

**2023 IEEE International
Conference on Electrical Systems
for Aircraft, Railway, Ship
Propulsion and Road Vehicles &
International Transportation
Electrification Conference
(ESARS-ITEC 2023)**

**Venice, Italy
29-31 March 2023**



**IEEE Catalog Number: CFP23G35-POD
ISBN: 979-8-3503-4690-9**

**Copyright © 2023 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:	CFP23G35-POD
ISBN (Print-On-Demand):	979-8-3503-4690-9
ISBN (Online):	979-8-3503-4689-3

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

Intelligent Driver Monitoring System for Safe Driving	1
<i>Adarsh Vijay</i>	
Fuel Cell/Battery Hybrid Electric System for UAV	7
<i>Jenica-Ileana Corcau, Liviu Dinca</i>	
On the Dynamic Behavior of an Aged Lithium-Iron Phosphate Battery	13
<i>Diego Iannuzzi, Babak Fahimi, Ciro Napolitano</i>	
New Model-Based Algorithm for Fault Detection and Identification in DC Railway Systems	18
<i>Damiano Lanzarotto, François Wallart, Gal Blaszczyk, Paul Verrax, Alberto Bertinato, Loïc Leclere</i>	
DC Series Arc Fault Detection Using Fractal Theory	24
<i>Danny Seeley, Mark Sumner, David W. P. Thomas, Stephen Greedy</i>	
Parameters Identification for Open Circuit Voltage Characteristic in Battery Models	30
<i>Elisa Mostacciolo, Luigi Iannelli, Domenico Natella, Silvio Baccari, Francesco Vasca</i>	
Multiport DC-DC Converter for Integrating Energy Systems in All-Electric Vehicles	36
<i>Immanuel N. Jiya, Pasan Gunawardena, Huynh Van Khang, Nand Kishor, Yunwei Li</i>	
Design Approach of an Integrated SiC-Inverter for an Electric Aircraft	42
<i>Dirk Fischer, Robert Rohn, Regine Mallwitz</i>	
Ground-Based Power Supply System to Operate Hybrid-Electric Aircraft for Future Regional Airports.....	48
<i>Markus Meindl, Martin März, Kai Johannes Weber</i>	
Battery Trains Operation from the Infrastructure Manager Perspective.....	54
<i>Benoit Sonier, Thomas Bausseron, Bogdan Vulturescu, Ignacio Riezu, Dimitri Mantel</i>	
Implementation of Alternative Aircraft Evaluation Techniques to Assess Electrical Aircraft Performance.....	59
<i>Roland Furmanek, Roman Škrásek, Bartosz Filochowski, Sébastien Gonczaronek</i>	
Propulsion System Based on the NPC Multi-Source Inverter for Battery Hybrid Trams: Experimental Validation	63
<i>Emanuele Fedele, Diego Iannuzzi, Ivan Spina</i>	
Unidirectional DC-DC Converters for Ultrafast Charging of Electric Vehicles	69
<i>O. Lopez-Santos, D. Zambrano-Prada, L. Martinez-Salamero, A. El Aroudi, L. Vazquez-Seisdedos</i>	
A Reduced Order Model for the Stable LC-Filter Design on Shipboard DC Microgrids.....	75
<i>Andrea Alessia Tavagnutti, Daniele Bosich, Stefano Pastore, Giorgio Sulligoi</i>	
Finite Element Analysis of a Set of Four Electric Machines with the Same Stator Armature and Main Size of the Rotor Magnetic Core.....	81
<i>Virgiliu Fireteanu</i>	

Integrated Braking and Traction Torque Vectoring Control Based on Vehicle Yaw Rate for Stability Improvement of All-Wheel-Drive Electric Vehicles.....	87
<i>Mahmoud Said Jneid, Péter Harth</i>	
Virtio-FPGA: A Virtualization Solution for SoC-Attached FPGAs.....	93
<i>Anna Panagopoulou, Michele Paolino, Daniel Raho</i>	
Optimal Design of a Three-Phase 540V/70kVA SiC Inverter for Aircraft Applications	99
<i>Duc Hoan Tran, Bernardo Cougo, Gilles Segond, Hans Hoffmann Sathler</i>	
Benefits of Selecting PMASR Machines as Traction Motors in Battery Electric Forklift Trucks.....	105
<i>Matteo Olivo, Alberto Tessarolo, Luca De Carli, Riccardo Pozzo</i>	
Power Distribution and Propulsion System for an All-Electric Regional Aircraft	111
<i>Janine Ebersberger, Ralf Johannes Keuter, Bernd Ponick, Axel Mertens</i>	
Low-Temperature PEM Fuel Cell Voltage Prediction Linked to Operating Conditions for a Mission Profile	118
<i>Grignon Mélanie, Jaafar Amine, Turpin Christophe, Rakotondrainibe André, Guenot Benoit, Soyez Emilie</i>	
Analytical Model for Device Currents in 5-Level Active Neutral Point Clamped Converter	124
<i>Daniel Zakzewski, Rakesh Resalayyan, Apurv Kumar Yadav, Alireza Khaligh</i>	
Enhanced Online Identification of Battery Models Exploiting Data Richness.....	130
<i>Chengxi Cai, Daniel J. Auger, Suresh Perinpanayagam</i>	
Driving Power Supply for Ultrasound Piezoelectric Transducers	136
<i>Modar Jomaa, François Costa, Dejan Vasic, Pierre-Etienne Lévy, Marwan Ali</i>	
Water Transport Decarbonization: Preliminary Case Study in Venice	141
<i>Alessandro Saldarini, Cristian Giovanni Colombo, Michela Longo, Morris Brenna, Seyed Mahdi Mirafzabzadeh, Wahiba Yaici</i>	
Cycle Aging Effect on the Open Circuit Voltage of Lithium-Ion Battery.....	145
<i>Simone Barcellona, Lorenzo Codecasa, Silvia Colnago, Luigi Piegari</i>	
Capacity Fade Estimation of LiFePo Cells Based on Improved Impulse Response Method: Experimental Results.....	151
<i>Diego Iannuzzi, Mattia Ribera, Paola Satariano, Emanuele Fedele, Francesco Pagliarini, Pasquale Cennamo, Filippo Orsini, Luigi Petrazzuoli, Marcello Spinelli</i>	
Impact of Fuel Switch to Methanol on the Design of an All Electric Cruise Ship	157
<i>Serena Bertagna, Vittorio Bucci, Alberto Marinò, Giorgio Sulligoi, Andrea Vicenzutti</i>	
Modelling and Determination of Short Circuit Traction Line Parameters for the Italian 3 kV DC Railway System.....	163
<i>Antonio Di Pasquale, Mario Pagano, Fabio Villone, Antonio Martinelli, Luigi Rufolo, Maurizio Santamaria, Francesco Vaccaro</i>	
Average Modeling of DC-DC Converters for DC Shipboard Microgrids with Constant Power Loads	169
<i>F. D'Agostino, F. Silvestro, F. Sivori, A. Fidigatti, E. Ragaini</i>	
A Statistical Approach for the Optimal Sizing of Partial Electrification for Battery Trains	175
<i>Maxime Juston, Bogdan Vulturescu, André Chamaret</i>	

GA-Based Features Selection for Electro-Chemical Impedance Spectroscopy on Lithium Iron Phosphate Batteries	181
<i>C. Bourelly, M. Vitelli, F. Milano, M. Molinara, F. Fontanella, L. Ferrigno</i>	
Investigation and Optimisation of Urban Rail Transit Lifecycle Energy Saving in Coordinating Section Running Time and Slope	187
<i>Haoran Geng, Masafumi Miyatake</i>	
High-Frequency Interactions Among Power Converters in Built-In dc Networks	193
<i>José Antenor Pomilio, André Faria Hernandez, Débora Pereira Damasceno, Mateus Pinheiro Dias, João Inácio Yutaka Ota, Gustavo Ortenzi, Rafael Kotchecoff Carneiro</i>	
Drive Cycle Evaluation and Consumption of PM Motors for a Typical Battery Electric City Bus.....	199
<i>Emma Arfa Grunditz, Mikael Alatalo</i>	
Hydrogen-Fuelled Fixed-Wing RPAS. an Approach to Design and Size the Electrical Propulsion System	207
<i>Cirilo Delgado Asencio, Jose Manuel Andújar Márquez, Francisca Segura Manzano, Juan Mora Macias</i>	
An Advanced Power Generation Architecture for More-Electric Aircraft Applications.....	216
<i>Ge Bai, Tao Yang, Seang Shen Yeoh, Serhiy Bozhko, Patrick Wheeler</i>	
Reliability Modelling of Marine Hybrid Power and Propulsion System Considering Operation Profile.....	222
<i>Ziwen Wang, Siamak Karimi, Mehdi Zadeh, Markus Heimdal</i>	
Multi-Battery Swapping Station Modelling for EVs with Strategic Discounting and Solar Energy	228
<i>Manish Sharma, Deep Kiran</i>	
Optimised Architecture Design for an MEA Power Distribution System Considering Load Profile and Fault-Tolerance	234
<i>Xin Wang, Jason Atkin, Seang Yeoh, Serhiy Bozhko</i>	
Online Loss Reduction of Isolated Bidirectional DC-DC Quad-Active Bridge Converters.....	241
<i>Ahmed A. Ibrahim, Tommaso Caldognetto, Davide Biadene, Paolo Mattavelli</i>	
A Thermal Investigation on a Commercial Stack of Prismatic Lithium-Ion Batteries	247
<i>Nicolò Zatta, Giovanni Bonanno, Andrea Trovò, Simone Visonà, Giovanni Cristofoli, Lorenzo Mozzato, Paolo Mattavelli, Massimo Guarnieri</i>	
A Case Study on High-Temperature Fuel Cells for Hybrid Electric Ship Propulsion	253
<i>Flavio Balsamo, Clemente Capasso, Tommaso Coppola, Luca Micoli, Roberta Russo, Ottorino Veneri</i>	
Capacitor Voltage Balancing of Four-Level ANPC and π -Type Converters Based on Simplified Virtual-VectorPWM.....	260
<i>Muhammad Attique Qamar, Alber Filba-Martinez, Sergio Busquets-Monge, Wang Kui</i>	
Scaling of Hybrid Propulsion in Respect of Power, Energy and Redundancy	266
<i>Jens Biebach, Michael Lorenz, Alfons Doerr, Alexander Oswald</i>	
Design and Efficiency Measurement of a Sub-Unit for a 20kW DC-DC Multiphase Power Converter.....	272
<i>Bastien Pasquet, Sébastien Vinnac, Jean-Marc Blaquièrre, Thierry Meynard, Sébastien Sanchez</i>	

Progress in Marine Hybrid Propulsion Drive Systems.....	278
<i>Marco Altosole, Flavio Balsamo, Andrea Bove, Ugo Campora, Nunziante Ianniello, Luigi Vitiello</i>	
Overview on the Effects of Mission Profiles on Radiation Induced Failures in All-Electric Aircraft.....	284
<i>Leon Fauth, Jens Friebe</i>	
Investigation of Electric Motors for All-Electric Aircraft with Different Material Combinations from an Environmental Perspective	290
<i>Ralf Johannes Keuter, Sofia Pinheiro Melo, Pavan Krishna Jois, Felipe Cerdas, Christoph Herrmann, Bernd Ponick</i>	
A Hybrid-Electric Passenger Vessel for Inland Waterway.....	296
<i>Donato Padolecchia, Samuele Utzeri, Luca Braidotti, Alberto Marino</i>	
Changes in Weight and Stability on Ships After Conversion from Diesel to Hybrid-Electric.....	302
<i>Germano Degan</i>	
A Security-Constrained Optimal Power Management Algorithm for Shipboard Microgrids with Battery Energy Storage System.....	307
<i>F. D'Agostino, M. Gallo, M. Saviozzi, F. Silvestro</i>	
Comparison of Two Cascaded Converter Topologies for Voltage Balancing in AC Railway Substations	313
<i>Didier Flumian, Philippe Ladoux, Joseph Fabre</i>	
Technico-Economic Analysis of EV Charging Station in Smart Grid.....	320
<i>Alexandra Catalina Lazaroiu, Mariacristina Roscia, Claudia Laurenta Popescu, Mihai Octavian Popescu, Luiza Brindusa Popa, Monica Alexandru</i>	
Opportunity Charging of Electric Buses Directly from a DC Metro Catenary and Without Storage.....	326
<i>Ibrahim Diab, Gautham Ram Chandra Mouli, Pavol Bauer</i>	
Normalised Flux Weakening Control Technique Acting on the Actual Speed for Automotive Dual Three-Phase IPMSMs.....	332
<i>A. Navarro-Temoche, E. Ibarra, I. Kortabarria, A. Sierra-González, I. Elosegui</i>	
Minimization of DC-Link Capacitance in Voltage Source Rectifiers Through Nonlinear Controls Based on Lyapunov's Direct Method.....	338
<i>Mark Vygoder, Robert M. Cuzner, Brian S. R. Armstrong</i>	
A Novel Root-Finding Algorithm to Solve the Pseudo-2D Model of a Lithium-Ion Battery.....	345
<i>Toshan Wickramanayake, Mehrnaz Javadipour, Kamyar Mehran</i>	
Energy Storage System Hybridization Algorithm for Mobility Applications Based on Future Battery and Fuel Cell Technologies.....	351
<i>Bruno Lemoine, Priscilla Caliendo, Thomas Wannemacher, Nils Baumann, Andrea Vezzini</i>	
Low Complexity and High Safety Architecture of Automotive Li-Ion Battery Management Systems in Compliance with the ISO 26262 Standard	357
<i>Apostolos Delizonas, Christos Mademlis, Evangelos Tsioumas, Dimitrios Papagiannis, Nikolaos Jabbour, Tilemaxos Matiakis</i>	
Using the Thermal Inertia of Trains for Contributing to Primary Frequency Control in Grids with Photovoltaic Generation	363
<i>Jesús Araúz, Sergio Martinez</i>	

Battery Thermal Management Systems: A Case Study on Li-NMC Storage Systems for Electric Vehicles	369
<i>Clemente Capasso, Luigi Iannucci, Stanislao Patalano, Ottorino Veneri, Ferdinando Vitolo</i>	
A Novel Bidirectional CLC-T Resonant Immittance Converter for CC / CV Battery Charging	375
<i>N. J. Merlin Mary, Shelas Sathyan</i>	
PM-Free Electric Motor Powertrains in Road and Rail Transport: An Overview	381
<i>Ion Boldea, Fabrizio Marignetti, Giuseppe Graber, Mario Porzio, Luigi Fratelli</i>	
Comparison of V-Shaped IPM Machines Winding Topologies for Heavy-Duty EV Applications.....	390
<i>Leia George, Adam Walker, Fengyu Zhang, Gaurang Vakil, Chris Gerada</i>	
Design of Electric Spindle Control System for High-Grade CNC Machine Tools.....	397
<i>Jinhua Liang, Haiping Xu, Wei Liu</i>	
Advantages of a Variable Board Supply Voltage in All-Electric Aircraft with Regard to Cosmic Radiation Induced Failures.....	402
<i>Leon Fauth, Janine Ebersberger, Yongtao Cao, Jens Friebe</i>	
Brazilian Engineering Research Center for the Aerial Mobility of the Future	408
<i>Domingos A. Rade, Luciano J. Pedrote Dos Santos, Jose A. Pomilio, Roberto G. Annes Da Silva, Carlos Henrique C. Ribeiro, Alfredo Rocha De Faria, Emilia Villani</i>	
Holistic Design of a Twin-Hull Short-Sea Shipping Vessel with Hybrid-Electric Propulsion	414
<i>Panagiotis Margaronis, Aphrodite Kanellopoulou, Nicholas Sillionis, Dimitrios Liarokapis, Elias Sofras, John Prousalidis</i>	
Optimising the Energy System for Electrified Airport Operations Using Digital Twin	420
<i>Stefano Ferrari, Mika Grundström, Tommi Laitinen</i>	
Study and Validation of a Contra-Rotating Dual Rotor Switched Reluctance Machine in Marine Propulsion.....	428
<i>Ruben De Croo, Thomas Van Lierde, Frederik De Belie</i>	
A Neural Embedding-Based Recommender System to Get the Most Out of EV Recharge Times	434
<i>Luigi Libero Lucio Starace, Luca Bianco, Sergio Di Martino</i>	
Upgrading a DC Source to a PHIL Amplifier.....	440
<i>Lucas Rotava, Selimcan Deda, Oliver König, Gernot Pammer</i>	
Inverter Emulator as Multi-Purpose Test System for Aerospace Electric Power Systems	445
<i>Selimcan Deda, Oliver König, Thomas Haidinger, Gernot Pammer</i>	
Assessing E-Vehicle Utilization in Supply Chains	451
<i>Jyri Vilko, Dong Liu, Lassi Aarniovuori</i>	
Smart Integration and Energy Optimization of EVs Charging Systems in a Nanogrid	457
<i>Stefano Leonori, Cristina Moscatiello, Maria Carmen Falvo, Fabio Massimo Frattale Mascioli</i>	
The Maritime Sector in the Electric Energy Markets	463
<i>Anastastios Manos, Dimitrios Lyridis, John Prousalidis</i>	
Simplified Modelling and Control of Dual Active Bridge Converter for Future Electrified Aerospace Application.....	469
<i>Xingyu Yan, Yiren Zhu, Zhenyu Wang, Tao Yang, Serhiy Bozhko, Patrick Wheeler</i>	

Diagnosis of Energy Consumption During Parking of Different Rail Vehicles and Evaluation of Energy Savings Solutions	475
<i>Andre-Philippe Chamaret, Didier Frugier, Luis Maria Alonso, Patrick Henry, Jérôme Deon</i>	
Smart Hybrid Electric Railway Grids: A Comparative Study of Architectures	480
<i>Hamed Jafari Kaleybar, Morris Brenna, Francesco Castelli-Dezza, Maria Stefania Carmeli</i>	
Evaluation of the Effects of Propeller Imbalance on PM Motors for Aircraft Electric Propulsion	486
<i>Gianluca Brando, Adolfo Dannier, Andrea Del Pizzo, Luigi Pio Di Noia</i>	
A Comprehensive Study of a Railway Power Conditioner for 25 kV Substations with Scott and V/V Transformer	492
<i>Paul Sacco, Philippe Ladoux, Sébastien Sanchez, Mahmoud Hassan</i>	
Modeling and Experimental Validation of Tram Power Consumption.....	498
<i>Nermin Colo, Senad Huseinbegovic, Senad Smaka, Branislava Perunicic Dracenovic, Šemsudin Mašić</i>	
No-Load Characteristic Computation for Wound Field Synchronous Propulsion Motors	504
<i>Federica Graffeo, Silvio Vaschetto, Alberto Tenconi, Andrea Cavagnino</i>	
Integrated Energy Systems for Green Ports; A Cost Model and Case Study.....	510
<i>Ritvana Rrukaj, Mehdi Zadeh</i>	
Resonant Controllers to Achieve Torsional Stability: A Ship Case Study	515
<i>Lorenzo Bongini, Rosa Anna Mastromauro</i>	
Enhanced Control of PV CHB Inverter with Embedded BESS.....	521
<i>Monica De Riso, Marino Coppola, Santolo Daliento, Pierluigi Guerriero, Andrea Del Pizzo</i>	
Two-Phase Interleaved DC-DC Converter with 3.3 kV SiC MOSFET Modules	526
<i>Radek Sobieski, Rafal Miskiewicz, Jacek Rabkowski, Rafal Kopacz</i>	
Design and Verification of Aircraft Electrical Power System.....	531
<i>Hüseyin Sagirkaya</i>	
The SSE-ID Card of Ships in the Sustainable Maritime Framework	537
<i>John Prousalidis, Fabio D'Agostino, Anastasios Manos, Daniele Bosich</i>	
Review on EMC Standards (9–500 kHz) for DC Microgrids to Support Arc Fault Detection & Power Line Communication and Its Potential Application in Hybrid Ships	543
<i>Da Wang, Dominique Weyen, Paul Van Tichelen</i>	
Sizing the Energy Source and Battery for Electrical Driven Railway Vehicles for Non-Electrified Lines.....	549
<i>Shunsuke Jindo, Kana Matsunaga, Keiichiro Kondo</i>	
Review and Future Developments of Wound Field Synchronous Motors in Automotive	555
<i>Gaia Petrelli, Stefano Nuzzo, Tianjie Zou, Davide Barater, Giovanni Franceschini, Chris Gerada</i>	
Operating Areas Overview of Electrically Excited Synchronous Motors	561
<i>Charbel Zaghrini, Gabriel Houry, Maurice Fadel, Ragi Ghosn, Flavia Khatounian</i>	
Future Workplace EV Charging Architectures: DC and AC Charging Choices	567
<i>Mohamed Yasko, Attila Balint, Johan Driesen, Wilmar Martinez</i>	

Optimal Shaping for Electrically Excited Synchronous Motor	574
<i>Luca Cinti, Nicola Bianchi</i>	
An Integrated Approach to Lithium-Ion Battery Cell Management Through Accurate Voltage Measurement and Cell Balancing	580
<i>Regis Nibaruta, Prasanth Venugopal, Gert Rietveld, Volodymyr Havryliuk, Thiago Batista Soeiro</i>	
A Hardware-Based Bidirectional Power Flow Decoupling Approach for Multi-Active-Bridge Converters	587
<i>Peyman Koochi, Alan J. Watson, Thiago Batista Soeiro, Jon C. Clare, Marco Rivera, Prasanth Venugopal, Patrick W. Wheeler</i>	
Control and Coordination of Ultra-Capacitor and SMES Systems for Transient Power Provision in Electric Vessels	594
<i>Faysal Hardan, Pietro Tricoli</i>	
Opportunity Charging for Public Transportation: Opportunities and Challenges.....	600
<i>Nicola Campagna, Vincenzo Castiglia, Filippo Pellitteri, Rosario Miceli, Massimo Caruso</i>	
Performance Analysis of a Cell Equalizer Based on a Multiple Active Bridge.....	604
<i>Emanuele Di Fazio, Francesco Porpora, Mauro Di Monaco, Giuseppe Tomasso</i>	

Author Index