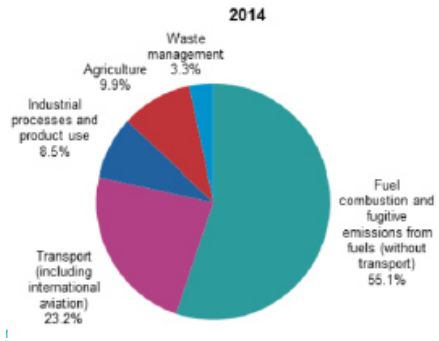
Optimización de conductores de alto rendimiento Wide Band Gap a través de simulaciones multifisicas para la eficiencia energética

The vision of HiPERFORM is a resource-efficient and decarbonized transportation system supported through the use of advanced and highly integrated wide-bandgap (WBG) technologies in the electronic power circuits of electrified vehicles and the necessary efficient charging infrastructure.

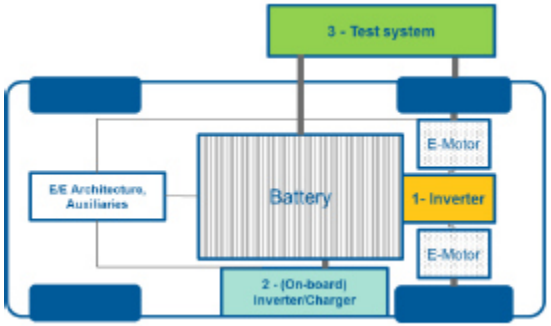


Distribution of energy consumption in Europe in different industrial sectors

Vision of HiPERFORM

The transportation system in Europe contributes, with a share of approx. 23%, significantly to the total Greenhouse gas emissions1 (GHG) and thus to global climate warming (compare also). The Kyoto long term objectives of -20% GHG in 2020 compared to 1990 can be reached, however, the next target Europe has set itself is a -40% reduction in 2030 and will require substantial measures in all affected areas. For car manufacturers and industry another target of 95g CO2 per kilometre in 2021 is evident, since EU has set rules to fight climate change in this area as well. A penalty of €95 for every gram of CO2 above this target is set out and may cost the automotive industry several billion euros2. The current fleet values for CO2 are located around 120-130g per kilometre and reaching a reduction of ~25% within the next 3-4 years is extremely ambitious if not impossible. The prognosis gets worse if we take into account the planned changes in testing regime, to measure emissions in real driving conditions rather than the currently used but outdated or at least not very realistic driving cycle (NEDC). It is expected that the new worldwide-harmonised light vehicle test procedure (WLTP) will increase CO2 emissions by 10% in comparison to NEDC test cycles in average for all OEMs3.

HiPERFORM



Overview about systems with advanced WBG-power electronics in HiPERFORM

The massive introduction of affordable electrified vehicles is the only means that can help to reach the very ambitious targets for the transport, which of course must be accompanied by introduction of renewable energy sources to produce the electricity. Besides development of battery electric vehicles (BEV), which do not directly emit any CO2 but are still rather expensive because of the battery technology, the introduction of hybrid vehicles and fuel cell powered systems might be very useful. However, all types of electrified vehicles need efficient power electronics to convert the electrical energy between different voltage levels or from AC to DC and vice-versa. Intelligent control modules and charging units are required to balance and control the energy between different sources and find the best optimum that requires minimal energy resources. The high level requirements for the electric or electrified drivetrain require dedicated development and testing tools that allow the exploration of different variants and investigations into optimal solutions.

Objectives

- **HiPERFORM will investigate advanced production processes and methods for GaN and SiC based switches for the application in automotive domain and aims to enable a long term cost reduction of 40% in comparison with existing samples of these innovative switches.**
- **The project HiPERFORM will research and develop architectures for switching topologies and controllers with SiC and GaN switches that support switching frequencies up to 500 kHz and have 30% less energy losses in comparison to existing architectures, enabling energy efficiencies up to 98% in power train applications.**
- **The partners in HiPERFORM will research and develop compact and reliable concepts for power electronic modules for the use in electrical drivetrains and test systems based on SiC and GaN technologies with up to 50% less spatial volume in comparison to existing modules.**
- **The research work in HiPERFORM will enable EMC compliant next generation inverters, charging devices and test systems built on SiC/GaN technologies that have 30% less energy losses and are up to 50% smaller in size, compared to existing systems. The overall reliability and safety of the system will be at the same level as for drivetrains with Si-technology that is currently investigated in other related research projects for e-drivetrains.**

Proyecto desarrollado en consorcio con Tecnalia, Ibermática-i3B, Idiada Automotive y Modemsys junto con organizaciones de Austria, Alemania (incluido el Instituto Fraunhofer), Bélgica, Italia, Francia, Eslovaquia, Eslovenia y Holanda.

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