

**WIDE BAND GAP
SEMICONDUCTOR BASED
POWER ELECTRONICS FOR
AUTOMOTIVE INDUSTRY**

HiPERFORM

Online Webinar Series

May 4th, 12th, 18th, 25th and June 1st 2021

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| Speakers

mec

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| Introduction

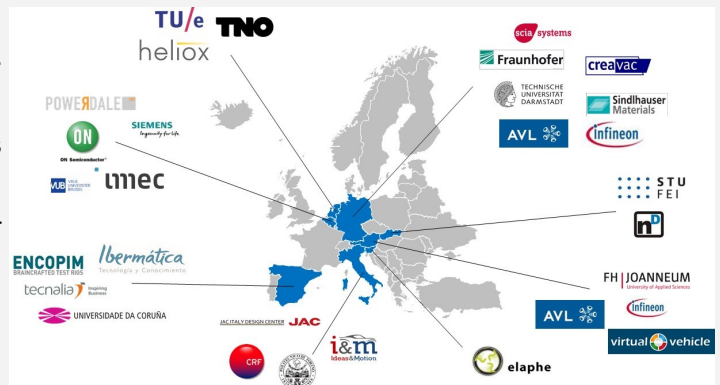
Wide Band Gap Semiconductor based Power Electronics for Automotive Industry

Since quite some while, electric mobility is discussed as an enabler for green mobility and an urgently needed reduction of CO₂ emissions in the transport sector. In the last two to three years, the shift towards electromobility has accelerated significantly. However, today's technology still limits driving ranges and prices of electric cars are higher than those of conventional vehicles. Research is therefore focusing on innovative technologies to remove the limitations and enable electric mobility for a wide range of customers.

A promising approach is the application of wide band gap semiconductors in automotive applications. They help to enable highly efficient power electronics for electric cars and thus increase the range. The HiPERFORM project develops wide band gap semiconductors for use in automotive applications such as inverters, charging and testing solutions.

In HiPERFORM, 31 partners from 8 European countries are collaborating since May 2018. Meanwhile significant advances were made in GaN production processes (e.g., breakdown voltages as high as 1.2 kV for GaN buffer layers) as well as newly developed WBG devices are ready for application:

- GaN switches at 100, 200 and 650 V, and
- SiC based power modules at 1200 V.



This webinar series gives insight into the development of the project, especially the application in the automotive domain. The first part will focus on new GaN production processes and the achieved advances. Secondly, highly innovative inverter concepts based on double side cooled SiC power modules will be presented. The third webinar will focus on the application of WBG semiconductors in charging applications: on- and off-board. Essential for the development of EVs are also according testing solutions which will be highlighted in webinar number four. The last webinar will demonstrate an integrated vehicle, having a WBG powered drivetrain for dual in-wheel motors.

Let's watch our Webinars and check out the advances!

| Key Topics

- Innovative substrates for GaN
- SiC automotive inverter
- WBG off- and on-board charger
- E-mobility test systems
- Wide band gap automotive inverter

| Webinar Sessions

#1 | Tuesday, May 4th, 4 - 5 p.m.

| Innovative Substrates for GaN Power Electronics: Poly-AlN and Sputtered AlN films on Si
Speakers: Benoit Bakeroot, Hagen Bartzsch



Within HiPERFORM, two approaches for innovative substrates for gallium nitride (GaN) power electronics are investigated. The first approach makes use of poly-Aluminium-Nitride (poly-AlN) as substrate material, with the objective developing 1.2 kV-rated GaN buffers on these substrates. The second approach deals with the magnetron sputter deposition of AlN and GaN layers onto Si. Reactive magnetron sputtering has the potential of a cost-efficient process and of lower stress in the films. The present status of epitaxial deposition of AlN thin films onto Si wafer will be shown.

#2 | Wednesday, May 12th, 4 - 5 p.m.

| Double-side cooled Modules as future Technology in automotive Traction Inverter
Speakers: Peter Weiss, Omar Vanegas



In order to utilize the full capabilities of SiC MOSFETs in automotive inverters, various aspects must be considered. Understanding WBG semiconductor materials, efficiency, smaller packages and high-power density, EMC challenges, lowest unit price and integrability are some of these aspects. All these points are highly competing with each other. This webinar shows a SiC traction inverter with double-side cooled (DSC) modules, that optimizes this seemingly incompatible points in a structured manner. An innovative solution uses DSC modules as an enabler to raise the compatibility of the above factors to a balanced optimum, resulting in a future-proof and market-driven DC/AC converter for the automotive market.

#3 | Tuesday, May 18th, 4 - 5 p.m.

| Advanced WBG semiconductors in on- and off-board chargers
Speakers: Humphrey de Groot, Mohamed Abdel-Monem



The continuous development of semiconductor switches based on GaN and SiC technology is gaining influence on EV chargers. This webinar aims to provide a deeper understanding of the current state and potential impact of using GaN and SiC based technologies in on- and off-board chargers. While SiC technology is replacing Si-based IGBTs in off-board chargers, GaN technology is making its way into on-board chargers.

#4 | Tuesday, May 25th, 4 - 5 p.m.

| Power & Dynamic Performance Measurement for Fast Switching Power Electronics
Speakers: Oliver König, Thomas Platzler



Modern e-drivetrain components demand powerful and highly dynamic test systems. This webinar introduces you into DC supplies, which also serve as powerful, dynamic actuators. Combined with a high-speed and modular data acquisition platform, it is possible to measure the dynamic performance in time and frequency domain. Possible applications are DC/DC and DC/AC converters as well as DC energy storage systems and entire DC power systems. This webinar gives an insight, how this technology is used for developing new test systems.

#5 | Tuesday, June 1st, 4 - 5 p.m.

| WBG powered drivetrain for dual in-wheel motors

Speakers: José A. García-Naya, Claudio Romano, Nicola Amati



This webinar gives insight into a vehicle demonstrator, having a flexible and modular e-traction axle system, which is the combination of in-wheel motors and a SiC based dual inverter. Additionally, a telematics control unit allows remote wireless access to the data available on the CAN bus. Furthermore, to improve vehicle yaw stability, active torque distribution in rear axle is used and will be discussed in this webinar. The presentation will be closed by an overview of the test results obtained by a test campaign carried out on a dedicated test rig.