

2020 IEEE Vehicle Power and Propulsion Conference (VPPC 2020)

**Virtual Conference
18 November – 16 December 2020**

Pages 1-442



**IEEE Catalog Number: CFP20VPP-POD
ISBN: 978-1-7281-8960-4**

**Copyright © 2020 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:	CFP20VPP-POD
ISBN (Print-On-Demand):	978-1-7281-8960-4
ISBN (Online):	978-1-7281-8959-8
ISSN:	1938-8756

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

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

TRACK 1: ENERGY STORAGE AND GENERATION, COMPONENTS AND SYSTEMS

A DATA-DRIVEN METHOD BASED ON RECURRENT NEURAL NETWORK METHOD FOR ONLINE CAPACITY ESTIMATION OF LITHIUM-ION BATTERIES.....	1
<i>Sahar Khaleghi, S. Hamidreza Beheshti, Maitane Berecibar, Joeri Van Mierlo</i>	
A NOVEL FRAMEWORK OF MULTI-DIMENSION CAPACITY ESTIMATION AND FUSION FOR LITHIUM-ION BATTERY.....	8
<i>Bo Jiang, Haifeng Dai, Wei Jiang, Fenglai Pei</i>	
BATTERY AGING TEST DESIGN DURING FIRST AND SECOND LIFE.....	13
<i>Romain Tabusse, David Bouquain, Samir Jemei, Daniela Chrenko</i>	
CHARACTERIZATION OF LITHIUM-ION SILICON-GRAPHITE 18650 CELLS UNDER DRIVING CYCLES.....	19
<i>Jorge Alonso-Del-Valle, Juan Carlos Viera, Manuela González, David Anseán, Víctor García</i>	
COORDINATED CONTROL OF WAYSIDE SUPERCAPACITOR AND ON-BOARD SUPERCAPACITOR BASED ON THRESHOLD CURVE OPTIMIZATION IN URBAN RAIL TRANSIT.....	25
<i>Zhihong Zhong, Zhongping Yang, Fei Lin, Xiaochun Fang</i>	
ENERGY GENERATION WITH CAPACITIVE DEIONIZATION SYSTEMS.....	32
<i>Daniel Del Rivero, Alberto M. Pernía, Miguel J. Prieto, Juan A. Martín-Ramos, Pedro J. Villegas, F. Nuño</i>	
FAST CHARGING PROTOCOLS BASED ON PULSE-MODULATION WITH VARYING RELAXATION FOR ELECTRIC VEHICLE LI-ION CELLS.....	37
<i>T. G. T. A. Bandara, D. Anseán, J. C. Viera, L. Sánchez, M. González</i>	
INVESTIGATION OF DEGRADATION MECHANISMS IN LITHIUM-ION BATTERIES BY INCREMENTAL OPEN-CIRCUIT-VOLTAGE CHARACTERIZATION AND IMPEDANCE SPECTRA.....	43
<i>M. Sc. Erik Goldammer, Julia Kowal</i>	
NOVEL PARAMETER IDENTIFICATION METHOD FOR LITHIUM-ION BATTERIES BASED ON CURVE FITTING.....	51
<i>Milos Lukic, Paolo Giangrande, Christian Klumpner, Michael Galea</i>	
ONLINE IDENTIFICATION OF BATTERY INTERNAL RESISTANCE UNDER EXTREME TEMPERATURES.....	56
<i>Nassim Noura, Killian Cos, Loic Boulon, Samir Jemei</i>	
PARTICLE SWARM OPTIMIZATION OF A FUZZY CONTROLLED HYBRID ENERGY STORAGE SYSTEM - HESS.....	61
<i>Lenon Diniz Seixas, Hilkija Gäus Tosso, Fernanda Cristina Corrêa, Jony Javorski Eckert</i>	
SIMULATION ON WIRELESS POWER TRANSFER BASED BATTERY PACK EQUALIZATION WITH SOC QUANTITATIVE REGULATION.....	67
<i>Tao Jiang, Guang Yang, Yong Tang, Chuanyu Tang, Tianru Wang, Jinlei Sun</i>	

SIZING OF RENEWABLE ENERGY AND STORAGE RESOURCES IN RAILWAY SUBSTATIONS ACCORDING TO LOAD SHAVING LEVEL.....	73
<i>Berk Celik, Andrea Verdicchio, Tony Letrouvé</i>	
STATE-OF-CHARGE ESTIMATION OF LITHIUM-ION BATTERY BASED ON A COMBINED METHOD OF NEURAL NETWORK AND UNSCENTED KALMAN FILTER.....	78
<i>Seyedmehdi Hosseininasab, Zhiwen Wan, Tim Bender, Giovanni Vagnoni, Lennart Bauer</i>	
SWITCHING SCHEMES OF THE BIDIRECTIONAL BUCK-BOOST CONVERTER FOR ENERGY STORAGE SYSTEM.....	85
<i>Ramy Georgious, Sarah Saeed, Jorge Garcia, Pablo Garcia</i>	
THE INFLUENCE OF HIGH POWER CHARGING ON THE LITHIUM BATTERY BASED ON CONSTANT AND PULSE CURRENT CHARGING STRATEGIES.....	90
<i>Jiuyu Du, Yizhao Sun</i>	

TRACK 2: POWER ELECTRONICS, MOTOR DRIVES AND ELECTRIC POWER SYSTEMS

A BACK-EMF ESTIMATION METHOD FOR A SWITCHED RELUCTANCE MOTOR USING MODEL PREDICTIVE CONTROL.....	97
<i>Manuel Pereira, Pedro Melo, Rui Esteves Araújo</i>	
A CALIBRATION STRATEGY FOR EV DRIVES BASED ON IMPROVED MTPV TABLE DECOUPLED FROM PERMANENT MAGNET FLUX LINKAGE VARIATION.....	102
<i>Yilin Ma, Guangyuan Liu, Huan Yang, Yufei Dong</i>	
AN ENERGY CONSCIOUS PV GENERATION AND ENERGY STORAGE BASED CONVERTER FOR METRO DC TRACTION GRID	108
<i>Hongbo Li, Chao Zhang, Zihao Huang, Wenguang Luo</i>	
AN INVESTIGATION INTO TORQUE ACCURACY FOR A 48V IPMSM UNDER USAGE OF SENSORLESS CONTROL.....	113
<i>Christoph Cheshire, Felix Bertele, Tobias Röser, Felix Gliese, Achim Vedde, Ulrich Ammann</i>	
ANALYTICAL EQUATIONS OF THE CURRENTS IN DUAL ACTIVE BRIDGE CONVERTER FOR MORE ELECTRIC AIRCRAFT	118
<i>A. Fernandez-Hernandez, A. Garcia-Bediaga, I. Villar, G. Abad</i>	
CHARACTERIZATION OF GAN HEMT TRANSISTORS FOR DC/DC CONVERTERS IN TRANSPORTATION APPLICATIONS	124
<i>Rand Al Mdanat, Ramy Georgious, Jorge Garcia, Giulio De Donato, Fabio Giulii Capponi</i>	
COMPARISON OF FAULT-TOLERANT CONTROL STRATEGIES FOR A NINE-PHASE IPMSM-FSCW	130
<i>Maitane Carrasco, Amaia Lopez-De-Heredia, Irma Villar</i>	
CONTROL OF T-TYPE THREE-LEVEL BIDIRECTIONAL HYBRID RECTIFIER CIRCUIT FOR ELECTRIC VEHICLE HIGH-POWER CHARGING SYSTEM	136
<i>Haotian Ding, Jiuyu Du, Xiaogang Wu</i>	
DESIGN OF A DC/DC POWER CONVERTER FOR LI-ION BATTERY/SUPERCAPACITOR HYBRID ENERGY STORAGE SYSTEM IN ELECTRIC VEHICLES	141
<i>Lakhdar Mamouri, Tedjani Mesbahi, Patrick Bartholomeus, Théophile Paul</i>	

DUAL-INVERTER CONTROL SYNCHRONIZATION STRATEGY TO MINIMIZE THE DC-LINK CAPACITOR CURRENT	146
<i>Maximilian Schiedermeier, Cornelius Rettner, Marcel Steiner, Martin März</i>	
EFFICIENT SMALL-SIGNAL ALGORITHM FOR HIGH DYNAMIC PHASE-SHIFTED FULL-BRIDGE CONVERTERS	152
<i>Martin Baumann, Bert Haj Ali, Christoph Weissinger, Hans-Georg Herzog</i>	
ESTIMATING THE LOCATION OF PLUGS IN MOLTEN-SALT PIPES	157
<i>Miguel J. Prieto, Pedro J. Villegas, Juan A. Martín-Ramos, Juan Á. Martínez, Juan Díaz, Alberto M. Pernía</i>	
FAULT-TOLERANT MODEL PREDICTIVE CURRENT CONTROL OF FIVE-PHASE PERMANENT MAGNET SYNCHRONOUS HUB MOTOR CONSIDERING CURRENT CONSTRAINTS	163
<i>Zhou Shi, Xiaodong Sun, Yanling Liu, Weiqi Zhou</i>	
GAN-BASED DC-DC POWER CONVERTER FOR HYBRID ENERGY STORAGE SYSTEM.....	168
<i>Ander Avila, Asier Garcia-Bediaga, Iñigo Gandiaga, Luis Mir, Alejandro Rujas</i>	
HYBRID PROPULSION MOTOR DRIVES MODEL BASED ON MULTI-LEVEL INVERTERS WITH OPTIMISED FUEL ECONOMY	173
<i>Jinfeng Li</i>	
INFLUENCE OF ROTOR CURRENT ON NOISE EXCITATION IN ELECTRICALLY-EXCITED SYNCHRONOUS MACHINES	178
<i>Maximilian Martens, Korbinian König-Petermaier</i>	
NONLINEAR CONTROL OF DUAL HALF BRIDGE CONVERTERS IN HYBRID ENERGY STORAGE SYSTEMS.....	183
<i>Ricardo De Castro, Jonathan Brembeck, Rui Esteves Araujo</i>	
PARTIAL POWER PROCESSING ARCHITECTURE APPLIED TO A BATTERY ENERGY STORAGE SYSTEM.....	188
<i>Jesús Sergio Artal-Sevil, Carlos Bernal-Ruiz, Jon Anzola, Iosu Aizpuru, Antonio Bono-Nuez, José Miguel Sanz-Alcaine</i>	
RESEARCH ON THE SIC MOSFETS SHORT CIRCUIT DETECTION AND PROTECTION OPTIMIZATION METHOD	194
<i>Baowei Yu, Xizheng Guo, Xucong Bu, Jingjing Wu</i>	
SIMPLE EQUIVALENT CIRCUIT CAPACITANCE MODEL FOR TWO-WINDING TRANSFORMERS	201
<i>Christian Østergaard, Claus Kjeldsen, Morten Nymand</i>	
STATIC CURRENT UNBALANCE OF PARALLELED SIC MOSFET MODULES IN THE FINAL LAYOUT.....	207
<i>Ander Jauregi, David Garrido, Igor Baraia-Etxaburu, Asier Garcia-Bediaga, Alejandro Rujas</i>	
THERMAL DESIGN OF A 2-PHASE FLOW COOLED MEDIUM-FREQUENCY 140KVA TRANSFORMER FOR RAILWAY APPLICATIONS.....	212
<i>Kui Li, Xiang Xie, Kai He, Lei Yao, Zhaozan Feng, Tao Chen</i>	
VOLTAGE-SCALING OF A PHASE-SHIFTED FULL-BRIDGE CONVERTER WHILE MAINTAINING DYNAMIC PERFORMANCE	219
<i>Bert Haj Ali, Martin Baumann, Julian Taube, Christoph Weissinger, Hans-Georg Herzog</i>	

WIRELESS LLC CONVERTER FOR ELECTRIC BICYCLE	224
<i>Alberto M. Pernía, Miguel J. Prieto, Juan A. Martín-Ramos, Pedro J. Villegas, Alberto Navarro, Javier Sedano</i>	

TRACK 3: VEHICULAR ELECTRONICS AND INTELLIGENT TRANSPORTATION SYSTEMS

ECOLOGICAL ADAPTIVE CRUISE CONTROL FOR URBAN ENVIRONMENTS USING SPAT INFORMATION	229
<i>Sai Krishna Chada, Ankith Purbai, Daniel Görges, Achim Ebert, Roman Teutsch</i>	

MODE-SWITCHING-BASED VEHICLE LOW-FREQUENCY LONGITUDINAL VIBRATION CONTROL WITH BACKLASH DURING TIP-IN CONDITION	235
<i>Yang Long, Huang Ying, Guillaume Colin</i>	

POWERTRAIN DISTRIBUTION BASED ON TOTAL COST OF OWNERSHIP FOR PRIVATELY OWNED VEHICLES AND TNC IN THE CHICAGO METROPOLITAN AREA.....	242
<i>Vincent Freyermuth, Joshua Auld, Dominik Karbowski, Ayman Moawad, Sylvain Pagerit, Aymeric Rousseau</i>	

TRACK 4: CONTROL AND ENERGY MANAGEMENT OF ELECTRIFIED VEHICLES

ADAPTIVE PRIORITIZATION OF A SITUATION-BASED POWER MANAGEMENT FOR HYBRID ELECTRIC VEHICLES	248
<i>Bedatri Moulik, Kausik Bhaumik, Nejra Beganovic, Ahmed M. Ali, Dirk Söffker</i>	

EFFECT OF ENGINE DYNAMICS ON OPTIMAL POWER-SPLIT CONTROL STRATEGIES IN HYBRID ELECTRIC VEHICLES	254
<i>Anand Ganesan, Sébastien Gros, Nikolce Murgovski, Chih Feng Lee, Martin Sivertsson</i>	

INTEGRATED TRAIN TRAJECTORY OPTIMIZATION FOR AN URBAN RAIL TRANSIT LINE BASED ON MILP.....	262
<i>Miao Zhang, Zhaoyang Zhang</i>	

LEARNING BASED ENERGY MANAGEMENT STRATEGY OFFLINE TRAINERS COMPARISON FOR PLUG-IN HYBRID ELECTRIC BUSES.....	268
<i>Jon Ander López-Ibarra, Haizea Gaztañaga, Yancho Todorov, Mikko Pihlatie</i>	

OPTIMAL PREDICTIVE POWER MANAGEMENT STRATEGY FOR FUEL CELL ELECTRIC VEHICLES USING NEURAL NETWORKS IN REAL-TIME.....	273
<i>Ahmed M. Ali, Mostafa I. Yacoub</i>	

PROGNOSTICS-BASED ENERGY MANAGEMENT IN FUEL CELL HYBRID ELECTRIC VEHICLE CONSIDERING RUL UNCERTAINTY	279
<i>Meiling Yue, Samir Jemei, Nouredine Zerhouni</i>	

STUDY ON REGENERATIVE BRAKING CONTROL STRATEGY FOR EXTENDED RANGE ELECTRIC VEHICLES.....	285
<i>Yongliang Li, Changlu Zhao, Ying Huang, Xu Wang, Fen Guo, Long Yang</i>	

THE STUDY FOR EQUIVALENT CONSUMPTION MINIMIZATION STRATEGY CONSIDERING DRIVABILITY OF PARALLEL HEV	291
<i>Jinho Jang, Hyeongcheol Lee</i>	

TIME-OPTIMAL CONTROL STRATEGIES FOR ELECTRIC RACE CARS WITH DIFFERENT TRANSMISSION TECHNOLOGIES	296
<i>Olaf Borsboom, Chyannie A. Fahdzyana, Mauro Salazar</i>	

TRANSFERRED ENERGY MANAGEMENT STRATEGIES FOR HYBRID ELECTRIC VEHICLES BASED ON DRIVING CONDITIONS RECOGNITION.....	301
<i>Teng Liu, Xiaolin Tang, Jiaxin Chen, Hong Wang, Wenhao Tan, Yalian Yang</i>	

TRACK 5: MODELING, ANALYSIS AND SIMULATION OF ELECTRIFIED VEHICLES

A METHOD TO PREDICT PROPULSION ARCHITECTURE FOR FUTURE JETLINERS	307
<i>Syed Abu Nahian, Andrew McGordon, Dinh Quang Truong, Jong Il Yoon</i>	

ANALYSIS OF POWERTRAIN EFFICIENCY OF A MULTI-MODE HYBRID ELECTRIC VEHICLE BASED ON OPERATING MODES.....	312
<i>Woong Lee, Haeseong Jeoung, Dohyun Park, Liyue Yang, Namwook Kim</i>	

AUTOMATED GENERATION OF REAL DRIVING EMISSIONS COMPLIANT DRIVE CYCLES USING CONDITIONAL PROBABILITY MODELING.....	317
<i>Alexander Wasserburger, Christoph Hametner</i>	

DIFFERENT PENETRATION OF ELECTRIC VEHICLES AND IMPACT ON DEVELOPMENTS IN THE ELECTRIC GRID.....	323
<i>Enrico Mancini, Michela Longo, Federica Foidelli, Giovanni Parrotta, Gabriele Montinaro</i>	

ELECTRIC CITY BUS PERFORMANCE EVALUATION BY CHASSIS DYNAMOMETER MEASUREMENTS	328
<i>Joel Anttila, Sai Santhosh Tota, Yancho Todorov</i>	

FINE-TUNING A REAL-TIME SPEED PLANNER FOR ECO-DRIVING OF CONNECTED AND AUTOMATED VEHICLES.....	333
<i>Jihun Han, Woong Lee, Dominik Karbowski, Aymeric Rousseau, Namwook Kim</i>	

INNOVATIVE TRAIN TECHNOLOGIES ENERGY COMPARISON ON ONE NON ELECTRIFIED RAILWAY	339
<i>Clément Depature, Tony Letrouvé</i>	

METHODOLOGIES FOR THE SYNTHESIS OF RELIABLE MEA ELECTRICAL POWER SYSTEM ARCHITECTURES.....	345
<i>Angel Recalde, Serhiy Bozhko, Jason Atkin</i>	

MODELING CONTROL AND SIMULATION OF A SERIES HYBRID PROPULSION SYSTEM.....	350
<i>Davide Tebaldi, Roberto Zanasi</i>	

TRACK 6: CHARGING SYSTEMS AND INFRASTRUCTURES

HARDWARE IN THE LOOP FRAMEWORK FOR ANALYSIS OF IMPACT OF ELECTRICAL VEHICLE CHARGING DEVICES ON DISTRIBUTION NETWORK.....	357
<i>Jovan Zelic, Luka Novakovic, Ivana Klindo, Giambattista Gruosso</i>	

MULTI-INPUT MULTI-OUTPUT MODEL OF AIRPORT INFRASTRUCTURE FOR REDUCING CO ₂ EMISSIONS.....	362
<i>Mehmet Cagin Kirca, Andrew McGordon, Truong Quang Dinh</i>	

NOVEL INTEGRATED CHARGER CONCEPT USING AN INDUCTION MACHINE AS TRANSFORMER AT STANDSTILL	368
<i>Erik Hoevenaars, Tobias Illg, Marc Hiller</i>	
ON-BOARD INTEGRATED BATTERY CHARGER USING A NINE-PHASE FSCW PMSM FOR AN ELECTRIC BUS.....	373
<i>Ruben Aguirre, Amaia Lopez-De-Heredia, Irma Villar, Gaizka Almandoz</i>	
PARTIAL POWER PROCESSING BASED CHARGING UNIT FOR ELECTRIC VEHICLE EXTREME FAST CHARGING STATIONS	379
<i>Jon Anzola, Iosu Aizpuru, Asier Arruti, Argiñe Alacano, Ramon Lopez, Jesus Sergio Artal-Sevil, Carlos Bernal-Ruiz</i>	
PRICE AND TIME-SLOT NEGOTIATION PROTOCOL FOR EVS CHARGING IN HIGHLY CONGESTED DISTRIBUTION NETWORKS	385
<i>Komal Khan, Islam El-Sayed, Pablo Arboleya</i>	
REVIEW AND NOVEL OPTIONS OF THREE-PHASE INTEGRATED BATTERY CHARGERS FOR EVS.....	391
<i>Henri Josephson Raherimihaja, Guoqiang Xu, Qianfan Zhang</i>	
UNIVERSAL ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ANALYSIS TOOL	396
<i>Iosu Aizpuru, Asier Arruti, Jon Anzola, Unai Iraola, Mikel Mazuela, Alejandro Rujas</i>	

TRACK 7: HYDROGEN FUELING INFRASTRUCTURE AND FUEL CELL VEHICLES

ACTIVE THERMAL MANAGEMENT FOR AN AUTOMOTIVE WATER-COOLED PROTON EXCHANGE MEMBRANE FUEL CELL BY USING FEEDBACK CONTROL.....	401
<i>Jin Zhang, Ya-Xiong Wang, Hongwen He, Yao Wang</i>	
FAULT TOLERANT CONTROL OF A PROTON EXCHANGE MEMBRANE FUEL CELL BASED ON A MODIFIED FAILURE MODE AND EFFECT ANALYSIS	406
<i>Julie Aubry, Nadia Yousfi Steiner, Simon Morando, Noureddine Zerhouni, Daniel Hissel</i>	
IDENTIFICATION OF ESSENTIAL SENSORS FOR A PEMFC SYSTEM IN AUTOMOTIVE APPLICATIONS.....	411
<i>Hanqing Wang, Simon Morando, Arnaud Gaillard, Daniel Hissel</i>	
OPERATIONAL COST ANALYSIS OF FUEL CELL ELECTRIC VEHICLES UNDER DIFFERENT POWERTRAIN-SIZING CONFIGURATIONS	416
<i>Yang Zhou, Alexandre Ravey, Marie-Cécile Pera</i>	
OPTIMIZING PROTON EXCHANGE MEMBRANE FUEL CELL MANUFACTURING PROCESS TO REDUCE BREAK-IN TIME.....	422
<i>Fabian Van Der Linden, Elodie Pahon, Simon Morando, David Bouquain</i>	
OPTIMUM STRUCTURAL DESIGN OF FUEL CELL STACKS FOR IMPROVING THE RESISTANCE TO MECHANICAL SHOCK.....	427
<i>Hao Dong, Zhang Yanyi, Wang Renguang, Liu Lin, Hou Yongping, Guo Shuaishuai</i>	
PEMFC STATE-OF-HEALTH ESTIMATION USING A MODEL-BASED STATE BAYESIAN OBSERVER UNDER AN AUTOMOTIVE LOAD PROFILE	433
<i>Andres Jacome, Daniel Hissel, Vincent Heiries, Mathias Gerard, Sébastien Rosini</i>	

RECENT RESULTS

A UNIFIED BATTERY-QZSI MODEL AND IMC BASED DC-LINK-VOLTAGE CONTROL FOR EV APPLICATIONS.....	437
<i>Hung V. Nguyen, Binh Minh Nguyen, Minh C. Ta</i>	
AUTOMATIC CONVERSION OF A 3D THERMAL MODEL OF A BATTERY CELL INTO A 1D LUMPED-ELEMENT NETWORK.....	443
<i>Josep Salvador-Iborra, Juergen Schneider, Reinhard Tatschl</i>	
CHARGING MANAGEMENT STRATEGY USING ECO-CHARGING FOR ELECTRIC BUS FLEETS IN CITIES	449
<i>Mohammed Mahedi Hasan, Mikaela Ranta, Mohamed El Baghdadi, Omar Hegazy</i>	
DESIGN OF AN INTEGRATED GAN INVERTER INTO A MULTIPHASE PMSM	457
<i>Florentin Salomez, Stéphane Vienot, Bilel Zaidi, Arnaud Videt, Thierry Duquesne, Hugot Pichon, Eric Semail, Nadir Idir</i>	
EXAMINATION OF CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES BASED ON COMPONENTS OF SUSTAINABLE BUSINESS MODELS	463
<i>Rudolf Schnee, Daniela Chrenko, Nathalie Rodet-Kroichvili, Peter Neugebauer</i>	
HAZARD AND RISK ANALYSIS ON LITHIUM-BASED BATTERIES ORIENTED TO BATTERY MANAGEMENT SYSTEM DESIGN.....	469
<i>David Marcos, Maitane Garmendia, Jon Crego, Jose Antonio Cortajarena</i>	
HIL SIMULATION OF AN ELECTRIC RACE CAR WITH ELECTRIC DIFFERENTIAL AND REGENERATIVE BRAKING.....	475
<i>Andrés Camilo Henao-Muñoz, Paulo G. Pereirinha, Alain Bouscayrol</i>	
INTERNATIONAL AND EUROPEAN LEGISLATION AND STANDARDS FOR BATTERY ELECTRIC BUSES	481
<i>Isabel Carrilero Borbujo, Paulo G. Pereirinha, Jorge Alonso Del Valle, Manuela González Vega, David Anseán González, Juan Carlos Viera Pérez</i>	
INTEROPERABILITY RATING OF WIRELESS CHARGING EQUIPMENT USING A DECOUPLED IMPEDANCE INTERFACE	487
<i>Daniel Barth, Giuseppe Cortese, Ahmed H. Darrat, Cong Cheng, Erik Wöhr, Michael R. Suriyah, Thomas Leibfried</i>	
ROBUST DESIGN OF COMBINED CONTROL STRATEGY FOR ELECTRIC VEHICLE WITH IN-WHEEL PROPULSION.....	493
<i>Marius Heydrich, Vincenzo Ricciardi, Klaus Augsburg, Valentin Ivanov</i>	
THE MASS TRANSPORT ANALYSIS OF PEMFC BASED ON MULTI-PHYSICAL FIELD FAULT MODEL.....	499
<i>Xuaxia Zhang, Yunkai Zhang, Yu Jiang, Weirong Chen</i>	

SPECIAL SESSION 1: IEEE VTS WORKSHOP ON ELECTRICAL RAILWAYS SYSTEMS

A NOVEL DIRECT GATE DRIVER FOR SERIES-CONNECTED SIC MOSFETS.....	505
<i>Zhe Wang, Chi Li, Zedong Zheng</i>	

A NOVEL TEXT-STYLE SEQUENTIAL MODELING METHOD FOR ULTRASONIC RAIL FLAW DETECTION	511
<i>Xiao Luo, Yun Qin Hu, Yue Liu, Huang Mengying, Wei Chu, Jun Lin</i>	
ACTIVE GUIDANCE OF A RAILWAY RUNNING GEAR WITH INDEPENDENTLY ROTATING WHEELS	516
<i>Andreas Heckmann, Alexander Keck, Gustav Grether</i>	
ANALYSIS AND DESIGN OF BIDIRECTIONAL ISOLATION CONVERTER BASED ON FULL-BRIDGE CLLC.....	521
<i>Zhang Qing, Zhang Xiaoyong, Rao Peinan, Zhou Shuai</i>	
CALCULATE FOR INVERTER SUPPLIED PERMANENT MAGNET SYNCHRONOUS MOTOR LOSSES	527
<i>Peng Jun, Li Yifeng, Li Weiye</i>	
CALCULATION AND SIMULATION OF PROPULSION POWER SUPPLY SYSTEM FOR HIGH-SPEED MAGLEV TRAIN	533
<i>Yu Zhang, Guangming Qing, Zhaoyang Zhang, Jianghong Li, Huaguo Chen</i>	
CALIBRATION SET-UP FOR ENERGY MEASURING SYSTEMS INSTALLED IN AC RAILWAY SYSTEMS	538
<i>F. Garnacho, J. Rovira, A. Khamlichi, P. Simón, T. García, D. Istrate</i>	
DESIGN OF COUPLING MECHANISM FOR DYNAMIC WIRELESS POWER TRANSFER SYSTEM.....	544
<i>Kai Chen, Hu Cao, Dongyi Li, Meizheng Li, Yi Wang, Jingdong Chen</i>	
DESIGN OF THREE-PHASE DELTA-DELTA LLC RESONANT CONVERTER.....	549
<i>Jinzhou Cao, Xiaoyong Zhang, Peinan Rao, Shuai Zhou, Fengwu Zhou, Qing Zhang</i>	
DISCUSSION OF ELECTRICAL AND ELECTROMAGNETIC IMPACT ON ENVIRONMENT AND USERS OF ELECTRIFIED TRANSPORTS	554
<i>Andrea Mariscotti</i>	
EFFECT OF THE DC TRACTION SUBSTATIONS NO-LOAD VOLTAGE SET UP OVER THE SYSTEM EFFICIENCY	559
<i>Bassam Mohamed, Islam El-Sayed, Pablo Arboleya, Clément Mayet</i>	
END-TO-END HIGH-SPEED RAILWAY DROPPER BREAKAGE AND SLACK MONITORING BASED ON COMPUTER VISION	564
<i>Shiwang Liu, Yunqing Hu, Jun Lin, Hao Yuan, Qunfang Xiong, Wei Yue</i>	
ENERGY-METER DATA VALIDATION IN RAILWAY VIA PHYSICAL MODELS.....	569
<i>Luis Maria Alonso, Laurent-Didier Roux, Lionel Taunay, Aurelien Watere, Christophe Saudemont, Benoît Robyns</i>	
ENGINEERING CONCERNS OF OPTIMAL REALIZATION FOR A MEDIUM FREQUENCY TRANSFORMER IN TRACTION POWER ELECTRONIC TRANSFORMERS	574
<i>Xuan Guo, Chi Li, Zedong Zheng, Yongdong Li</i>	
ESTIMATION OF SOFTWARE AND HARDWARE SOLUTIONS TO DECREASE THE OVERLOAD OF THE 1.5 KV DIRECT CURRENT RAILWAY NETWORK	579
<i>Andrea Verdicchio, Tony Letrouve, Hervé Caron</i>	

EV CHARGING STATION INTEGRATED WITH ELECTRIC RAILWAY SYSTEM POWERING BY TRAIN REGENERATIVE BRAKING ENERGY	584
<i>Hamed Jafari Kaleybar, Morris Brenna, Federica Foiadelli</i>	
EXPERIMENTAL STUDY OF THE PWM CONTROL STRATEGY FOR SIC TRACTION INVERTER OF METRO VEHICLES	590
<i>Hu Liang, Mei Wenqing, Wen Yuliang, Lv Yongcan, Fu Xiangyu, Jia Yan</i>	
FAILURE ANALYSIS AND OPTIMIZATION DESIGN OF A COOLING FAN IN AUXILIARY CONVERTER	595
<i>Peng Xuanlin, Tang Xionghui, Qi Zimei, Xia Liang, Zeng Yaping</i>	
FREQUENCY ADAPTION CONTROL STRATEGY FOR THE POWER ELECTRONIC TRACTION TRANSFORMER	600
<i>Yu Ai, Jianqiang Liu, Jingxi Yang, Trillion Q. Zheng</i>	
HOW PANTOGRAPH ELECTRIC ARCS AFFECT ENERGY EFFICIENCY IN DC RAILWAY VEHICLES	606
<i>Andrea Mariscotti, Domenico Giordano, Antonio Delle Femine, Daniele Gallo, Davide Signorino</i>	
IN-DEPTH LIFE CYCLE COST ANALYSIS OF A LI-ION BATTERY-BASED HYBRID DIESEL-ELECTRIC MULTIPLE UNIT	611
<i>Josu Olmos, Iñigo Gandiaga, Dimas Lopez, Xabier Larrea, Txomin Nieva, Iosu Aizpuru</i>	
INTEGRATION OF ENERGY STORAGE AND RENEWABLE ENERGY SOURCES INTO AC RAILWAY SYSTEM TO REDUCE CARBON EMISSION AND ENERGY COST	616
<i>Zhongbei Tian, Nakaret Kano, Stuart Hillmansen</i>	
LONGITUDINAL CONTROL OF AUTONOMOUS-RAIL RAPID TRAM IN PLATOONING USING MODEL PREDICTIVE CONTROL	622
<i>Xiwen Yuan, Qian Zhang, Sha Zhang, Ruipeng Huang, Xinrui Zhang, Hu Yunqin</i>	
LOW CONSTANT SPEED CONTROL OF HEAVY HAUL ELECTRIC LOCOMOTIVES BASED ON VARIABLE PARAMETER PI REGULATOR	627
<i>Chen Ke, Guo Wei, Gan Weiwei, Wang Wentao, Hou Zhaowen</i>	
OPTIMAL CAPACITY DESIGN OF ENERGY FEEDBACK SYSTEM IN URBAN RAIL CONSIDERING DUTY CLASSES	632
<i>Ge Zhou, Yang Yingbing, Zhang Jian, Li Xiaobing, Liu Wei, Zhan Xianbai</i>	
OPTIMAL SITING AND SIZING FOR INVERTER FEEDBACK DEVICE APPLIED IN URBAN RAIL TRANSIT	636
<i>Xie Wei, Ge Tiejun, Zhang Hao, Li Zhe, Liu Wei, Li You</i>	
OPTIMIZATION OF RAILWAY OPERATING IN TERMS OF DISTRIBUTION SYSTEM VOLTAGE DROP	641
<i>M. Botte, L. D’Acierno, F. Mottola, M. Pagano</i>	
QUANTITATIVE ANALYSIS TECHNIQUES FOR EVALUATING THE RELIABILITY OF LI- ION BATTERY: CHALLENGES AND SOLUTIONS	646
<i>Foad. H. Gandoman, Theodoros Kalogiannis, Maitane Berecibar, Joeri Van Mierlo, Peter Van Den Bossche</i>	
REAL-TIME DIAGNOSIS OF SENSOR FAULT FOR TRACTION DRIVE SYSTEM	651
<i>Shaolong Xu, Xueming Li, Zhiwen Chen</i>	

RESEARCH ON CONTROL STRATEGY OF FOUR QUADRANT CONVERTER IN URBAN RAIL BIDIRECTIONAL SUBSTATION	657
<i>Guobin Sun, Yang Cui, Hairui Wang, Runze Zhang, Meng Jia, Xiao Deng</i>	
RESEARCH ON MULTI-VECTOR CASCADED MODEL PREDICTIVE CONTROL OF INDUCTION MOTORS	664
<i>Ling Feng, Jianguo Fu, Cheng Li</i>	
RESEARCH ON OUTPUT POWER QUALITY AND FAULT CHARACTERISTICS OF TRAIN TRACTION INVERTER	668
<i>Pankui Yang, Jianqiang Liu, Hui Dong, Chuanduo Liu, Xiaoyong Li, Bin Jiang</i>	
SIMULATION AND TEST RESEARCH OF HYDROGEN-POWERED TRAM	675
<i>Jianying Liang</i>	
STATE OBSERVATION AND PARAMETER IDENTIFICATION FOR AUTONOMOUS HEAVY HAUL TRAIN	681
<i>Kaibing Du, Zhanchao Wang, Zhengfang Zhang</i>	
STATE OF ENERGY ESTIMATION OF LITHIUM-ION CAPACITOR FOR RAIL TRANSIT APPLICATION	686
<i>Hao Li, Jiuchun Jiang, Zhanguo Wang, Weige Zhang, Bingxiang Sun, Fulai An, Xitian He</i>	
STATIONARY HYBRID ENERGY STORAGE SYSTEM CONTROL STRATEGY CONSIDERING TIMETABLE AND BATTERY LIFE	689
<i>Liu Yuyan, Zhongping Yang, Meiyu Song</i>	
THERMAL ANALYSIS IN RAILWAY ELECTRIFICATION SYSTEMS FOR BARE CONDUCTORS	695
<i>Alejandro Gancedo, Islam El-Sayed, Peru Bidaguren, Pablo Arboleya</i>	
TRANSIENT SIMULATION AND PROTECTION ANALYSIS OF SHORT-CIRCUIT FAULT ON URBAN RAIL TRANSIT TRACTION SYSTEM	701
<i>Tingting Wang, Guobin Sun, Hu Cao, Zhexun Zhang, Jinheng Chen</i>	
WEB-BASED SOFTWARE-SUITE FOR DC RAILWAY SIMULATION AND ANALYSIS: ARCHITECTURE, DATA MANAGEMENT AND VISUALIZATION	708
<i>Islam El-Sayed, Bassam Mohamed, Pablo Arboleya</i>	

SPECIAL SESSION 10: SYSTEM MODELLING, VALIDATION AND TESTING FOR ELECTRIFIED AND AUTOMATED VEHICLES

NOVEL DEVELOPING ENVIRONMENT FOR AUTOMATED AND ELECTRIFIED VEHICLES USING REMOTE AND DISTRIBUTED X-IN-THE-LOOP TECHNIQUE	714
<i>Viktor Schreiber, Klaus Augsburg, Valentin Ivanov, Hiroshi Fujimoto</i>	
RIDE BLENDING CONTROL FOR AWD ELECTRIC VEHICLE WITH IN-WHEEL MOTORS AND ELECTROMAGNETIC SUSPENSION	719
<i>Lukas Hott, Valentin Ivanov, Klaus Augsburg, Vincenzo Ricciardi, Miguel Dhaens, Monzer Al Sakka, Kylian Praet, Joan Vazquez Molina</i>	

SPECIAL SESSION 11: ECONOMICS AND DECISION-MAKING IN THE TRANSITION TO ELECTRIC VEHICLES

APPLYING A DETAILED VEHICLE MODEL TO TECHNO-ECONOMIC ANALYSIS OF AN ELECTRIC VEHICLE.....	724
<i>A. Desreveaux, I. Mekki, C. Youbi, S. Zhang, E. Hittinger, A. Bouscayrol</i>	
ECONOMICS OF ELECTRIC VEHICLE CHARGING INFRASTRUCTURE IN A CAMPUS SETTING	728
<i>Eric Hittinger, Alain Bouscayrol, Elodie Castex</i>	
ELECTRIFICATION OF LEISURE BOATS: A COMMERCIAL STATE-OF-THE-ART.....	733
<i>Mario Porru, Marco Pisano, Alessandro Serpi, Fabrizio Pilo</i>	
LIFE-CYCLE GREENHOUSE GAS EMISSIONS OF ALTERNATIVE AND CONVENTIONAL FUEL VEHICLES IN INDIA	739
<i>Tapas Peshin, Inês M. L. Azevedo, Shayak Sengupta</i>	
THE ELECTRO-MOBILITY LIVING LAB DEVELOPPED BY ECAMPUS	745
<i>E. Masclef, E. Castex, S. Miaux, A. Bouscayrol, L. Boulon</i>	

SPECIAL SESSION 2: ELECTRIC (AND HYBRID) BUSES I: COMPONENTS LEVEL

A FRAMEWORK FOR CHARGING STANDARDISATION OF ELECTRIC BUSES IN EUROPE	751
<i>Mehrnaz Farzam Far, Marko Paakinen, Peter Cremers</i>	

SPECIAL SESSION 3: ELECTRIC (AND HYBRID) BUSES II: SYSTEMS LEVEL

ELECTRIC BUS FORWARD AND BACKWARD MODELS VALIDATION METHODOLOGY BASED ON DYNAMOMETER TESTS MEASUREMENTS.....	755
<i>Jon Ander López-Ibarra, Haizea Gaztañaga, Joel Anttila, Pekka Rahkola, Mikaela Ranta, Mikko Pihlatie</i>	
FUZZY BASED PREDICTIVE CONTROL FOR OPTIMAL ENERGY MANAGEMENT IN HYBRID URBAN BUSES	762
<i>Brishith Falcon-Mendoza, Victor Herrera-Pérez, Jon Ander Lopez-Ibarra, Haizea Gaztañaga, Haritza Camblong-Ruiz</i>	
GENETIC ALGORITHM CONTROL STRATEGY FOR HEAT PUMP SYSTEM IN BATTERY ELECTRIC BUSES	767
<i>Rabih Al Haddad, Hussein Basma, Charbel Mansour</i>	
HARDWARE-IN-THE-LOOP EXPERIMENTAL VALIDATION OF A LEARNING BASED NEURO-FUZZY ENERGY MANAGEMENT STRATEGY FOR PLUG-IN HYBRID ELECTRIC BUSES	773
<i>Jon Ander López-Ibarra, Haizea Gaztañaga, Andoni Saez De Ibarra, Haritza Camblong</i>	
OPTIMIZATION OF BATTERY ELECTRIC BUS CHARGING UNDER VARYING OPERATING CONDITIONS	778
<i>Hussein Basma, Charbel Mansour, Maroun Nemer, Marc Haddad, Pascal Stabat</i>	

SPECIAL SESSION 4: EMR AND OTHER GRAPHICAL DESCRIPTIONS

DIFFERENT VOLTAGE AND CURRENT CONTROL SCHEMES FOR MULTI-PACK BATTERY OF ELECTRIC SCOOTERS	784
<i>Thanh Vo-Duy, Bao-Huy Nguyen, Minh C. Ta, João P. Trovão, Nhp Nguyen</i>	
EMR-BASED SWITCHED MODEL OF DC RAILWAY SYSTEMS SUPPLIED BY REVERSIBLE TRACTION POWER SUBSTATIONS AND REGENERATIVE TRAINS	789
<i>C. Mayet, A. Bouscayrol, P. Arboleya, P. Delarue, B. Mohamed, I. El-Sayed</i>	
ENERGETIC SIMULATION OF DC RAILWAY MICRO-GRID INTERCONNECTING WITH PV SOLAR PANELS, EV CHARGER INFRASTRUCTURES AND ELECTRICAL RAILWAY NETWORK	795
<i>Julien Pouget, Baoling Guo, Luc Bossoney, Julien Coppex, Dominique Roggo, Christoph Ellert</i>	
FUEL CELL DUAL-MODE TRAIN: IMPACT OF CHARGE DEPLETING STRATEGY ON HYDROGEN CONSUMPTION	802
<i>Ayoub Aroua, Amadou Ball, Sabrina Messal, Walter Lhomme, Clément Départure</i>	
FUEL SAVING OF REAR BASED RETROFIT HYBRIDIZATION FROM FRONT BASED ENGINE VEHICLE	808
<i>F. Tournez, R. Vincent, W. Lhomme, A. Richert, A. Bouscayrol, M. Ahmed, B. Lemaire-Semail, A. Lievre</i>	
MECHANICAL BRAKING STRATEGY IMPACT ON ENERGY CONSUMPTION OF A SUBWAY	814
<i>Ryan O. Berriel, Alain Bouscayrol, Philippe Delarue, Charles Brocart</i>	
POWER-ORIENTED MODELING OF EPICYCLIC GEAR TRAINS	819
<i>Roberto Zanasi, Davide Tebaldi</i>	
VIRTUAL POWER PLANT INTEGRATION AND TEST BENCH FOR RAILWAY SMART GRID APPLIED TO STATIONARY ENERGY STORAGE SYSTEMS AND STATIONS	825
<i>Rudy Chaumont, Tony Letrouvé</i>	

SPECIAL SESSION 5: IEEE VTS MOTOR VEHICLES CHALLENGE 2020 □ ENERGY MANAGEMENT OF A FUEL CELL/ULTRACAPACITOR/BATTERY HEV

AN MPC-BASED ENERGY MANAGEMENT SYSTEM FOR A HYBRID ELECTRIC VEHICLE	831
<i>Alessandro Serpi, Mario Porru</i>	
ENERGY MANAGEMENT STRATEGY FOR A FUEL CELL/LEAD ACID BATTERY/ULTRACAPACITOR HYBRID ELECTRIC VEHICLE	837
<i>Silvia Colnago, Marco Mauri, Luigi Piegari</i>	
ENERGY MANAGEMENT SYSTEM DESIGNED FOR REDUCING OPERATIONAL COSTS OF A HYBRID FUEL CELL-BATTERY-ULTRACAPACITOR VEHICLE	842
<i>Eduardo Gaston Amaya, Héctor Gerardo Chiacchiarini, Cristian De Angelo</i>	
IEEE VTS MOTOR VEHICLES CHALLENGE 2021 - ENERGY MANAGEMENT OF A DUAL-MOTOR ALL-WHEEL DRIVE ELECTRIC VEHICLE	847
<i>Bao-Huy Nguyễn, João Pedro F. Trovão, Samir Jemei, Loic Boulon, Alain Bouscayrol</i>	

RULE-BASED ENERGY MANAGEMENT STRATEGY OF FUEL CELL/ULTRACAPACITOR/BATTERY VEHICLES: WINNER OF THE IEEE VTS MOTOR VEHICLES CHALLENGE 2020	853
<i>Alessandro Ferrara, Christoph Hametner</i>	

SIZING AND ENERGY MANAGEMENT STRATEGY IMPACT ON THE TOTAL COST OF OWNERSHIP IN FUEL CELL ELECTRIC VEHICLES.....	860
<i>Charles Lorenzo, Diana Sofia Mendoza, Juan M. Rey, David Bouquain, Samuel Higon, Daniel Hissel, Javier Solano</i>	

SPECIAL SESSION 6: IEEE VPPC APPLICATION OF WIDE BANDGAP DEVICES (SIC/GAN) BASED POWER ELECTRONICS SYSTEMS FOR E-MOBILITY

LOSS ANALYSIS AND CALCULATION OF IPMSM WITH SIC INVERTER BASED ON FIELD CIRCUIT COUPLING METHOD.....	866
<i>Xiaowei Ju, Yuan Cheng, Mingliang Yang, Kai Yao, Ling Ding, Shumei Cui</i>	

REVIEWING OF USING WIDE-BANDGAP POWER SEMICONDUCTOR DEVICES IN ELECTRIC VEHICLE SYSTEMS: FROM COMPONENT TO SYSTEM	872
<i>Thang V. Do, Ke Li, João P. Trovão, Loïc Boulon</i>	

SPECIAL SESSION 8: MULTI-LEVEL MODELS FOR SIMULATION OF ELECTRIFIED VEHICLE

COMPARISON OF EQUIVALENT CIRCUIT BATTERY MODELS FOR ENERGETIC STUDIES ON ELECTRIC VEHICLES.....	878
<i>David Ramsey, Ronan German, Alain Bouscayrol, Loïc Boulon</i>	

COMPARISON OF TWO LEVELS OF CELL MODELS FOR AN EV CURRENT CYCLE	883
<i>R. German, J. Jaguemont, A. Bouscayrol</i>	

EMR MODELING OF MOBYPOST	889
<i>Daniela Chrenko, Loïc Vichard</i>	

ENERGETIC MACROSCOPIC REPRESENTATION OF SCALABLE PMSM FOR ELECTRIC VEHICLES.....	893
<i>Walter Lhomme, Florian Verbelen, Mohamed N. Ibrahim, Kurt Stockman</i>	

MULTI-LEVEL SIMULATION OF A BEV USING EMR METHODOLOGY	899
<i>Calin Husar, Eduard Edis Raclaru, Cristi Irimia, Mihail Grovu, Matthieu Ponchant, Joris Jaguemont, Alain Bouscayrol, Ronan German, Mircea Ruba, Claudia Martis, Gabriel Mihai Sirbu</i>	

SPECIAL SESSION 9: INNOVATIVE DRIVETRAINS FOR ELECTRIFIED VEHICLES

EXPERIMENTAL & MODELLING STUDY OF ADVANCED DIRECT COIL COOLING METHODS IN A SWITCHED RELUCTANCE MOTOR.....	905
<i>Stephan Schlimpert, Branimir Mrak, Ilja Siera, Ruud Sprangers, Jasper Nonneman, Michel De Paepe, Steven Vanhee</i>	

SCALABLE ELECTRICAL VARIABLE TRANSMISSION MODEL FOR HEV SIMULATIONS USING ENERGETIC MACROSCOPIC REPRESENTATION.....	910
<i>F. Verbelen, W. Lhomme, A. Aroua, A. Bouscayrol, P. Sergeant</i>	

TRANSMISSION RATIO DESIGN FOR ELECTRIC VEHICLES VIA ANALYTICAL
MODELING AND OPTIMIZATION..... 916
Theo Hofman, Mauro Salazar

Author Index