ninomiya, Akira Matsumoto, Akiyoshi Fukui and Mikio Yamasaki*

### **AC Fault Ride-Through Capability of VSC-HVDC Transmission Systems**

*Grain Philip Adam, Stephen Jon Finney, Barry Wyne Williams and Hani Ahmed Khaled*

### **Three-Level Converters with Selective Harmonic Elimination PWM for HVDC Application**

*Mebtu Beza and Staffan Norrga*

### **Input Impedance Modeling of Multipulse Rectifiers by Double-Fourier Series Method**

*Zhonghui Bing and Jian Sun*

## **Session 107: Sustainable Energy Applications: Wind Turbine Control I**

### **Growing Neural Gas based MPPT of Variable Pitch Wind Generators with Induction Machines**

*Maurizio Cirrincione, Marcello Pucci and Gianpaolo Vitale*

### **Grid-Connected Wind Farm Power Control using VRB-Based Energy Storage System**

*Wenliang Wang, Baoming Ge, Daqiang Bi and Dongsun Sun*

### **Control of Variable Pitch, Variable Speed Wind Turbine in Weak Grid Systems**

*Xibo Yuan, Jianyun Chai and Yongdong Li*

### **A Battery Energy Storage Interface for Wind Power Systems with the use of Grid Side Inverter**

*Shantha D Gamini Jayasingha, Don Mahinda Vilathgamuwa and Udaya K Madawala*

## **Session 108: Electric Machines: Permanent Magnet Machines II**

**Analysis and Measurement of 3D Torque and Forces for Permanent Magnet Motors with Slotless Windings**

*Andreas Looser, Thomas Ivar Baumgartner, Christof Zwysig and Johann Walter Kolar*

**Sensorless Drive of Brushless DC Motors with Estimating Torque Constant for Home Appliance**

*Je-Wook Park, Seon-Hwan Hwang, Jang-Mok Kim and Jin-Woo Ahn*

**Cogging Torque Minimization in PM Motors using Robust Design Approach**

*Mohammad Islam, Rakib Islam, Tomy Sebastian, Ashok Chandy and Suat Ozsoylu*

**A Novel E-Core Flux-Switching PM Brushless AC Machine**

*J.T. Chen, Z.Q. Zhu, S. Iwasaki and R. Deodhar*

## **Session 109: DC-DC Converters: Special Topics II**

**Sawtooth Burst Mode with Minimum On-Time in Stand-By Operation of Power Supply**

*Bong-Chul Kim, Ki-Bum Park and Gun-Woo Moon*

**A Linear Assisted DC/DC Converter for Envelope Tracking and Envelope Elimination and Restoration Applications**

*Pablo F. Miaja, Miguel Rodriguez, Javier Sebastian and Alberto Rodriguez*

**High Efficiency Power Amplifier based on Envelope Elimination and Restoration Technique**

*Miroslav Vasic, Oscar Garcia, Jesus Angel Oliver, Pedro Alou and Daniel Diaz*

**A New Family of Marx Generator based on Resonant Converter**

*Sasan Zabihi, Firuz Zare, Gerard Ledwich, Arindam Ghosh and Hidenori Akiyama*

## **Session 110: Sustainable Energy Applications: Flexible Renewable/Alternative Energy System II**

**Predictive Control for Universal and Flexible Power Management**

*Stefano Bifaretti, Pericle Zanchetta, Alan Watson, Luca Tarisciotti and Jon C. Clare*

**Instantaneous Active and Nonactive Power Control of Distributed Energy Resources with a Current Limiter**

*Yan Xu, Huijuan Li, Tom Rizy, Fangxing Li and John Kueck*

**A Two-Stage High Power Density Single-Phase AC-DC Bi-Directional PWM Converter for Renewable Energy Systems**

*Dong Dong, Dushan Boroyevich, Ruxi Wang and Igor Cvetkovic*

**A Novel Phase-Shift Bidirectional DC-DC Converter with an Extended High-Efficiency Range for 20 kVA Solid State Transformer**

*Haifeng Fan and Hui Li*



## **Session 111: Electric Drives: N-Phase Drives**

### **Two-Phase Motor Drive Systems with Z-Source Inverter and Hybrid PWM**

*Euzeli Cipriano dos Santos Jr, Mario Pacas and Marcelo G. Molina*

### **Six-Phase Machine Drive System with Reversible Parallel AC-DC-AC Converters**

*Euzeli Cipriano dos Santos Jr, Cursino Jacobina, Nady Rocha and Edison Roberto C. Silva*

### **A Separate Double-Winding 12-phase Brushless DC Motor Drive Fed from Individual H-Bridge Inverters**

*Byung-Geuk Cho, Young-Doo Yoon, Seung-Ki Sul, Young Kyung Kong and Jae Goo Bin*

### **Torque Maximization in High-Torque Density Multiphase Drives based on Induction Motors**

*Luca Zarri, Giovanni Serra, Angelo Tani, Domenico Casadei and Michele Mengoni*

## **Session 112: Transportation Applications: Energy Storage**

### **System Identification-Based Lead-Acid Battery Online Monitoring System**

*Larry Juang, Philip Kollmeyer, Thomas Jahns and Robert Lorenz*

### **Automatic Charge Equalization Circuit based on Regulated Voltage Source for Lithium-Ion Batteries**

*Moon-young Kim, Chol-Ho Kim, Shin-Young Cho and Gun-Woo Moon*

### **Power Electronics Enabled Energy Management for Energy Storage with Extended Cycle Life and Improved Fuel Economy in a PHEV**

*Lei Wang, Xiaohu Liu, Hui Li, Won-Sang Im and Jang-Mok Kim*

### **A Modularized Charge Equalizer using Battery Monitoring IC for Series Connected Li-Ion Battery Strings in an Electric Vehicle**

*Chol-Ho Kim, Moon-young Kim, Daeyoun Cho and Gun-Woo Moon*

## **Session 113: Sustainable Energy Applications: VAR Compensators**

### **Safe Current Injection Strategies for a STATCOM under Asymmetrical Grid Faults**

*Pedro Rodriguez, Gustavo Medeiros, Alvaro Luna, Marcelo Cavalcanti and Remus Teodorescu*

### **Design and Implementation of a 154 kV, +/- 50 MVar Transmission STATCOM based on 21-Level Cascaded Multilevel Converter**

*Burhan Gultekin, Cem Ozgur Gercek, Tevhid Atalik, Mustafa Deniz and Nazan Bicer*

### **Negative-Sequence Reactive-Power Control by the Modular Multilevel Cascade Converter based on Double-Star Chopper-Cells (MMCC-DSCC)**

*Makoto Hagiwara, Ryo Maeda and Hirofumi Akagi*

### **Four-Branch Star Neutral Current Hybrid Power Filter and Var Compensator**

*Pedro Rodriguez, Ignacio Candela, Alvaro Luna, Remus Teodorescu and Frede Blaabjerg*

## **Session 114: Electric Machines: High Speed Machines**

### **Harmonic Loss Analysis and Air-Gap Optimization of High Speed Induction Motors**

*Katsumi Yamazaki, Akihiro Suzuki, Motomichi Ohto, Teruyuki Takakura and Satoshi Nakagawa*

### **Novel High-Speed, Lorentz-Type, Slotless Self-Bearing Motor**

*Thomas Ivar Baumgartner, Andreas Looser, Christof Zwysig and Johann Walter Kolar*

### **Rotor Design of a High-Speed Permanent Magnet Synchronous Machine Rating 100.000 rpm at 10kW**

*Bjoern Riemer, Marc Lessmann and Kay Hameyer*

### **Design of a 750,000 rpm Switched Reluctance Motor for Micro Machining**

*Jacob Kunz, Siwei Cheng, Yao Duan, James Mayor and Ronald Harley*

## **Session 115: DC-AC Inverters: Multi-Level Inverters II**

### **Low Output Frequency Operation of the Modular Multi-Level Converter**

*Arthur J. Korn, Manfred Winkelkemper and Peter Steimer*

### **A Hybrid Cascaded Multilevel Inverter Application for Renewable Energy Resources Including a Reconfiguration Technique**

*Surin Khomfoi, Nattapat Praisuwanna and Leon Tolbert*

### **Review of Novel Multilevel Current-Source Inverters with H-Bridge and Common-Emitter based Topologies**

*Toshihiko Noguchi and Suroso Suroso*

### **Symmetrical Hybrid Multilevel DC-AC Converter in Cascade**

*Domingo Ruiz Caballero, Samir Ahmad Mussa, Marcelo Lobo Heldwein, Hector Vergara S and Rene Sanhueza R*

## **Session 116: DC-DC Converters: Soft Switching Techniques II**

### **A ZVS Technique for Single-Switch PWM Converters Implemented with Paralleled MOSFETS**

*Navid Golbon and Gerry Moschopoulos*

### **Zeroing Transformer's DC Current in Resonant Converters with No Series Capacitors**

*Alexander Gertsman and Sam Ben-Yaakov*

### **Design and Implementation of a ZCS Two-Switch DC-DC Forward Converter with Variable Inductor**

*Po-Tso Chen, Tsorng-Juu Liang, Lung-Sheng Yang, Ming-Yang Cheng and Shi-Ming Chen*

## Rapid Simulation of Multi-Resonant LLC Converters with Capacitive Output Filter based on an Extended First Harmonic Approximation

*Alexander Bucher, Thomas Duerbaum and Juergen Stahl*

### **Session 117: Sustainable Energy Applications: Power Quality II**

#### A Simple Sag Generator using SSRs

*Osman S. Senturk and Ahmet Hava*

#### Comparison between Conventional, GA and PSO with Respect to Optimal Capacitor Placement in Agricultural Distribution System

*K.V.S.Ramachandra Murthy, M. Ramalinga Raju, Govinda Rao Gade and R. Srinivasa Rao*

#### Direct Power Control for Unified Power Flow Controller Series Converter

*Jan Verveckken, Fernando Silva, Dionisio Barros and Johan Driesen*

#### Harmonic Identification in a Power System using an Echo State Network for Adaptive Power Filter Applications

*Jing Dai, Ganesh Venayagamoorthy, Harley Ronald and Corzine Keith*

### **Session 118: Sustainable Energy Applications: Wind Turbine Control II**

#### Review and Critical Analysis of the Research Papers Published Till Date on Maximum Power Point Tracking in Wind Energy Conversion System

*Syed Muhammad Raza Kazmi, Hiroki Goto, Hai-Jiao Guo and Osamu Icinokura*

#### Network Damping Capability of DFIG-Based Wind Farm

*Bing Gong, Dewei Xu and Bin Wu*

#### Mechanical Sensorless Maximum Power Tracking Control for Direct-Drive PMSG Wind Turbines

*Xu Yang, Xiang Gong and Wei Qiao*

#### Determination of Steady State Control Laws of Doubly – Fed Induction Generator using Natural and Power Variables

*Joseph Ojo, Adeola Balogun, Frank Okafor and Sosthenes Karugaba*

### **Session 119: Electric Machines: IPM Machines**

#### Design Tradeoffs between Constant Power Speed Range, Uncontrolled Generator Operation and Rated Current of IPM Motor Drives

*Gianmario Pellegrino, Paolo Guglielmi and Alfredo Vagati*

#### Multi Objective Design Improvement of IPM Motor-Drive using Physic-Based Motor Model

*Ali Sarikhani, Wilder Saint-Hilaire and Osama A. Mohammed*

## Unbalanced Operation of Current Regulated Sine-Wave Interior Permanent Magnet Machines

*Ian P. Brown, Dan M. Ionel and David G. Dorrell*

## Implementation and Control of a PMSM Self-Bearing Motor Drive

*Sheng-Ming Yang and Chia-Pin Chen*

### **Session 120: DC-DC Converters: Modeling and Analysis**

#### Experimental Study of Chaotic Behaviour in Parallel Connected DC-DC Boost Converters with Unbalanced Inductors

*Ammar Natsheh, J. Gordon Kettleborough and Ghada Aldahim*

#### Large-Signal Linearization of Boost Converter

*Kapil Jha and Santanu Mishra*

#### Design of High Performance Point of Load Converters with Ultra-Low Output Voltage Ripple

*Mohamed Orabi, Shima Fathi, Ahmed Abou-Alfotouh and Fatma Al-Zahara Said*

#### State Space Decoupling Control Design Methodology for Switching Converters

*Evandro de C. Gomes, Luiz Antonio R. Souza, Sebastian Catunda, Robert Lorenz and Joao Victor Caracas*

### **Session 121: Sustainable Energy Applications: Energy Harvesting I**

#### Self-Powered Wireless MEMS Sensor Modules for Measuring Electrical Quantities in Residential, Commercial, Distribution, and Transmission Power Systems

*Igor Paprotny, Eli Leland, Chris Sherman, Richard White and Paul Wright*

#### Human Powered Axial Flux Permanent Magnet Machines: Review and Comparison

*Samuel Ani, Deok-Je Bang, Henk Polinder, Ji-Young Lee, SeungRyul Moon and Dae-Hyun Koo*

#### Wideband Energy Harvesting for Resonant Piezoelectric Devices

*Cheng Luo and Heath Hofmann*

#### Wireless Power Transfer using Weakly Coupled Magnetostatic Resonators

*Jose Oscar Mur-Miranda, Giulia Fanti, Yifei Feng, Keerthik Omanakuttan, Roydan Ongie, Albert Setjoadi and Natalie Sharpe*

### **Session 122: Electric Drives: Control and Testing**

#### Closed Loop Control of Active Damped Small DC-link Capacitor based Drive

*RamKrishan Maheshwari and Stig Munk-Nielsen*

#### DC-Link Voltage Control for Switched Reluctance Drives with Reduced DC-Link Capacitance

*Christoph Neuhaus and Rik De Doncker*

### Three-Phase Electric Drive with Modified Electronic Smoothing Inductor

*Yash Veer Singh, Peter Omand Rasmussen and Torben Ole Andersen*

### Parameter Identification of an Induction Motor at Standstill using Vector Constructing Method

*Yanhui He, Yupeng Feng, Yue Wang, Zhao'an Wang and Wanjun Lei*

## **Session 123: Transportation Applications: Power Converters**

### The Electromagnetic Compatibility Design Considerations of the Input Filter of a 3-Phase Inverter in a Railway Traction System

*Mohamed Youssef, Jaber Abu-Qahouq and Mohamed Orabi*

### Design of Power Electronic Building Blocks (PEBB) for MultiMW Modular Traction Converters

*Unai Viscarret, Ion Etxeberria-Otadui, Jose Maria Azurmendi, Jon San-Sebastian and Txomin Nieva*

### Design and Implementation of Fully Digital-Controlled 400Hz Active Power Filter for Aircraft Applications

*Haibing Hu, Wei Shi and Yan Xing*

### Multiphase Multilevel Modular DC-DC Converter for High Current High Gain TEG Application

*Dong Cao and Fang Z. Peng*

## **Session 124: Sustainable Energy Applications: Battery Concepts and Modeling**

### A Transient-Based Approach to Estimation of the Electrical Parameters of a Lead-Acid Battery Model

*Lalit Mandal and Robert Cox*

### Improvement of Electrical Modeling of NiMH Battery for Application of Microgrid System

*Novie Ayub Windarko, Gyo-Bum Chung and Jaeho Choi*

### Analysis of an Electromechanical Battery for Rural Electrification in Sub-Saharan Africa

*Richard Okou, Mohamed Azeem Khan, Paul Barendse, Ben Adoniya Sebitosi and Pragasen Pillay*

### Series-Connected Reconfigurable Multicell Battery: A Novel Design Towards Smart Batteries

*Taesic Kim, Wei Qiao and Liyan Qu*

## **Session 125: Energy Public Policy and Economics: Electrified Transport and Hydrogen Economy**

### On-Site Electrolysis Sodium Metal Production by Offshore Wind or Solar Energy for Hydrogen Storage and Hydrogen Fuel Cycle

*Masataka Murahara and Kazuichi Seki*

## Flexible Electric Vehicle (EV) Charging to Meet Renewable Portfolio Standard (RPS) Mandates and Minimize Green House Gas Emissions

*Jorge Hernandez, Frank Kreikebaum and Deepak Divan*

## Financial Incentives to Encourage Demand Response Participation by Plug-In Hybrid Electric Vehicle Owners

*Megan Mallette and Giri Venkataramanan*

## Investigations into the Minimization of Electrical Costs for Traction-Type Elevators

*Leonard White, Srdjan Lukic and Subhashish Bhattacharya*

## **Session 126: Electric Drives: Multi-Level Drives**

### On Interaction between Internal Converter Dynamics and Current Control of High-Performance High-Power AC Motor Drives with Modular Multilevel Converters

*Antonios Antonopoulos, Kalle Ilves, Lennart Angquist and Hans-Peter Nee*

### Power Quality Enhancement in High Power Multi-Level Drives

*Mehdi Abolhassani and Thomas Keister*

### Model Predictive Direct Current Control for Multi-Level Inverters

*Tobias Geyer*

### Introduction of a Large Scale High Efficiency 5-Level IEGT Inverter for Oil and Gas Industry

*Mostafa Al Mamun, Masahiko Tsukakoshi, Kazunori Hashimura, Hiromi Hosoda and Steven C. Peak*

## **Session 127: DC-AC Inverters: Advanced Inverter System I**

### Advanced Energy Conversion System using Sinusoidal Voltage Tracking Buck-Boost Converter Cascaded Polarity Changing Inverter

*Nabil A. Ahmed*

### A New Approach for Real-Time Multiple Open-Circuit Fault Diagnosis in Voltage Source Inverters

*Jorge O. Estima and A. J. Marques Cardoso*

### Dynamic Voltage Balancing of Series Connected IGBTs using Slope Regulating and Voltage Clamping

*Chunpeng Zhang, Yingdong Wei, Qirong Jiang and Luyuan Tong*

### High-Frequency DC Link Grid-Connected Power Conversion with Improved Active Clamp

*Xiaogao Xie, Hongyun Gui, Junming Zhang and Shirong Liu*

## **Session 128: Sustainable Energy Applications: Power Quality III**

Research on Active Harmonic Resister to Damping Resonance in Distribution System

*Wanjun Lei, Yue Wang, Ninghuan Su and Ming Li*

Novel Current Limitation Technique without Current Feedback for Digital-Controlled Battery Charger in UPS Applications

*Bo-Yuan Chen, Chin-Chang Hsu and Yen-Shin Lai*

Elimination of Transfer Time Effects in Line-Interactive and Passive Standby UPSs by means of a Small-Size Inverter

*Manuel Arias, Marta Hernando, Diego G. Lamar and Arturo Fernandez*

A Hybrid Multilevel Inverter with Both Staircase and PWM Switching Schemes

*Hossein Sepahvand, Mostafa Khazraei, Mehdi Ferdowsi and Keith Corzine*

## **Session 129: Enabling Technologies: Magnetic Design and Optimization I**

Single-Phase vs. Three-Phase High Density Power Transformers

*Jing Xue, Fred Wang, Dushan Boroyevich and Zhiyu Shen*

Inductor Design Methods with Low-permeability RF Core Materials

*Yehui Han and David Perreault*

New Core Loss Measurement Method for High Frequency Magnetic Materials

*Mingkai Mu, Qiang Li, David Gilham, Fred Lee and Khai Ngo*

Optimal Design of a Pot Core Rotating Transformer

*J.P.C. Smeets, D.C.J. Krop, J.W. Jansen, M.A.M. Hendrix and E. Lomonova*

## **Session 130: Electric Drives: Improved PWM Methods**

Pulse-Width Modulation Technique for BLDCM Drives to Reduce Commutation Torque Ripple without Calculation of Commutation Time

*Yong-Kai Lin and Yen-Shin Lai*

Vector Quantized Spread Spectrum Modulation Scheme for Three Level Inverters

*Biji Jacob and Baiju M.R.*

Single Current Sensor Operation with Fixed Sampling Points based on TSPWM

*Xiaomeng Cheng, Haifeng Lu and Wenlong Qu*

## **Session 131: DC-DC Converters: System Architectures**

Modeling and Simulation of a Distributed Power System for Avionic

*Sanna Vesti, Pedro Alou, Jesus A. Oliver, Oscar Garcia and Roberto Prieto*

The Analysis of DC-DC Converter Topologies based on Stackable Voltage Elements

*Ke Zou, Mark.J Scott and Jin Wang*

Observer-Based Fault Diagnosis of Power Electronics Systems

*Kieran Levin, Eric Hope and Alejandro Dominguez-Garcia*

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An Input-Powered Active AC/DC Converter with Zero Standby Power for  
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*Yuan Rao and David Arnold*

A New Single Stage AC-DC Converter for Low Voltage Electromagnetic Energy Harvesting

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Design of a Low Cost Self-Powered "Stick-On" Current and Temperature Wireless  
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*Rohit Moghe, Yi Yang, Frank Lambert and Deepak Divan*

## **Session 133: Electric Drives: Sensing Techniques**

A Method for Speed-Sensorless Identification of Two-Mass-Systems

*Henning Zoubek and Mario Pacas*

Compensation of Analog Rotor Position Errors due to Nonideal Sinusoidal Encoder Output Signals

*Seon-Hwan Hwang, Jong-Ho Lee, Jang-Mok Kim and Cheol Choi*

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*Christopher Wolf and Robert Lorenz*

## **Session 134: Sustainable Energy Applications: Fuel Cell Power Systems**

Design and Experimental Validation of a Robust Control Method for a Hybrid Fuel Cell Power  
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*David Hernandez-Torres, Olivier Sename and Delphine Riu*



## Techniques for Efficiency Gains in Soft Switching Full-Bridge Fuel Cell Power Conversion

*Martin Ordonez and John Quaiocoe*

## Grid-Interfaced Fuel Cell Energy System based on a Boost-Inverter with a Bi-Directional Back-Up Battery Storage

*Minsoo Jang and Vassilios G. Agelidis*

## **Session 135: Enabling Technologies: Power Electronics Modeling and Simulation Tools**

### Efficient CAD Tool for Power Electronics Compensator Design

*Carlos Martinez, Virgilio Valdivia, Antonio Lazaro, Javier Lourido, Isabel Quesada, Carlos Lucena, Pablo Zumel and Andres Barrado*

### Modeling and Evaluation of Diode Reverse Recovery in Discrete-Transition Simulators

*Natan Krihely and Sam Ben-Yaakov*

### Digital Flickermeter Design and Implementaton based on IEC Standard

*Daniel Fregosi, Leonard White, Subhashish Bhattacharya, Eric Green and Jason Watterson*

## **Session 136: Energy Efficiency and Industrial Applications: Special Topics**

### A Review of Monitoring and Identification Methods for Electric Loads in Commercial and Residential Buildings

*Yi Du, Liang Du, Bin Lu, Ronald Harley and Thomas Habetler*

### Design of a Supercapacitor based Storage System for Improved Elevator Applications

*Sergio Luri, Ion Etxeberria-Otadui, Alejandro Rujas, Endika Bilbao and Antonio Gonzalez*

### Applying a Novel Power Management Unit (PMU) to Replace the Large DC Bus Electrolytic Capacitors in Fuel Cell Power Generation System

*Xiao Li, Chengrui Du, Wenping Zhang, Guoqiao Shen and Dehong Xu*

## **Session 137: Enabling Technologies: Power Semiconductors III**

### Analysis of Static Voltage Balance of Series Connected Self-Power ETOs

*Qian Chen, Alex Huang and Subhashish Bhattacharya*

### The Integrated Emitter Turn-Off Thyristor (IETO) – An Innovative Thyristor based High Power Semiconductor Device Using MOS Assisted Turn-Off

*Michael Bragard, Marcus Conrad and Rik De Doncker*

### High Frequency Switching High-Power Converter with SiC-PiN Diodes and Si-IEGTs

*Kazuto Takao, Yasunori Tanaka, Kyungmin Sung, Keiji Wada and Takeo Kanai*

## **Session 138: DC-AC Inverters: Advanced Inverter System II**

Analysis and Suppression of a Common Mode Resonance in the Cascaded H-Bridge Multilevel Inverter

*Rixin Lai, Maja Harfman Todorovic and Juan Sabate*

Optimal Pulsewidth Modulation of Multilevel Inverters for Low Switching Frequency Control of Medium Voltage High Power Industrial AC Drives

*Akshay Rathore, Joachim Holtz and Till Boller*

Seven-Level Cascaded ANPC-Based Multilevel Converter

*Sridhar Reddy Pulikanti, Georgios Konstantinou and Vassilios G. Agelidis*

## **Session 139: Energy Public Policy and Economics: Reducing Renewable Energy Cost with Power Electronics and Carbon Trading**

An Alternative Mechanism for Carbon Emission Permit Price Volatility Mitigation

*Li Xu, Shijie Deng and Valerie Thomas*

Reduction of Green House Gas Emission by Clean Power Trading

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Transportation Applications using Practical Hydrogen-on-Demand Systems

*Jonathan Goldman, Suresh Sharma and Steve Suggs*

## **Session 140: Enabling Technologies: Magnetic Design and Optimization II**

Selection of the Appropriate Winding Setup in Planar Inductors with Parallel Windings

*Roberto Prieto, Rafael Asensi and Jose Cobos*

A High Efficient Integrated Planar Transformer for Primary-Parallel Isolated Boost Converters

*Gokhan Sen, Ziwei Ouyang, Ole.C Thomsen, Michael A. E. Andersen and Lars Moller*

Planar Integrated Magnetics Design in Wide Input Range DC-DC Converter for Fuel Cell Application

*Ziwei Ouyang, Zhe Zhang, Ole Thomsen, Michael Andersen, Ole Poulsen and Thomas Bjorklund*