



Optimization of scalaBle rEaltime modelS and functiOnal testing for e-drive ConceptS

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Public/Publishable Summary

Alternative energy in combination with E-mobility will replace combustion drive-chains step by step in the next years and decades – due to technical and environmental advantages. Highly efficient E-cars and a narrow mesh of service stations is needed, therefore. Besides pioneers in industrial E-car manufacturing, as Tesla Motors, which was founded in 2003 by Martin Eberhard and Marc Tarpenning, conventional, high sophisticated car manufacturers as Rolls Royce are presenting the opportunity to own and proudly enjoy an exclusive, authentic Rolls Royce Corniche (Cabriolet or Coupé) which meticulously is transformed into a truly contemporary Battery Electric Vehicle (BEVs) - a new form of zero-emission “Sustainable e-Classic” which you can drive every day (Royce, 2019).

Within the Horizon 2020 program of the European Union, the OBELICS (Optimization of scalaBle rEaltime modeLS and functIonal testing for e-drive ConceptS) project refers to functional testing and test/system integration of battery, E-motor and inverter – the lung, heart and brains of every e-drive concept.

The present report, deliverable D4.4 completes the yearly reports within Work package 4 of the Horizon 2020 OBELICS-project, besides deliverables D4.1 and D4.3, in combination with deliverable D4.2 (which was focused on batteries and their control-systems) and milestone 03 (which ensured the functionality of the P-HiL system at AVL SFR). It focusses on Back-to-Back tests for high-frequency-inverter (HF-inverter) testing with e-motor emulator and batteries improved scalable tests. This, in order to shorten the time between design and test, simplify the handling of scalable real-time models for the purpose of testing and reduce the effort for transformation of testing methodologies in different stages of the development process.

The objective regarding to requirements is the efficiency increase of system engineering testing to increased improvement of test case generation and its management. These requirements are defined implicitly within the models (V-model) or are only loosely coupled.

With view to a high quality of the undertaken R&D activities, several use-cases (UCs) were implemented, where similar ones were bound together to use-case clusters (UCCs). The whole project is developed along these UCs. Moreover, a unique OBELICS-use-case contribution matrix was installed, which allows in steps of work-packages an interacting comparison of methods and results of all parallel developed UCs, resulting in discussions and conclusions. The implemented UCCs are here:

- UCCs 1 & 2 Complete Systems (incl. E-Motors): New e-drive concept & component sizing in earlier design phase (scalable models); E-vehicle system integration, optimization with real world verification (model-based testing)
- UCC 3 Batteries: Battery design and testing for improved safety & reliability
- UCC 4 HF-Inverters: E-motor, control and inverter design & testing

Work-package 4 (WP4), which is regarded here contains requirements, designs, test methodologies, and executes well-defined tests. The test environment covers all tests, starting from MiL to SiL and furthermore the HiL, ViL, PiL via XiL test cases for HF-inverters in combination with e-motors and batteries and its infrastructure.

The investigated methods and results are manifold, several high-sophisticated project partners are delivering contributions to this report.



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Project partners:

Partner no.	Partner organisation name	Short Name
1	AVL List GmbH	AVL
2	Centro Recherche Fiat SCpA	CRF
3	FORD Otomotiv Sanayi Anonim sirketi	FO
4	Renault Trucks SAS	RT-SAS
5	AVL Software and Functions GmbH	AVL-SFR
6	Robert Bosch GmbH	Bosch
7	SIEMENS INDUSTRY SOFTWARE NV	SIE-NV
8	SIEMENS Industry Software SAS	SIE-SAS
9	Uniresearch BV	UNR
10	Valeo Equipements Electroniques Moteurs	Valeo
11	Commissariat à l'Énergie Atomique et aux Énergies Alternatives	CEA
12	LBF Fraunhofer	FhG-LBF
13	FH Joanneum Gesellschaft M.B.H.	FHJ
14	National Institute of Chemistry	NIC
15	University Ljubljana	UL
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