AGENCE NATIONALE DE LA RECHERCHE

ANR

Presentation of the funded projects in 2010 for the « Véhicule pour les Transports Terrestres » Programme

AFAQ ISO 9001

« VTT » programme

YEAR 2010

Project title	**ActiSurTT** - Active safety system for "off road" vehicles
Abstract	The increasing requirements as well as the growing pressure on production activities has led the machine used in off-road conditions (such as public works or agriculture) more and more complex. In addition, the velocity of such vehicles, acting on irregular grounds increases irremediably. Moreover, bad grip conditions encountered in the considered context, appear to be variable (due to ground nature), as well as vehicle parameters (i.e. on loaded implements or ballasting masses). All these specificities tend to make risks related to loss of control substantially increase. As a consequence, frequency and seriousness of accidents in this field of area are always too high. If the driver education and responsibility is an important factor for risk reduction, the development of assistance devices constitutes a promising alternative, still poorly investigate in off-road applications. Such devices have been largely and successfully designed and applied in on-road conditions. Off-road applications could hardly take benefit of these innovations. Nevertheless, the numerous encountered situations and conditions as well as their variability decrease the efficiency of systems such as ABS or ESP. Moreover, situations leading to accidents are also quite different (mainly loss of trajectory control in on-road conditions against loss of stability in off-road). The proposed ActiSurTT project aims at designing new driver assistance systems dedicated to off-road vehicles, enabling to anticipate and then reduce the risk of accident. Situations of accident particularly addressed in the frame of that project will be the rollover (longitudinal and lateral) and the control loss due to bad grip condition (leading to vehicle drift, especially in slope). Because of uncertainty and variability of dynamics encountered in the framework of that project, a first objective lies in the accurate description and knowledge of the machine motion in real time. Based on both reconstruction algorithms and the design of a low cost perception system using innovative sensors, adaptive models to characterize uncertain dynamics will be developed. This will enable the estimation of behaviour in real time with respect to the context and interaction with the environment. Thanks to this knowledge, the design of algorithms for risk estimation and anticipation will be designed. Such a prediction, gathered with the study of the driver

behaviour will allow the definition of warning systems easily understandable. In order to be fully applicable, such devices have also to warranty their integrity (accuracy, fault detection...). This will be investigated by a sensitivity study coupled with probabilistic reliability algorithms. Above driver warnings, the risks detection and anticipation will also enable the synthesis of autonomous correction law, acting in relationship with the driver on actuators, enabling to maintain vehicle in a safe domain. This project, scheduled on 36 months, will gather the scientific and technical contributions around an experimental vehicle, enabling to test and evaluate the benefits of the device developed. This experimental vehicle will be derived from an actual agriculture marketed machine particularly facing accident risks. The synergy between laboratories and manufacturers involved in that project will favoured the efficiency and applicability in middle term of the project contributions on "off road" vehicles.

Partners	- Cemagref - Université Paul Cézanne Aix Marseille III / Laboratoire des Sciences de l'Information et des Systèmes - Université de Limoges / XLIM UMR 6172 - Université Blaise Pascal / Laboratoire des Sciences et Matériaux pour l'Electronique, et d'Automatique - Caisse Centrale de la Mutualité Sociale Agricole - Centre Technique des Industries Mécaniques - AXEMA - PHIMECA - GREGOIRE SAS - POCLAIN HYDRAULICS Industries SAS
Coordinator	Michel BERDUCAT – Cemagref michel.berducat@cemagref.fr
ANR funding	1 322 230 €
Starting date and duration	2010-12-15 / 36 months
Reference	ANR-10-VPTT-008
Cluster label	VIAMECA - ELOPSYS

« VTT » programme

YEAR 2010

Project title	**BicNanoCat** - Ionic bombardment for catalyst creation
Abstract	The more and more severe laws on environmental protection, as well as society concerns on life quality and sustainable development, oblige industrial entities and institutions to a strict control of exhaust emissions from vehicles equipped with combustion engines. To face the forecast rules on tolerate emissions, abatement catalysts for car exhaust are necessary. Nowadays, to be effective, a catalytic exhaust system must reach a working temperature of about 250°C. This device for NOx, HC and CO conversion emissions is, as a consequence, ineffective during the cold start. The present project concerns environmental protection catalysts, based on platinum-series elements, to be applied to exhaust abatement systems from vehicle thermal engines. One of the main goals is to decrease their working temperature for the catalytic reaction, increasing in parallel their durability towards temperature ageing. The expected consequence should be a significant decrease of the time necessary to reach steady conditions in the exhaust control system after the cold engine start (particularly when the vehicle is driven in a town centre), and that stabilized towards ageing with time. Catalysts are generally synthesized by conventional methodologies, such as ionic exchange or impregnation of platinum or palladium precursors on metal oxide supports. These synthesis methods are generally unable to provide an optimal dispersion of noble metals. Moreover, metal particles are affected by sintering phenomena and removal from the support due to system ageing. That obliges impregnators to increase noble metal loading, which provokes important extra-costs for the vehicles car exhaust control systems. Car constructors are interested to study a modification process of the surface composition and/or morphology of post-treatment catalysts, in collaboration with academic laboratories. Preliminary tests have in fact encouraged this project. They have shown that ionic bombardment leads to: 1) a better dispersion of the metallic phase and to the creation of nanoparticles on a silicon support; 2) a better catalytic activity of a commercial shaped catalyst. In the frame of this project, these investigations must continue on two parallel axes: • Fundamental research (ILV, LCS): determination of the

phenomena correlating the ionic bombardment with metal nano-dispersion, depending on the nature and energy of the ion, towards the nature of the treated metal. Application to the catalytic activation of platinum-group metals and other metals on different supports.

• Industrial research (PCA, Renault): tests and validation of the ionic bombardment process on prototypes of catalytic exhaust systems, analyzed on a synthetic gas bench and on a motor bench. Study and development of ionic bombardment methods adapted to the industrial production.

Partners	- CNRS Délégation Régionale Normandie / Laboratoire Catalyse et Spectrochimie - PEUGEOT CITROËN AUTOMOBILES SA - Regienov G.I.E. - Renault - Université de Versailles Saint Quentin en Yvelines / Institut Lavoisier de Versailles, UMR CNRS UVSQ 8180
Coordinators	Marco DATURI & Philippe BAZIN – LCS Marco.Daturi@ensicaen.fr ; Philippe.Bazin@ensicaen.fr
ANR funding	829 952 €
Starting date and duration	2011-01-01 / 36 months
Reference	ANR-10-VPTT-003
Cluster label	MOV'EO

« VTT » programme

YEAR 2010

Project title	**DIVAS** - Diesel Innovative VVA and Advanced air System for Downspeeding
Abstract	DIVAS Project aims to identify promising and innovative technological ways in order to cut off CO2 emissions (by 10%) on Diesel engines. Strong downspeeding approach is addressed, in order to overcome scientific and technological locks in air loop management (increasing air filling for low end torque). Considering results already obtained by simulation, two concepts with strong potential have been identified ; target of the project is to explore more deeply these concepts, by advanced dedicated research and experimental work on adapted engines : - compressor + turbocompressor: this new technological way allows high increase of air filling, with benefits in CO2 emissions. We propose to study and adapt prototype engine (adaptation of air path) with advanced control strategies in order to take maximum advantage of air filling, to study current technological locks (drivability, compressor drive power...) and to confirm potential on experimental tool. - variable valve actuation + turbocompressor: innovative concept of variable valve actuation is proposed in order to allow scavenging (enhancing turbocharging and air filling) without penalties well known in Diesel engines (deep valve pockets in piston). We propose to validate on experimental engine good results obtained in simulation, identifying transient behavior and explore more in details this concept in part load operation: lowering fuel / air ratio, after treatment control. The coupling of these two techniques will be performed at the end of the program, after identification of synergies. This project is complementary to Synergy project, that aims to perform downspeeding but with different technological ways (2-stage turbocharging, VVA for part load operation). Moreover, experimental tools share some features (combustion system, generic VVA definition on multi cylinder engine), that helps to better identify benefits and drawbacks of each approach and dramatically reduces costs linked to conception and tests.
Partners	- Renault (Regienov G.I.E.) - IFP ENERGIES NOUVELLES - VALEO SYSTEMES THERMIQUES, Domaine Efficacité de la Propulsion - IRSEEM - Arts et Métiers ParisTech, Laboratoire DynFluid - Equipe

	Turbomachines :EA 92
Coordinator	Karim BENCHERIF – Renault (Regienov G.I.E.) karim.ben-cherif@renault.com
ANR funding	1 279 493 €
Starting date and duration	2010-12-01 - 24 months
Reference	ANR-10-VPTT-012
Cluster label	MOV'EO

Project title	**E-CEM** - Electromagnetic compatibility of power systems
Abstract	One way to significantly reduce carbon emissions in transport is to consider the development of hybrid and electric vehicles. Thus, the use of power converters will rapidly increase in modern vehicles. In order that the introduction of power converters in transport vehicles be done in harmony with the low-level systems as well as constraints related to human exposure to electromagnetic fields, it has become fundamental to anticipate the behaviour of EMC in power systems at a very early design stage. As such, this project is a continuation of SP4 program O2M and therefore proposes to continue the development of tools to take into account EMC in static energy converters. For memory the SP4 O2M has treated the problem of active power component description in time and frequency domains, the near-field coupling between electronic components and taking into account the effect of temperature. The result is the ability to obtain a reliable model for a power module. These models will be completed by those of harnesses and of motors / actuators. Also a big effort will be made to the propagation phenomena and the development of optimization tools. The goal now is to go into modelling a subsystem that is to say a system composed only of the power module, a beam and an actuator / motor. This model will allow the search for optimum configuration. The proposed methods must be adaptable to rapid modelling required during the pre-sizing or simulations more time-consuming giving access to quantitative results. We will study aspects including system modelling and global optimization.
Partners	- Valeo Etudes Electroniques - Ecole Centrale de Lyon - Laboratoire AMPERE :UMR 5005 - Institut de Recherche en Systèmes Electroniques Embarqués - Grenoble-INP - LABORATOIRE DE GENIE ELECTRIQUE DE GRENOBLE :UMR 5269 - CNRS - Délégation Ile de France EST (DR03) - Laboratoire des systèmes et applications des technologies de l'information et de l'énergie :UMR 8029 - CEDRAT S.A. - REGIENOV
Coordinator	François DE DARAN - Valeo Etudes Electroniques (VEE)

	francois.de-daran@valeo.com
ANR funding	1 255 805 €
Starting date and duration	2011-01-03 / 36 months
Reference	ANR-10-VPTT-013
Cluster label	MOV'EO

« VTT » programme

YEAR 2010

Project title	**FIDEA** - Reliability and Diagnostic of Automotive Power Electronic Devices
Abstract	In conventional vehicles more and more electrical components are embedded to meet the needs of comfort, consumption reduction and function optimizations. Moreover, in the case of electric vehicles (EV) and hybrid (HEV) traction functions are handled by electronic power converters. For the latter applications, the markets for hybrid vehicles in the various possible architectures are beginning to develop at a "serial" scale". Particularly in Europe, based on micro-hybrid or mild-hybrid architectures, generally with low voltage (<50V) ads for series production are increasing. This leads to an increase in the number of power components embedded in a vehicle and thus to greater occurrence of failures of these components. Simultaneously to reduce costs, the active area of these components is increasingly reduced, leading to a continuous increase of electro-thermo-mechanical applied stresses. Due to manufacturing processes and modern methods of maintenance, component failure generally leads to the module failure. All this leads to a very high requirement in terms of reliability, a requirement which must be achieved gradually as the electric power installed increase progressively under penalty of greatly hamper the necessary development goals of consumption reduction. To achieve this objective, it is first necessary to understand the failure modes and failure mechanisms of power modules following normal and abnormal use. But such a study must be considered at a system level of the power electronics (module + thermal environment and packaging + connections) taking into account the real application environment.
Partners	- FRENCH INSTITUTE OF SCIENCE AND TECHNOLOGY FOR TRANSPORT, DEVELOPMENT AND NETWORKS / Laboratoire des Technologies Nouvelles - Institut Polytechnique de Bordeaux / Laboratoire de l'intégration du Matériaux au Système - CNRS Délégation Régionale Midi Pyrénées / Laboratoire d'Analyse et d'Architecture des Systèmes du CNRS - Université de Montpellier 2 / Institut d'Electronique du sud - Université de Montpellier 2 - Ecole Nationale de Mécanique et d'Aérotechnique / Institut P' - Département Physique et Mécanique des Matériaux

	- CNRS Délégation Régionale Ile de France Est / Systèmes et Applications des Technologies de l'Information et de l'Energie - CNRS Délégation Régionale Midi Pyrénées / Centre d'Elaboration des Matériaux et d'Etudes Structurales - Freescale Semiconducteurs SAS - ACTIA - PEUGEOT CITROËN AUTOMOBILES SA
Coordinator	Zoubir KHATIR - IFSTTAR (LTN-Satory) zoubir.khatir@ifsttar.fr
ANR funding	1 608 841 €
Starting date and duration	2010-12-01 / 36 months
Reference	ANR-10-VPTT-001
Cluster label	

« VTT » programme

YEAR 2010

Project title	**ICAMDAC** - Instabilities and Abnormal Combustions in Downsized Spark Ignition Engines
Abstract	Engine downsizing is a major route explored for reducing CO2 and pollutant emissions of spark ignition engines. Its principle is to reduce the engine displacement and to increase at the same time its specific power with the help of a turbocharger, especially at middle and high loads. Its development leads to the appearance of abnormal combustions (AC), whose control by a high EGR (exhaust gas recirculation) rate can also lead to important cyclic variabilities (CV). The identification of the multiple parameters controlling these phenomena, and the understanding of their interactions, is still very limited. For this reason, an approach based solely on experiments is insufficient. In this context, ICAMDAC proposes a fundamental research study combining experiments, three dimensional simulations and system simulations. Its idea is to investigate in detail a limited number of important parameters controlling AC and CV. The final objective is to contribute to the understanding of the involved mechanisms and to develop the simulation tools which will allow predicting the conditions of their occurrence. A central element of the proposed simulation approach is the development and the innovative usage of Large-Eddy Simulation (LES), which has the unique capacity to simulate successive individual engine cycles, and to provide at the same time detailed instantaneous and local flow phenomena. In order to achieve these objectives, three complementary research axes are proposed. The first deals with the further development of an existing LES tool to give it the capacity to represent these phenomena. These developments include a detailed representation of the wall temperature using multi-physics simulation, as well as an advanced modelling of auto-ignition and flame propagation. The latter relies on dedicated experiments in a high pressure vessel and on Direct Numerical Simulations (DNS) of laminar and turbulent spark ignition cases. The second one deals with the realisation of an unique experimental engine database, combining advanced optical diagnostics to visualise the aerodynamics and the mixing for motored operating points, and three ensembles of combustion points dedicated to the separate study of cyclic variability, knock and rumble. LES simulations of the acquired operating points will finally allow acquiring a deeper understanding of the

	phenomena leading to the appearance of AC and CV, and proposing phenomenological models for system simulation codes to reproduce their main effects, in a first step towards their future control.
Partners	- IFP Energies Nouvelles - Institut National Polytechnique de Toulouse / Institut de Mécanique des Fluides de Toulouse - Université d'Orléans / Institut PRISME - PEUGEOT CITROËN AUTOMOBILES SA - Regienov G.I.E. – Renault
Coordinator	Olivier COLIN – IFP Energies Nouvelles olivier.colin@ifp.fr
ANR funding	1 160 128 €
Starting date and duration	2011-01-01 / 36 months
Reference	ANR-10-VPTT-002
Cluster label	MOV'EO

« VTT » programme

YEAR 2010

Project title	**METRAMOTO** - Powered two wheelers traffic measurement for road safety and risks assessment
Abstract	The safety of powered two wheelers (PTW) plays an important role for the public authorities and the road managers. Globally speaking, since 2002, even the road safety has eventually increased but still the num of accidents involving the PTW are at high. If we look at the figures: PTW represent only 1 % of the total traffic but 28 % of the persons killed on the road. The risk of getting killed on a motorcycle is 24 times more than on a car. Since past few years, there has been a notably significant rise in the number of PTW but it is allowed a lack of data and information on PTW use and the interactions of PTW with the other road users and the road infrastructure. The state of the art conducted in 2009 showed that there is no technical solution as such that can be adapted to measure of the traffic of this specific category of vehicle (unlike the cars and the trucks) and the research development in this domain isn't much active which is an issue of concern. The project METRAMOTO aims not only to detect and follow the PTW in the traffic to get enough measurers to be used to the relative statistics with the circulation of PTW but also to identify the trajectory of PTW to analyze their interactions with the others vehicles. These objectives deal the mobility, the road operation and the road safety. These tools will be developed around several sensors technologies used in the domain of road traffic. The work will be realized by distinguishing the ones who need intrusive intervention on the road infrastructure (hybrid sensor piezo-electric + electromagnetic loop and magnetometers) to the one non-intrusive (image analysis and laser range finder). The companies in partnership for the project will implement the results of this research works and thereof having short-term industrial solutions. With the help of road managers, we will evaluate and compare the results. The output in order to get an overview of the technology developed with respect to the objective to be attained so that one is capable of targeting the proper field of application of each of these technologies.
Partners	- Centre d'Etudes Techniques de l'Equipement Normandie-Centre - Institut français des sciences et technologies des transports,

	de l'aménagement et des réseaux (IFSTTAR) - Centre d'Etudes Techniques de l'Equipement de l'Ouest - Centre d'Etudes Techniques de l'Equipement Ile de France - Centre d'Etudes Techniques de l'Equipement Méditerranée - Université de Rouen / LITIS - Université de Technologie de Belfort Montbeliard / Laboratoire SeT EA 3317 - Commissariat à l'énergie atomique et aux Energies Alternatives Grenoble / Commissariat à l'énergie atomique et aux Energies Alternatives-Laboratoire d'Electronique et de Technologie de l'Information - Société Toulousaine d'Etudes et de Réalisations en Electronique et Automatique - NEAVIA TECHNOLOGIES
Coordinator	Eric VIOLETTE - CETE Normandie-Centre eric.violette@developpement-durable.gouv.fr
ANR funding	942 623 €
Starting date and duration	2010-11-15 / 36 months
Reference	ANR-10-VPTT-007
Cluster label	MOV'EO

Project title	**PIREP2** - Innovative Process for Reducing Emissions of Particulates 2

Abstract

PIREP2 deals with the characterization and elimination of soot particulates emitted by Hybrid Diesel Cars (HDC). The main objective of PIREP2 is to develop a new generation of self-regenerating Diesel Particulate Filters (self-DPF) from the knowledge on filtering electrochemical catalysts acquired during the PIREP1 project (ADEME program, 2007-2010), managed by IRCELYON with the support of PSA. The main advantage of Hybrid Diesel cars is to strongly reduce the fuel consumption and, consequently, the emission of CO2 as well as the vehicular dependence on hydrocarbons. This achievement is absolutely necessary for limiting the global warming of earth. The ambitious target fuel consumption of HDC is 3 L for 100 km for a medium motorisation passenger vehicle (1.6 L). This represents a 50% reduction of the fuel consumption. However, HDC will still require a complex catalytic post-treatment in order to achieve future European legislations (EURO 6 in 2014 and EURO 7 in 2018-2020) in terms of emissions of NOx, unburned hydrocarbons, CO and particulate matter. The actual solution for removing soot particulates is the Diesel Particulate Filter (DPF) which is a porous ceramic structure. In addition, the necessary periodic regeneration of these DPFs is performed by post-injection of fuel which allows, via the exothermicity of oxidation reactions, a rapid increase of the DPF temperature catalyzing soot oxidation. These regeneration steps induce fuel overconsumption that undermines the main objective of the Hydrid Diesel Technology. PIREP2 is an industrial research program which aims to :

o Develop and optimize self-DPFs, based on ionic conducting ceramics, able to continuously burn soot particulates without fuel overconsumption and without the use of noble metals.

o Understand the mechanism for soot particulates activation by ionic conducting ceramics

o Analyse the gaseous and particulate emissions of HDC as well as the impact of self-DPF on nucleation processes (production of ultrafine particulates).

Partners	- Université Claude Bernard Lyon 1 / Institut de Recherches sur la Catalyse et l'Environnement de Lyon - IFP Energies nouvelles - Céramiques Techniques et Industrielles (CTI) - CNRS Délégation Alpes / Laboratoire d'Electrochimie et de Physicochimie des Matériaux et des Interfaces - PEUGEOT CITROËN AUTOMOBILES SA - CNRS Délégation Rhône Auvergne / Laboratoire de Météorologie Physique
Coordinator	Philippe VERNOUX – IRCELYON philippe.vernoux@ircelyon.univ-lyon1.fr
ANR funding	1 532 400 €
Starting date and duration	2011-02-01 - 36 months
Reference	ANR-10-VPTT-006
Clu ter label	AXELERA - MOV'EO – TRIMATEC

« VTT » programme

YEAR 2010

Project title	**ROADSENSE** - Prevention of lane departures by road audio tactile lanes: conception and evaluations
Abstract	The research project ROADSENSE aims to define, conceive, deploy and validate experimentally a driving assistance for motored road users. This assistance is delivered by audio tactile lines installed on the road, producing an alert by sound and vibration into the vehicle while passing on it. This alert is intended to correct the lane departures of distracted, disoriented or tired drivers having difficulties to perceive the road or to position their vehicle, or more generally having a hazardous or erratic trajectory compared to their circulating lane in rural roads. In order to achieve this target, the research project ROADSENSE aims: • To propose a functional framework of road safety based on a review of the art and on the identification of the stakes and the rural road crashes mechanisms • To characterize and to identify the sound and vibrations of existing alert lines • To conceive and validate relevant sound signals (sound) from psychoacoustics surveys on a panel of users, to recreate the on a numerical synthesizer • To implement the sound and vibration signs on a driving simulator, to set up reference scenarios • To experiment the efficiency and the acceptability of alert lines by audio-tactile delimitation of the driving lane from surveys on panels of users (i) on a driving simulator, (ii) on a test track and (iii) on open roads • To define and develop tools and methods enabling to evaluate the efficiency of the road devices from 3 roads test sites locally equipped in order to prepare an applicative research project (FUI). The efforts on the encoding of sounds and vibration to conceive audio tactile alert lines will offer a great opportunity to validate rigorously new low cost driving assist systems, that can

	be deployed on a short term and that should answer to the needs of the whole park of existing vehicles on the roads infrastructures.
Partners	- AXIMUM - Institut de Recherche et Coordination Acoustique/Musique - Centre d'Etudes Techniques de l'Equipement Normandie Centre / ERA 34 - Centre d'Etudes Techniques de l'Equipement Ouest / ERA 33 - Laboratoire Central des Ponts et Chaussées - Laboratoire Central des Ponts et Chaussées / Laboratoire, Exploitation, Perception, Simulateurs et Simulations :UMR - COLAS / Campus Scientifique et Technique
Coordinator	Pierre ANELLI – AXIMUM anelli@aximum.fr
ANR funding	636 291 €
Starting date and duration	2010-12-01 - 30 months
Reference	ANR-10-VPTT-010
Cluster label	MOV'EO - Cap Digital Paris-Région

Project title	**SAFEPLATOON** - Safe platoon of autonomous vehicles
Abstract	SafePlatoon project is aimed at studying autonomous vehicle platoons taking into account urban, military and agricultural applications. It focuses on design and experimental deployment of a set of extended and robust platoon capabilities. SafePlatoon is concerned with mastering platoon operation aspects, with different geometric configurations: linear, triangular, front line. It also concentrates on the conception of platoon's dynamic adaptation capabilities: configuration changes, vehicle insertion and ejection. Verification and validation of proposed decision and control algorithms represents one of the key points of SafePlatoon project. Verification consists in proving that a set of safety properties is valid relatively to a given system by applying specific methods and tools. Validation relies on performing a set of test scenarios through a simulation model and/or a prototype of the platoon system. Scenarios are defined to evaluate the correctness and the quality of the proposed approaches. SafePlatoon project partners possess an experience in development, validation and verification of platoon decision and control algorithms and in the design of experimental intelligent vehicles. Partners have already participated in projects devoted to platoon systems and/or autonomous vehicle for urban transportation, agriculture and military applications.
Partners	- Université de Technologie de Belfort-Montbéliard / Laboratoire Systèmes et Transports : EA 3317 - Université Blaise Pascal : Clermont-Ferrand II - Laboratoire des Sciences et Matériaux pour l'Electronique et d'Automatique : UMR 6602 - Centre National du Machinisme Agricole, du Génie Rural, des Eaux et des Forets - CEMAGREF - Direction Générale de l'Armement Techniques terrestres - DGA - CIVITEC
Coordinator	Abderrafiaa KOUKAM - Laboratoire Systèmes Et Transports (SeT) abder.koukam@utbm.fr
ANR funding	844 715 €

Starting date and duration	2011-03-01 - 36 months
Reference	ANR-10-VPTT-011
Cluster label	Véhicule du futur - VIAMECA

« VTT » programme

YEAR 2010

Project title	**SIM2CO+** - Design of motorcycle training modules including simulation to the development of cognitive skills
Abstract	Accident data relating to motorcyclists highlight the risks of this type of transport.Per vehicle-kilometer of travel, motorcyclists are twenty times more likely to die than passenger car drivers (ONISR, 2010). These worrying data are even more extreme for novice riders, this vulnerable group of road users which does not follow the current trends in improving road safety (ONISR, 2010). The potential value of studying initial motorcycle training, both for research purposes and with regard to public policy, is readily apparent, as it may be partly responsible for the behavior of novice riders and their accident rates. These problems must be considered with the increase of the motorbike park in France. In terms of scientific research, efforts to achieve a better understanding of the specific phenomena associated with motorcycling are conducted particularly through recent ANR and/or PREDIT projects which concern the study of motorcyclists' risk (RIDER, AU2RM ...) and the development of systems to avoid or reduce the accidents severity (Sumotori, Promoto, DAMOTO ...). To answer the question of accident rates of riders, it is necessary to carry out multidisciplinary projects which aim to propose new issues for motorcyclists' training. The objective of SIM2CO+ project is to desgin and validate a range of motorcycle training modules, including riding simulation, to promote cognitive skills. The failures in rider hazard perception are clearly involved in more accidents than motorcycle control (RIDER, 2005). Concretely, the ambition is to develop motorcycle riding simulators dedicated to training, design the associated educational devices and to adequately integrate these modules in the traditional curriculum. This project seeks to make novice riders safer.
Partners	- Institut National de Recherche sur les transports et leur sécurité - ECA FAROS - Université d'Orléans / Laboratoire AMAPP - Institut National de Recherche sur les transports et leur sécurité - Editions Nationales du Permis de Conduire - Université Paris Sud 11 / Institut d'Electronique Fondamentale

Coordinator	Stéphane ESPIE - INRETS LEPSIS espie@inrets.fr
ANR funding	710 328 €
Starting date and d ration	2011-01-01 - 36 months
Reference	ANR-10-VPTT-005
Cluster label	

« VTT » programme

YEAR 2010

Project title	**SUPERCAL** - Interaction between calendar ageing modes of supercapacitors for automotive applications
Abstract	To date, scientific results from studies on the ageing of on-board Energy Storage Systems (ESS), and particularly supercapacitors, are few. The main reasons come from either the confidentiality of the results from the manufacturers, the limited number of technologies actually available and accessible to specialized laboratories, or because the studies do not consider the implementation of ageing laws in the developed models and therefore they are incomplete. However, in case of modern hybrid vehicle applications, the integration of ESS based on supercapacitors requires a realistic estimation of the lifetime of the cells for different profiles of solicitation. This is essential for the optimal design of the ESS because the vehicle has to meet its initial specifications for a lifetime between 10 and 15 years. Moreover, for obvious reasons of cost, which is a criterion for the successful marketing of hybrid vehicles, we can not rely on the initial oversizing of supercapacitor cells. In these conditions, it is essential to have accurate models in order to estimate the lifetime of supercapacitors for different modes of ageing, both in power cycling and calendar modes. In this context, the project SIMSTOCK was launched in 2006 and concerns only the behaviour and the ageing in power cycling and does not take into account the calendar ageing. However, the average utilization rate of a particular vehicle is about 7000 hours for a 15 years lifetime. The calendar ageing appears as a dominant phenomenon and requires a specific research project on this topic as SUPERCAL. The organization of the project SUPERCAL is similar to the SIMSTOCK one takes benefits of both the experience and specific equipment of laboratories and industrial partners. The main objective of SUPERCAL is to develop advanced models for the latest technology of supercapacitors in which the different ageing modes are taken into account. An essential part of this project focuses on endurance tests where the voltage across the supercapacitor is kept constant by an external device whose role is to compensate the self-discharge of the cell. Under these conditions, the ageing is the result of a combined action of both the temperature and the voltage representative of the energetic state of the supercapacitor. The monitoring of the characteristics evolution

of the elements is achieved through continuous measurement of leakage current and thanks to periodic characterization tests based on capacitance, equivalent series resistance and impedance measurements. Thus, the calendar lifetime can be quantified thanks to evolution laws of these electrical parameters for fixed voltage and temperature conditions. More specific tests will be conducted with the aim to highlight and study other modes of calendar ageing, which correspond to real solicitations in hybrid vehicles applications. Firstly, from thermal point of view, tests will be conducted to study the impact of a slowly varying temperature profile on the calendar ageing, at a daily or weekly timescale. Then, another objective is to study the influence of the superposition of an alternative voltage component to the constant bias voltage on the changing characteristics of the samples. The link with the project SIMSTOCK and the inter-comparison of the results will be addressed through specific tests based on calendar ageing tests with intermittent cycling periods. Finally, all these results will be analyzed in order to define behavioural laws for the different ageing modes and to implement them into simulation models.

Partners	- IMS Labs - Institut Polytechnique de Bordeaux - PEUGEOT CITROËN Automobiles SA - VALEO Systèmes Electriques et Moteurs - BATSCAP - IFSTTAR – LTN Satory - AMPERE Labs - Université Claude Bernard Lyon 1
Coordinator	Jean-Michel VINASSA - IMS jean-michel.vinassa@ims-bordeaux.fr
ANR funding	826 848 €
Starting date and duration	2010-12-10 / 36 months
Reference	ANR-10-VPTT-009
Cluster label	MOV'EO

« VTT » programme

YEAR 2010

Project title	**TICTACT** - Information system using an interactive tactile device
Abstract	.
Partn rs	- RATP Délégation Générale à l'Innovation et au Développement Durable / REGIE AUTONOME DES TRANSPORTS PARISIENS - Commissariat à l'Energie Atomique Siège Administratif / Commissariat à l'Energie Atomique Laboratoire d'Intégration des Systèmes et des Technologies - Association pour la Recherche et le Développement des Méthodes et Processus Industriels - Université Paris 8 / Laboratoire Technologie, Handicap, Interfaces, Multimodalités (THIM) EA 4004 CHART - GOOBIE - CAMINEO SAS
Coordinator	Patrick ATTARD - RATP
ANR funding	1 086 907 €
Starting date and duration	2010-11-15 / 30 months
Reference	ANR-10-VPTT-004
Cluster label	SYSTEM@TIC Paris région