High performant Wide Band Gap Power Electronics for Reliable, energy efficient drivetrains and Optimization through Multi-physics simulation

Results

<table>
<thead>
<tr>
<th>Project Information</th>
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<tr>
<td><strong>HiPERFORM</strong></td>
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<tr>
<td>Grant agreement ID: 783174</td>
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<td><strong>Funded under</strong></td>
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<td>H2020-EU.2.1.1.7.</td>
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<td><strong>Overall budget</strong></td>
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<td>€ 41 367 954,09</td>
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<tr>
<td><strong>EU contribution</strong></td>
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<tr>
<td>€ 11 798 310,94</td>
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<td><strong>Coordinated by</strong></td>
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<td>AVL LIST GMBH</td>
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<td>Austria</td>
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Start date: 1 May 2018
End date: 31 October 2021

Deliverables

Documents, reports (7)

- Assessment of measurement technologies for high-frequency electronic systems
- Results of Task 3.1.1
- Specification for use-cases for inverters, test systems and chargers
- Results of Task 1.1.1
Report on the potential of using chargers with higher switching frequency capability for the preconditioning and monitoring of battery systems
Results of Task 5.2.2

Initial Dissemination Plan
Results of Task 6.2.1

Assessment of control algorithms for electronic systems with WBG technologies - Version 1
Deliverable with focus on control algorithms for electronic systems with WBG technologies (T3.2.1) - Version 1

Report on the design of off board charger systems for electric vehicles
Results of Task 5.2.2

Report on the design of on-board charger systems for electric vehicles
Results of Task 5.2.2

Websites, patent filings, videos etc. (4)

Newsletter M24
Results of Task 6.2.1

Newsletter M12
Results of Task 6.2.1

Press Release
Results of Task 6.2.1

Website
Results of Task 6.2.1

Other (1)

Design optimization of Switching Topologies
Results of Task 3.1.1

Publications
An energy efficient intelligent torque vectoring approach based on fuzzy logic controller and neural network tire forces estimator

**Author(s):** Alberto Parra, Asier Zubizarreta, Joshué Pérez  
**Published in:** Neural Computing and Applications, 2021, ISSN 0941-0643  
**DOI:** 10.1007/s00521-020-05680-2

Novel Thermal Management Strategy for Improved Inverter Reliability in Electric Vehicles

**Author(s):** Elena Trancho, Edorta Ibarra, Pablo Prieto, Antoni Arias, Adrian Lis, Ajay Poonjal Pai  
**Published in:** Applied Sciences, Issue 10/22, 2020, Page(s) 8024, ISSN 2076-3417  
**DOI:** 10.3390/app10228024

Symmetric-component decoupled control of grid-connected inverters for voltage unbalance correction and harmonic compensation

**Author(s):** Y. Zhang, M.G.L. Roes, M.A.M. Hendrix, J.L. Duarte  
**Published in:** International Journal of Electrical Power & Energy Systems, Issue 115, 2020, Page(s) 105490, ISSN 0142-0615  
**DOI:** 10.1016/j.ijepes.2019.105490

Assessment of Methods for the Real-Time Simulation of Electronic and Thermal Circuits

**Author(s):** Borja Rodríguez, Francisco González, Miguel Ángel Naya, Javier Cuadrado  
**Published in:** Energies, Issue 13/6, 2020, Page(s) 1354, ISSN 1996-1073  
**DOI:** 10.3390/en13061354

Sensorless Neutral Point Voltage Stabilization in Three-Phase Four-Wire Converters

**Author(s):** Xinwei Xu, Gabriel Tibola, Jorge L. Duarte  
**Published in:** 2020 22nd European Conference on Power Electronics and Applications (EPE'20 ECCE Europe), Issue 7-11 Sept. 2020, 2020, Page(s) P.1-P.10  
**DOI:** 10.23919/epe20ecceurope43536.2020.9215759

Application of Model Order Reduction with Cauer Ladder Networks to Industrial Inductors

**Author(s):** Niels Köster, Oliver König, Alexander Thaler, Oszkar Biro  
**Published in:** 19th International IGTE Symposium 2020, Issue 20 - 23 September 2020, 2020
A Telematic Control Unit Based Co-Simulation and Test Platform for Control Area Network Bus Systems

**Author(s):** Javier Rodas, Valentín Barral, José A. García-Naya, Luis Castedo, Carlos J. Escudero

**Published in:** International Symposium on Co-Simulation and Solver Coupling in Dynamics- COSIM 2021, Issue 24.05.2021, 2021

Impact Of Repetitive UIS And SC Stress On Degradation Of Power SIC TrenchMosfets

**Author(s):** J. Marek, J. Kozarik, A. Chvala, M. Minarik, P. Spanik, M. Jagelka, D. Donoval, M. Donoval

**Published in:** 2020 13th International Conference on Advanced Semiconductor Devices And Microsystems (ASDAM), 2020, Page(s) 92-95

**DOI:** 10.1109/asdam50306.2020.9393845

Modeling and Control Algorithm for a Modular GaN On-Board Charging System in Automotive Applications

**Author(s):** Tran, M. T., Zhaksylyk, A., Abdel Monem, M., Rasool, H., El Baghdadi, M., & Hegazy, O.

**Published in:** EPE Conference - 2021, 2021

Benchmark problems for co-simulation methods

**Author(s):** Alejandro Zar, Francisco González, Borja Rodríguez, Alberto Luaces, Miguel Naya, Javier Cuadrado

**Published in:** COSIM 2020 - International Symposium on Co-Simulation and Solver Coupling in Dynamics, Issue May 24 - 25, 2021, 2021

Thermal Stress Reduction of Power MOSFET in Electric Drive Application with Dynamic Gate Driving Strategy

**Author(s):** Lie Wang, Bas Vermulst, Jorge Duarte, Henk Huisman

**Published in:** 2021 IEEE Applied Power Electronics Conference and Exposition (APEC), Issue 21 July 2021, 2021, Page(s) 720-727

**DOI:** 10.1109/apec42165.2021.9487385

Integrated Local Control of Active Power and Voltage Support for Three-Phase Three-Wire Converters

**Author(s):** Ya Zhang, Gabriel Tibola, Maurice G. L. Roe, Jorge L. Duarte

**Published in:** 2019 IEEE 15th Brazilian Power Electronics Conference and 5th IEEE Southern Power Electronics Conference (COBEP/SPEC), Issue 16 April 2020, 2019, Page(s) 1-6

**DOI:** 10.1109/cobep/spec44138.2019.9065657
EVALUACION DE UN ALGORITMO DE TORQUE VECTORING CON CAPACIDAD DE FRENADO REGENERATIVO

Author(s): A. Parra, A. Zubizarreta and J. Pérez
Published in: JJAA – Jornadas de Automática, 2019

Power SiC MOSFET under repetitive UIS conditions

Author(s): MAREK, Juraj - KOZÁRIK, Jozef - CHVÁLA, Aleš - ČERNAJ, Ľuboš - DONOVAL, Martin - DONOVAL, Daniel
Published in: ADEPT 2019 : 7th International conference on advances in electronic and photonic technologies - Proceedings, Issue 24.7.2019, 2019, Page(s) 179-182

A Non-Regulated Full-Bridge Resonant Converter for Implementing CC and CV Charges of Electric Vehicle Batteries

Author(s): Vu, H. N., Abdel-Monem, M., El Baghhdadi, M., Van Mierlo, J., Lataire, P., & Hegazy, O.
Published in: 21st European Conference on Power Electronics and Applications (EPE’19 ECCE Europe), Issue September 2 - 6, 2019, 2019, Page(s) P-1

A Test Framework for the Co-simulation of Electric Powertrains and Vehicle Dynamics

Author(s): Borja Rodríguez, Francisco González, Miguel Ángel Naya, Javier Cuadrado
Published in: 2019 ECCOMAS Multibody Dynamics Conference, Issue July 15 - 18, 2019, 2019

Multi-Objective Optimization of On-Board Chargers Based on State-of-the-Art 650V GaN Power Transistors for the Application of Electric Vehicles

Author(s): Hai-Nam Vu ; Mohamed Abdel-Monem ; Mohamed El Baghhdadi ; Joeri Van Mierlo ; Omar Hegazy

Defect analysis of Ni-Au/AlN/p-Si MIS capacitors

Author(s): STUCHLÍKOVÁ, Lubica - DROBNÝ, Jakub - BENKO, Peter - KÓSA, Arpád - MIKOLÁŠEK, Miroslav - CHVÁLA, Aleš - MAREK, Juraj
Electrical and DLTS characterization of AlN buffers for GaN on Si technology

Author(s): MAREK, Juraj - MIKOLÁŠEK, Miroslav - DROBNÝ, Jakub - ZHAO, Ming - STOFFELS, Steve - KÓSA, Arpád - BENKO, Peter - CHVÁLA, Aleš - BAKEROOT, Benoit - DECOUTERE, Stefaan - STUCHLÍKOVÁ, Ľubica
Published in: WOCSDICE 2019 : 43rd Workshop on compound semiconductor devices and integrated circuits held in Europe, Issue 17.6.2019, 2019

650 V p-GaN Gate Power HEMTs on 200 mm Engineered Substrates

Author(s): K. Geens, X. Li, M. Zhao, W. Guo, D. Wellekens, N. Posthuma, D. Fahle, O. Aktas, V. Odnoblyudov, S. Decoutere
Published in: IEEE 7th Workshop on Wide Bandgap Power Devices and Applications (WiPDA), Issue Oct. 29 - 31, 2019, 2019, Page(s) pp. 292-296

Estrategias de Torque Vectoring en Vehículos Eléctricos: Una revisión del Estado del Arte

Author(s): Parra, A. Zubizarreta and J. Pérez
Published in: SAAEI - Seminario Anual de Automática y Electrónica Industrial, 2019

A novel Torque Vectoring Algorithm with Regenerative Braking Capabilities

Author(s): Parra, A. Zubizarreta and J. Pérez
Published in: IECON- 45th Annual Conference of the IEEE Industrial Electronics Society, 2019

DLTS study of electrically active defecta in power SiC MOSFET

Author(s): MAREK Juraj, DROBNÝ Jakub, KÓSA Arpád, BENKO Peter, STUCHLÍKOVÁ Lubica
Published in: SURFINT - SREN VI : 6h Conference on Progress in applied surface, interface and thin film science, Issue November 18-21, 2019, Page(s) 96-97

Electrical and capacitance characterization techniques for power and optoelectronic devices

Author(s): MIKOLÁŠEK, Miroslav - CHYMO, Filip - HARMATHA, Ladislav - ONDREJKA, Peter - MAREK, Juraj
Published in: ADEPT 2019 : 7th International conference on advances in electronic and photonic technologies - Proceedings, Issue June 24-27, 2019, 2019, Page(s) 11-14

Power p-GaN HEMT under short circuit conditions
Application considerations for Double Sided Cooled Modules in Automotive Environment.

Author(s): KOZÁRIK, Jozef - MAREK, Juraj - ČERNAJ, Ľuboš - CHVÁLA, Aleš - ZÁVODNÍK, Tomáš - DONOVAL, Daniel
Published in: ADEPT 2019 : 7th International conference on advances in electronic and photonic technologies - Proceedings, Issue 24.7.2019, 2019, Page(s) 115-118

Design and Evaluation of Finite Control Set Model Predictive Control of Interleaved Inverter Topology with Induction Machine

Author(s): Hoegerl, J., Goray, K., Moeller, S., El Baghdadi, M., Abart, C.
Published in: CIPS - International Conference on Integrated Power Electronics Systems, 2019

Thermal Concept Design of MOSFET Power Modules in Inverter Subsystems for Electric Vehicles

Author(s): Danial Karimi, Hamidreza Behi, Joris Jaguemont, Mohamed El Baghdadi, Joeri Van Mierlo, Omar Hegazy
Published in: 2019 9th International Conference on Power and Energy Systems (ICPES), 2019, Page(s) 1-6
DOI: 10.1109/icpes47639.2019.9105437

Optimal Design Strategy and Electro-Thermal Modelling of a High-Power Off-Board Charger for Electric Vehicle Applications

Author(s): Haaris Rasool, Assel Zhaksylyk, Sajib Chakraborty, Mohamed El Baghdadi and Omar Hegazy
Published in: IEEE EVER 2020, Issue 24-26 Sep. 2020, 2020

Reactive magnetron sputtering of epitaxial AlN-films on Si111

Author(s): Stefan Neuhaus, Hagen Bartzsch, Steffen Cornelius, Alexander Hinz, Olaf Zywitzki, Manuela Junghähnel
Published in: SVC proceedings, Issue 4.5.2021, 2021

Degradation of 600V GaN HEMTs under Repetitive Short Circuit Conditions

Author(s): J. Kozarik, J. Marek, M. Minarik, A. Chvala, L. Cernaj, M. Donoval, D. Donoval
Published in: 2020 13th International Conference on Advanced Semiconductor