

E-VOLVE EV FOR LIFE, VALUE, EFFICIENCY



NEWSLETTER 10/23

Welcome to this autumn edition of our E-VOLVE newsletter, taking you on a little journey (re)visiting activities from our cluster projects all over Europe. While we will investigate the past on what has happened since the last edition as well as sneak-peak into the future on what will be done, we are finetuning on the strategic orientation and added value of our cluster itself. Of course, we will be taking you on to this journey, as well. For now, please enjoy this edition of the newsletter and mark your calendars on the upcoming events.

CONFERENCE PARTICIPATION

PowerDrive @ICE2023



Power electronics optimization for next generation electric vehicle components

In September, the ICE2023 International Conference on Engines & Vehicles for Sustainable Transport took place in Capri, Italy, and we would like to thank Christof Schernus from FEV, Chairman of EARPA, for introducing the E-VOLVE Cluster in his keynote speech “European Collaborative Research on Road Transport and the Challenges of Resources”. One of the project cluster members, PowerDrive was exhibiting at the conference and presenting the project to the international conference audience.

More information:



EM-Tech and HighScope @FISITA



FISITA, Barcelona, Spain

Taking place from October 12 to October 14, the FISITA World Congress, FISITA World Mobility Summit, FISITA Intelligent Safety Conference Europe and EuroBrake hosted 2,164 attendees and 103 exhibitors and delivered 393 presentations, 80 technical papers and 12 panel sessions.



Thanks to the coordination of University of Surrey, the projects EM-TECH and HighScope have prepared a common publication on “Innovative e-Machine and Power Electronics Solutions for e-Axle and e-Corner Vehicle Powertrains”. The paper has been presented by Eric Armengaud: “Twenty minutes to summarize the advances of two research programs is very challenging. At the same time, it was a great exercise to extract to the core essence of the projects. Many thanks to Roel Verhoog from Valeo as moderator of the session, and to the participants for the valuable discussions!”

The full paper is openly available on Zenodo. Click on [this link](#) to get access.

Follow the project EM-Tech:



Follow the project HighScope:



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NEW REPORTS

RHODaS



Reinventing high-performance power converters for heavy-duty electric transport

New Reports on the Hardware and Software Specifications for the Integrated Motor Drive Prototypes and the Aspects Related to Testing and Performance

RHODaS researchers from Valeo have submitted two reports that provide a comprehensive overview of the specifications and architecture for the Integrated Motor Drive (IMD) prototype, and aim at defining the performance metrics, use cases, and an initial set of automotive standards.

The core components of the IMD, including the power converter, thermal management system, and gearbox, are detailed, along with their interfaces and associated sub-parts. The power converter, integral to the IMD powertrain, interfaces with other critical sub-components like the thermal management system and digital twin platform. Hardware interfaces for the electric engine, gearbox, and software interfaces such as the Internet of Things (IoT) Gateway are also outlined.

Moreover, the report underscores the significance of software in driving the IMD, dispersed across multiple control units. The Thermal Control Unit (TCU) ensures optimal cooling of the power converter under normal conditions whilst also regulating output and temperature during abnormal scenarios. The Electronic Control Unit (ECU) governs the power converter and electric motor, orchestrating the IMD's output in terms of speed and torque by converter switching.

Additionally, a data acquisition system is in place to measure and monitor IMD parameters during operation and tests, supported by various sensors.

To enhance functionality and implement crucial ancillary functions like condition monitoring for averting significant powertrain failures, a cloud platform aggregates and stores data from the powertrain. This platform encompasses an IoT platform, Digital Twin platform, and a Gateway, enabling seamless data collection and storage for further analysis and improvements. The ultimate aim is to facilitate a robust and efficient IMD through meticulous hardware and software designs, ensuring its successful integration and performance in the envisioned powertrain.

Testing and performance evaluation of the Integrated Motor Drive (IMD) will be undertaken by the Bosmal Automotive Research and Development Institute in RHODaS Work Package 5. The initial focus has been on outlining the subcomponents of the IMD, and then defining the performance metrics, use cases, and an initial set of automotive standards.

By aligning with vehicle target requirements, the performance parameters of the subcomponents are determined and serve as the basis for establishing test bench requirements, and the necessary equipment like dynos, pumps, chillers, etc. Moreover, the report emphasizes studying use case scenarios to create a linkage between typical driver use cases and IMD-level use cases, essential for defining comprehensive testing procedures and where target performances for the IMD are established based on inverter output.

Preliminary requirements for the test bench have been defined to assess IMD performance, and the hardware and capabilities for the test bench will be solidified through coordination with other RHODaS partners. Finally, the report identifies

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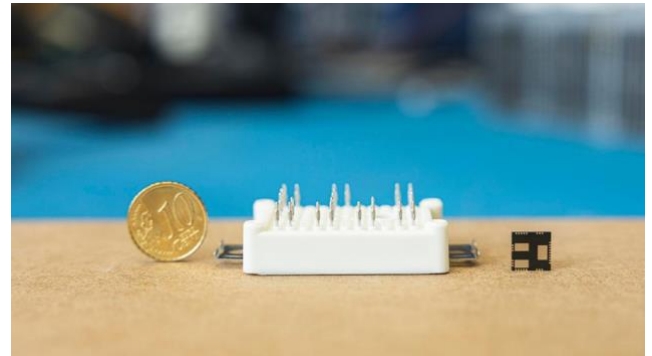
various use cases that will help shape the procedures for testing the key operational functionalities of the IMD.

New Report: Intelligent power modules with integrated sensors and OTP/OCP circuits

RHODaS researchers have also recently submitted a report on the development of Intelligent Power Modules with Integrated Sensors and Over Temperature Protection (OTP) / Over Current Protection (OCP) Circuits.

The core focus revolves around the design intricacies of power modules, integrated sensors, and fault tolerance algorithms. A critical aspect discussed is the meticulous selection process for suitable silicon carbide (SiC) and gallium nitride (GaN) devices for converters and details the selected GaN and SiC semiconductors for both low and high-power converters with their specific characteristics. This research is vital in ensuring that the new power converters being developed by RHODaS are more efficient, smaller, lighter, and affordable.

The report sheds light on the crucial functionalities that the gate-driver circuit must encompass to ensure optimal protection for the converter. The selection process for appropriate drivers, considering their compatibility with desired functionalities, is clearly outlined for both low and high-power converters. Furthermore, the integration of sensors essential for implementing desired functionalities is highlighted, with a specific focus on temperature, current, and voltage sensors for high and low power converters.



The document also delves into an in-depth analysis of potential faults in semiconductors, addressing their causes and effects. To detect faults regardless of their origin, a sophisticated fault detection algorithm is proposed, leveraging the integrated sensors and driver protections. This algorithm has the capability to identify various semiconductor faults, setting the stage for future work on fault localization.

In conclusion, the report signifies a successful design and implementation of power modules, offering valuable insights into sensor integration, semiconductor selection, and fault tolerance analysis. These findings significantly contribute to the overall progress and success of the RHODaS project, paving the way for advancements in intelligent power modules and enhanced system reliability.

The full report will be available on the RHODaS website's Public Deliverables page soon.

More information:



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COMING UP



Join our partner project EM-Tech together with the projects MAXIMA, HEFT and VOLT CAR on October 24th, the International Day Against Climate Change, for an exciting workshop that explores the cutting-edge advancements in electric vehicle (EV) technology. Titled "Sustainable Drives: Exploring Innovations in Green Vehicle Propulsion", this workshop brings together four pioneering European projects dedicated to transforming the automotive industry's approach to electrification.

The automotive industry is undergoing a profound shift towards electric mobility to combat climate change. However, challenges such as high manufacturing costs, environmental impact, and resource scarcity still persist. This workshop showcases the innovations proposed by four EU-funded projects that are shaping the future of EV propulsion.

Throughout the workshop, experts from these projects will share their insights on designing, manufacturing, and validating eco-friendly electric traction motors.

Attendees will gain a deeper understanding of how these innovations contribute to sustainable electric vehicle mobility, reduce environmental impact, and address supply chain challenges associated with rare earth materials.

- 10:00 – 10:15: **Workshop Opening** – Workshop Schedule presented by *Angela Muñiz, FEUGA*.

- 10:15 – 10:30: **EM-TECH** Innovative e-motor technologies covering e-axles and e-corners vehicle architectures for high-efficient and sustainable e-mobility. – presented by *Dr. Eric Armengaud, Armengaud Innovate GmbH*.
- 10:30 – 10:45: **HEFT** Novel concept of a low-cost, high-power density and highly efficient recyclable motor for next generation mass produced electric vehicles. – presented by *Dr. Javier Poza, Mondragon Unibertsitatea*.
- 10:45 – 11:00: **MAXIMA** Modular AXIAL flux Motor for Automotive. – presented by *Prof. Stéphane Clenet, Arts et Métiers-Institute of Technology*.
- 11:00 – 11:15: **VOLT CAR** Design, manufacturing, and validation of ecocycle electric traction motor. – presented by *Dr. Jenni Pippuri-Makelainen, VTT - Technical Research Centre of Finland*.
- 11:15 – 11:45: **Panel Discussion**: "The Future of Electric Mobility". *Audience Questions and Discussions*.
- 11:45 – 12:00: **Workshop Conclusion**. Key Takeaways from Our Speakers.

Don't miss this opportunity to engage with experts at the forefront of green vehicle propulsion technology.

Please save the date and join the event online on October 24th! [Register here](#).

Here you can [download the event's schedule](#).

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EARPA Form Forum

October 17th – 18th, 2023



Next Edition of the E-VOLVE Newsletter

December 2023



A3PS EcoMobility 2023

November 16th – 17th 2023



EM-TECH

EM-TECH project meeting in Torino, IT

January 25th -26th 2024



TRA – 10th Conference in Dublin

April 15th-18th 2024



EM-TECH

Webinar “Sustainable Drives”

October 24th 2023



Next Cluster Meeting

November 10th, 2023



HighScope project meeting in Torino, IT

January 24th -25th 2024



Conference on Results from Road Transport Research in Brussels, Belgium

February 05th – 07th 2024



SAE WCX - World Congress Experience, Detroit

April 16th – 18th 2024

The research leading to these results have received funding from European Union's Horizon Europe research and innovation programme H2020 (GA No. 824290, 101006953) and Horizon Europe (GA No. 101056760, 101096083, 101056824, 101056896, 101056781 and 101056857). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the funding authority). Neither the European Union nor the funding authority can be held responsible for them.



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