

**E-VECTOORC**  
**Electric Vehicle Control of Individual Wheel Torque for On- and Off-Road Conditions**  
**FP7-INFSo-284078**

## Deliverable D8.3

# Year 2 Dissemination Report

Author(s)	Valentin Ivanov (TUIL)
Responsible of the deliverable	Valentin Ivanov (TUIL) Phone: +49 3677 693869 Email: valentin.ivanov@tu-ilmenau.de
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## E-VECTOORC Consortium

Participant organisation name	Part. short name	Country
University of Surrey (Coordinating Institution)	SURREY	UK
Technische Universität Ilmenau	TUIL	Germany
Jaguar and Land Rover	JLR	UK
Flanders DRIVE	FLANDERS	Belgium
Inverto	INV	Belgium
Fundacion CIDAUT	CIDAUT	Spain
Instituto Tecnológico de Aragón	ITA	Spain
VIF Kompetenzzentrum - Das virtuelle Fahrzeug, Forschungsgesellschaft mbH	VIF	Austria
ŠKODA AUTO a.s.	SKODA	Czech Republic
TRW Automotive Lucas Varity GmbH	TRW	Germany

## Abstract

The following document describes the dissemination activities of the E-VECTOORC project during year 2. The report includes:

- Promotion activities;
- Research and technology presentation activities;
- Other information relevant to the dissemination of the project results.

**Keywords:** Dissemination, promotion activities, presentation activities, stakeholders

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# 1 Coordination of dissemination activities in the E-VECTOORC consortium

During the second year of the E-VECTOORC project the dissemination activities have been continuously carried out in accordance with the targets indicated in the project description and specified after the completion of the first year of the project in Deliverable 8.2. All the consortium partners have taken an active part in the tasks of the “Dissemination and Exploitation” work package (WP8). The leader of WP8 is the project partner TUIL (Ilmenau University of Technology).

During the reporting time, the ongoing and expected dissemination activities were discussed and reviewed at the following meetings:

- The year 1 review meeting, Brussels (Belgium), 11.10.2012 – revision of the dissemination results obtained in the first year of the project and approval of the dissemination plan for the second year of the project. In particular, the publication plan has been updated in accordance with recent project results and measures for the actualization of the exploitation plan for the second and third years of the project have been defined.
- The 15-month review meeting, conference call, 11.12.2012 – refinement of the publication plan taking into account new project results obtained by the project partners University of Surrey (yaw moment control) and Aragon Technological Institute (active vibration controller);
- The 18-month review meeting, Mladá Boleslav (Czech Republic), 19.03.2013 – update of the dissemination plan for the second year of the project and preparation of the dissemination event in Graz (see section 4);
- The 21-month review meeting, conference call, 12.06.2013 – refinement of the publication plan taking into account recent tests on the E-VECTOORC vehicle demonstrator at the proving ground in Lommel (Belgium).

The results of the dissemination activities are regularly published on the official E-VECTOORC web-site <<http://www.e.vectoorc.eu>>. In particular, the project news were

updated twelve times and all conference presentations or other published materials were made accessible through the special dissemination page of the web-site <<http://www.e-vektorrc.eu/en/view/links.html>>.

The next sections introduce the main components of the dissemination activities relevant to the second year of the project.

## 2 Research and technology presentation activities

### 2.1 Conference papers and presentations

The research results were presented at conferences, symposia and workshops to engage with the relevant scientific communities. The conference papers and presentations delivered in year 2 are listed in Table 1.

Table 1 – Conference papers and presentations

No.	Authors, Title	Event	Partners
1	Knauder, B., Pözlbauer, F., Zehetner, J., „Modellierung von Informationskanälen für den Einsatz in Simulationsumgebungen“	SIMVEC 2012, Baden-Baden, Germany, 20.-21.11.2012	VIF
2	Ivanov, V., Augsburg, K., Savitski, D., Plihal, J., Nedoma, P., Machan, J. “Advanced cost functions for evaluation of lateral vehicle dynamics”	FISITA 2012 World Automotive Congress, 27-30.11.2012, Beijing, China	TUIL SKODA
3	Machan, J., Nedoma, P., Plihal, J. “E-VECTOORC Project Introduction”	The XXII International Conference Expert Forensic Science, 25-26.01.2013, Brno, Czech Republic	SKODA
4	Savitski, D., Plihal, J., Nedoma, P., Machan, J., Ivanov, V. “Cost Functions for Assessment of Vehicle Dynamics”	IEEE Symposium Series of Computational Intelligence, 15-19.04.2013, Singapore	SKODA TUIL
5	De Novellis, L., Sorniotti, A., Gruber, P., “Optimal Wheel Torque Distribution for a Four-Wheel-Drive Fully Electric Vehicle”	SAE 2013 World Congress, 16 - 18.04.2013, Detroit, USA	SURREY
6	De Novellis, L., Sorniotti, A., Gruber, P. "Torque-vectoring control for fully electric vehicles"	Vehicle Dynamics and Control, 16.04.2013, Cambridge, UK	SURREY
7	Steenbeke, D. “Results of the research project Electric Powertrain”	Workshop "The next generation electric powertrain: challenges and opportunities", 25.04.2013, Lommel, Belgium	SURREY FLANDERS
8	Pennycott, A. “E-VECTOORC: Improved vehicle performance by vehicle dynamics optimization”		
9	Savitski, D., Ivanov, V., Heidrich, L., Augsburg, K., Pütz, T. „Experimental investigation of braking dynamics of electric vehicle“	Eurobrake 2013 Conference, 17-19.06.2013, Dresden, Germany	TRW TUIL
10	Rodríguez, J.M., Meneses, R., Orús, J., “Active Vibration Control for Electric Vehicle Compliant Drivetrains”	IECON 2013 (Conference of the IEEE Industrial Electronics Society), November 10-13 2013, Vienna, Austria.	ITA
11	L. de Prada, M. I. González, J. S. Martín, B. Araujo, E. Cañibano, “Regenerative-Friction Braking Distribution. Tool for the Comparison of Strategies and Vehicles Configurations“	International Electric Vehicle Symposium & Exhibition, EVS 27, Barcelona, Spain, 17-20.11.2013	CIDAUT

## 2.2 Journal publications and book chapters

In the line with the targets set out in the project proposal, four papers have been published in year 2 (see Table 2). More journal papers are currently in preparation or already under review in order to be published in year 3.

Table 2 – Journal publications

No.	Authors, Title	Journal	Partners involved
1.	De Novellis, L., Sorniotti, A., Gruber, P. “Optimal Wheel Torque Distribution for a Four-Wheel-Drive Fully Electric Vehicle”	SAE International Journal of Passenger Cars – Mechanical Systems, Vol. 6, No. 1, pp. 128-136, 2013.	SURREY
2.	Ivanov, V., Augsburg, K., Savitski, D., Plihal, J., Nedoma, P., Machan, J. “Advanced Cost Functions for Evaluation of Lateral Vehicle Dynamics”	Lecture Notes in Electrical Engineering, Vol. 198, pp. 425-440, Springer, 2013.	SKODA TUIL
3.	M. I. González, B. Araujo, J. S. Martín, E. Cañibano. “Optimized Regenerative Friction Braking Distribution in an Electric Vehicle with Four In-Wheel Motors”	Advanced Microsystems for Automotive Applications (AMAA) 2013, Lecture Notes in Mobility 2013, pp 317-326	CIDAUT
4.	De Novellis, L., Sorniotti, A., Gruber, P. “Design and Comparison of the Handling Performance of Different Electric Vehicle Layouts”	Proc. IMechE, Part D: Journal of Automobile Engineering, 2013 (in press)	SURREY

### 3 Promotion and outreach activities

The promotion activities of the consortium follow the overall strategy developed in Work Package 8 aimed at the dissemination of all the results and outcomes (i) within the consortium, (ii) national and international research communities, and (iii) general public and media.

Especially for the project mid-term, an E-VECTOORC newsletter dedicated to the intermediate project results was prepared and published on the E-VECTOORC website as well as distributed by the consortium members to their business partners and stakeholders. The E-VECTOORC newsletter can be downloaded from the project web-site:

[http://e-vectoorc.eu/files/E-VECTOORC\\_newsletter\\_2013.pdf](http://e-vectoorc.eu/files/E-VECTOORC_newsletter_2013.pdf)

In addition, the following important promotional and outreach activities, aimed at promoting the communication between the research community and different clusters of the general public, were performed during year 2:

1. “Next generation electric powertrain presented by Flemish consortium”, Publication on the industry information platform for electrified vehicle experts worldwide, 30.04.2013; <http://www.cars21.com/news/view/5361>;
2. “Flanders' Drive Powertrain R&D-project is rond”, Publication at Engineeringnet.be, June 2013, [http://www.mainpress.com/nederlands/dossier\\_automation/pdf/FDpowerTrain.pdf](http://www.mainpress.com/nederlands/dossier_automation/pdf/FDpowerTrain.pdf);
3. „Information Harvesting” stoppt Informationsflut, Publication on CAR-IT information portal, 21.03.2013, <http://www.car-it.com/information-harvesting-stoppt-informationsflut/id-0036271>;
4. “Die Suche nach der perfekten Fortbewegung”, Publication on the Austrian media-portal ORF, 18.05.2013, <http://steiermark.orf.at/news/stories/2584903/>;
5. „Range Rover Elektro-Evoque: Ungeahnte Gelenkigkeit“. Publication in the Austrian newspaper Kurier, 17.05.2013, <http://kurier.at/lebensart/motor/range-rover-elektro-evoque-ungeahnte-gelenkigkeit/12.872.262>;



6. “Belgier entwickeln Motoren ohne Seltene Erden”, Publication in the German newspaper Wirtschaftswoche, 22.02.2013,  
<http://www.wiwo.de/technologie/auto/elektromobilitaet-belgier-entwickeln-motoren-ohne-seltene-erden-seite-all/7788358-all.html>;
7. „A motor with no rare earths?“, Publication in Drive World portal 10.07.2013  
<http://www.driveworld.de/en/focus-automation-en/general-fa/a-motor-with-no-rare-earths>;
8. Introduction of the project at the FISITA Educational Committee Meeting, Beijing, China, November 2012. Content: An example of the academia-industry partnership within the framework of the Green Car Initiative
9. Introduction of the project during the round table of the European Automotive Engineers Cooperation (EAEC) and FISITA Executive Body to Moscow, January 2013. Content: European funding research instruments in automotive area - case study of the project for the development of new electric vehicles technologies.
10. Presentation of a summary of E-VECTOORC on the Spanish-French dissemination event about electric vehicle at ITA "GreenCar: Retos, oportunidades y nuevos desarrollos", with participation of GM, CARTIF, FUJIKURA and ITA.

## 4 Engagement with stakeholders

The E-VECTOORC consortium has been in direct contact with the governmental, industrial, academic and relevant non-profit organizations identified as the potential stakeholders. The stakeholders have the benefit of obtaining first-hand information of the project results, and are able to contribute comments on the project findings. The most important action in this connection was the E-VECTOORC dissemination workshop, which took place on 13.05.2013 at the Congress Centre Graz (Austria). The invited experts from industrial and academic sectors were given the opportunity to assess recent research and technological outcomes of the project. In details, the programme covered the following presentations:

- „Benefits of all wheel electrification from the perspective of a manufacturer of highly capable vehicles“, Phil Barber (Jaguar Land Rover)
- „Human machine interface and vehicle dynamics parameters“, Zdenek Franc (Škoda Auto)
- „Novel electric drivetrains with switched reluctance electric motor drives“, Johan Theunissen (Flanders‘ Drive)
- „Torque-vectoring control for fully electric vehicles“, Aldo Sorniotti (University of Surrey)
- „Brake design for fully electric vehicles: the E-VECTOORC solutions“, Lukas Heidrich (Ilmenau University of Technology)
- „Torsional vibration controllers for electric drivetrains“, Javier Orus (The Aragon Technology Institute)
- „Electro-magnetic compatibility issues in fully electric vehicles“, Ivan Echeverria (The Aragon Technology Institute)

In conclusion, the E-VECTOORC project coordinator Dr. Aldo Sorniotti has introduced the next steps of the E-VECTOORC project activity. The workshop was accompanied by the exhibition of the vehicle demonstrator together with powertrain and brake system components.

Representatives of the following companies and research institutes attended the E-VECTOORC event:

- Oerlikon Graziano SpA;
- Hutchinson;
- TÜV;
- LMS International;
- Siemens AG;
- dSpace GmbH;
- International Society of Terrain-Vehicle Systems;
- Fraunhofer Institute for Transportation and Infrastructure Systems IVI;
- Triphase;
- MAGNA Powertrain AG & Co KG;
- ams AG;
- Fraunhofer Institute for Algorithms and Scientific Computing SCAI.

In year 3 of the project the stakeholders will be invited to the final E-VECTOORC dissemination workshop. This workshop will be organized in connection with one of the professional events in 2014 (expected: Special Session of FISITA 2014 World Automotive Congress at Maastricht, The Netherlands, 2-5 June 2014). The list of stakeholders can be updated and extended taking into account running activities of the consortium members. Additional stakeholders can be added upon recommendation of the EC.

The consortium gives special attention to collaborations with relevant European, national and internal projects. Such mutually advantageous cooperation is being organised with the following projects:

- *IEV: New methods of vehicle dynamics control for safety improvement and extension of cruising range of intelligent electric vehicles.* Project funded by the European Regional Development Fund, under performance at TUIL from 01.01.2012 till 31.12.2013. Subject of collaboration: (i) homologation of electric vehicles, (ii) advancement of procedures of hardware-in-the-loop testing of brake systems.
- *Intelligent Control on Terramechanic Systems with Application to Ground Vehicles.* Project funded by the German Research Foundation, under performance at TUIL from 11.2012 till 11.2013. Subject of collaboration: ABS control for all-wheel drive off-road vehicles.

- **PORT:** *Powertrain – Radio Train*. Interdisciplinary research group at Ilmenau University of Technology sponsored by Free State of Thuringia. Subject of collaboration: brake design for modular wheel corners of electric vehicles.
- **iCOMPOSE:** *Integrated control of multiple-motor and multiple-storage fully electric vehicles*. FP7 project to be started in October 2013 which is a synergetic extension of E-VECTOORC.
- **PLUS-MOBY:** *Premium low-weight urban sustainable e- mobility*. FP7 project to be started in October 2013. Through SURREY potential collaboration on vehicle control and energy management is possible.
- **FREE-MOBY:** *People centric easy to implement e-mobility*. Through SURREY potential collaboration on safety regulations is possible.

## 5 Preliminary plan of the dissemination activities for the third year of the project

The preliminary plan of the dissemination activities for the third year of the project is a subject of approval by all the consortium members. It will be discussed during the year 2 review meeting. The preliminary plan considers the following dissemination activities:

1. The dissemination event with the participation of stakeholders, Summer 2014. (responsibility - all partners)
2. The final project meeting, Autumn 2014 (responsibility - all partners)
3. Presentation of the project results at the following events:
  - FISITA 2014 World Automotive Congress, June 2014, Maastricht, The Netherlands (special session with the participation of all partners);
  - AVEC (Advanced Vehicle Control) 2014 Symposium, September 2014, Tokyo, Japan (responsibility - TUIL, ITA, FLANDERS, SURREY)
4. Publications in scientific journals. The manuscripts will be prepared to present the following project results:
  - State-of-the-art in ABS/TC for EV (responsibility – TUIL, SURREY);
  - State-of-the-art in yaw moment control (responsibility - SURREY, TUIL)
  - Experimental investigations of decoupled brake systems (responsibility – TUIL, TRW);
  - ABS and TC for EV (responsibility – ITA, FLANDERS, TUIL).
5. Patent applications:
  - Integrated ABS/TC system for electric vehicles (responsibility – TUIL, ITA, FLANDERS, SURREY);
  - Human-Machine-Interface for EV (responsibility – SKODA, TUIL).