

## 3Ccar Newsletter No.2/2016

February/March 2016

### Introduction

**¡Hola!** After having a great inspiration session in Malaga, the second newsletter of the 3Ccar aims at giving a glance on the progress of Workpackages and the Supply Chains as well as the dissemination events and other activities.

### Supply Chains updates

**SC1:** Till now, two deliverables were prepared in SC1. The first deliverable, D1.1, describes the requirements of the battery system and its components. It defines the 48V battery system that will be developed during 3Ccar with its subsystems. This includes the 48V to 12V DC/DC converter, the BMS master unit and the BMS slave units (smart battery cell electronics) and the communication between these devices. Further, the algorithms running on the BMS master unit were described.

**SC5:** SC5 is a rather small supply chain focussing on communication issues ranging from architecture and back-bone network for vehicles with automated driving functionality and related network components and ECUs to wireless connections for V2V and V2I implementation and related simulation and semiconductor devices. SC05 will produce a demonstrator showcasing a novel architectural design for improved safety features and connectivity. During the first 6 months project period, the input and common understanding of partners was developed, the team continues working in order to reach its goals.

**SC7:** MEMS mirror basic structure and manufacturing process has been designed and Okmetic is currently manufacturing SOI wafers for the first prototype run. Movable reflector is a 50  $\mu\text{m}$  thick SOI (Silicon on Insulator) layer which is piezoelectrically driven using thin-film AlN actuators and wafer-level capped in low pressure using Si-glass TSV (through silicon via) wafer on top and transparent glass window on bottom. Detailed structural design including FEM and photomask drawing is ongoing. Different LIDAR system architecture options have been analyzed. Two basic

options are single optical path device and a system with separate send and receive channels. Two possible lenses have been initially designed: omnidirectional and anamorphic. Linear APD (avalanche photodiode) has been found more suitable detector than a SPAD (single photon avalanche diode). Operation wavelength has been selected as 905 nm.

**SC9:** For the smart HVAC Flap a system lay-out was achieved together with the requirement definition of the distributed and integrated layout. For the smart damper the requirement definition is finalised and will be combined together with the smart Flap in deliverable D1.11, which will be finalised and reviewed in February. All partners did receive the vehicle parameters for their relevant vehicle simulation and the method of evaluating the results were discussed and agreed. VGTU has completed the building of a scaled damper with harvesting functionality for testing on the rig. Further a vehicle simulation model for vertical movements is currently being validated by Tenneco. TNO defined a cost models methodology for assessing comfort and energy use and have also developed Simulink models, which are made proving the advantages of active suspension on road excitations. TUE has built several components, including communication module and on-board electronics.

**SC10:** At this very initial project stage, side meetings and discussions were basically the main activities to achieve the alignment of the supply chain partners. Finally an agreement was reached to define two differentiated work lines/topics, providing more coherence and contents consistency, given the so generic supply chain title. The two defined topics are as follows: cost effective technology platform for an EV/PHEV onboard battery charger and the development of new low cost, high efficient and small footprint BCD semiconductor devices.

### Work Packages updates

**WP2:** The model of bipolar stepper motor together with the inverter model was created using Modelica

language in Dymola. This model enables to simulate behavior of bipolar stepper in micro stepping. It will be also used for reduction of required number of component for this control. Expected innovation is audible noise reduction and lowering down the complexity leading to price reduction. Preliminary discussions about powertrain motor layout show that the motor will be PMS one with six phases connected as 2 times three phase motor. The development of the model of this motor could start and it is actually in progress. The model is being constructed in the environment of Matlab Simulink with the emphasis on precise description using differential equation. This way of modelling will be helpful in control algorithm development since it will enable to decouple both inner motors. This is a key enabler of fault operational functionality which enables to switching off one three phase subsystem without influencing the other one and without leading to dramatic torque changes. The work has already started on development of thermal IGBT model for k-level n-phase inverter and on design of virtual prototype of domain controller integrated with system level model.

**WP3:** Activities, which are overlapping with WP2. According to WP1, partners try to define power electronic, like power modules and Chips to fulfil the specification sheets, coming from WP1. The Power module HP-Drive could be a promising candidate for applications needed in SC2 (Electro vehicle) and SC3 (Main switch fuel cell). This power module emerges as very flexible and powerful and could carry IGBT's as well as new wide band gap chips like SiC- MOSFET's. First Evaluation kits for HP-Drive are under preparation so that project partners (SC2, SC3) can get familiar to this power module. Simulations including switching losses and thermal resistances will be done next in order to find out critical working points (Peak current, hill hold, acceleration modus)



## Core Team highlights

Currently, the Core Team is working with the material developed in Malaga meeting. The videos are being processed and the partners are working on the presentation of the meeting results.

However, the next steps are to plan the Review preparation meeting, which takes place in **Oudenaarde, Belgium, on the 26<sup>th</sup>-27<sup>th</sup> of April**. Afterwards, the **review meeting in Munich on the 12<sup>th</sup>-14<sup>th</sup> of July** will follow.

## Dissemination & Meetings highlights

3Ccar project was presented in the **Nanoelectronics forum, 1-2nd of December 2015**, which took place in Berlin, Germany. The stand got a III place award in the exhibition.



In the end of January (18<sup>th</sup>-20<sup>th</sup>) there was a **HiPEAC conference** in Prague, Czech Republic, where 3Ccar partners have organized a workshop and disseminated the information of the project in the event.