Optimization of scalaBle rEaltime modeLs and functIonal testing for e-drive ConceptS

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Publishable Executive Summary

The OBELICS project relies on advanced scalable models of key drivetrain components for EV modeling and real-time HIL model deployment for testing and evaluation.

The power electronics inverter is a key component in the electric drivetrain, next to the traction battery and electric machine which have been studied before and were reported in previous deliverable documents.

In this deliverable document 'Models and tools for inverter', high frequency power inverters for EV motor drives are studied in detail and full scalable component models are developed. Advanced models and modeling techniques are used, covering a wide range of aspects for ensuring accuracy and good representation of real-word system behavior.

Starting from the fundamentals, detailed inverter models include accurate switch behavior, real losses modeling, combined electro-thermal aspects and linked to component thermal management and cooling. The models are applicable for a wide frequency range, power levels and voltage applications. Explicit low voltage inverters (48V) and different topologies are included. The switch technology goes beyond typical Silicon devices, and includes hybrid modules and wide-bandgap Silicon Carbide MOSFETs and IGBTs. Several tools and software environment implementations and comparisons are provided.

Another important topic covered is real-time inverter models and scalability while ensuring parameter continuity over the different stages. This allows for deployment on FPGA and HIL testing. Scalability techniques and methodology are studied and reported.

Finally, inverter models parametrization and integration into a configurator tool for decision-making based on performance and economic indicators is studied and presented.

The inverter modeling and tools developed in this framework comply to the project requirements and inputs of other work packages, and are further used with other component models in this work package, and also in the integrated electric vehicle systems and models of other work packages, and implemented for the different applications in the use cases of the OBELICS project.

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Project partners:

Partner no.	Partner organisation name	Short Name
1	AVL List GmbH	AVL
2	Centro Richerche Fiat SCpA	CRF
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