



CERTH
CENTRE FOR
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RESEARCH - TECHNOLOGY - INNOVATION
FOR SUSTAINABLE GROWTH

Hellenic Precision Medicine Network on Cancer: a new era in
healthcare

Adopting a new approach to patient management



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Eye on the future: HIT Open Days 2019

“We are preparing for the disruptive future of transport” was the general theme of the event «Open days, that was organized by the Hellenic Institute of Transport (HIT) of CERTH and was held at the end of 2019. During the event visitors of all ages and more than 60 Entities and Business representatives visited HIT’s research infrastructure and were informed about the modern technologies of smart mobility as well as the future of transport.

The Hellenic Institute of Transport (HIT) of the Centre for Research and Technology Hellas (CERTH) has once again organized the “Open Days” event that took place on 25th and 26th of November, 2019, with general theme “We are preparing for the disruptive future of transport”. More than 150 students from the Hellenic College of Thessaloniki, Friganiotis schools and the 6th Middle school of Thessaloniki visited HIT’s research infrastructure and were informed about the modern technologies of smart mobility and about the future of transport.

On the first day of the event, within the framework of “PANDORA’S BOX” initiative, the students had an opportunity to talk to the Vice Major of Infrastructure and Networks, Mr. Paris Billias, describing to him their issues in using soft transport modes and discussing the solutions offered by the local government to tackle these issues. On the second day, the students had a discussion with the researchers and executives of innovative businesses regarding the future professions in transport and logistics.



During the event the visitors have been informed about the research results of HIT by the Director of CERTH I HIT Dr. Evangelos Bekiaris

Along with the visits from the school, more than 60 Entities and Business representatives visited HIT and participated in various activities organized within the framework of the “Open Days”.

On 25/11, a meeting was held with representatives of the technical services of the Municipalities of FYROM with the aim of presenting the "Support Center for SUMP and Innovative Techniques for the Participation of Entities and Citizens" in their development. The event was organized by the Regional Development Fund of the Region of Central Macedonia and HIT/CERTH within the framework of the two Interreg Europe REFORM and e-smartec projects where these two entities cooperate.

On the afternoon of the same day, the official ceremony of the “Best Road Safety Initiative” award 2019 was held. The award is given every year in cooperation with the HELLENIC ASSOCIATION of TOLL ROAD NETWORK (Hellastron) and the Hellenic Institute of Transportation Engineers (HITE). This year, the award was given to the Road Traffic

Police department of Thessaloniki, for the innovative applications developed in the field of Road Safety the previous year, and particularly for the program "Little Traffic Policemen ... in action!" demonstrating a pioneering visual and practical interest in promoting Road Safety.



The scientific team of HIT on the day of the event



Official ceremony of the “Best Safety Initiative” award to the Road Traffic Police Department of Thessaloniki for the innovative applications developed in the field of Road Safety

“ The Traffic Police Department of Thessaloniki has performed **holistic actions** to promote **child safety** by combining **pedagogical leaflets and books, experiential activities, software, Dissemination in social media**, as well as use of **Virtual Reality (VR) gadgets**, Dr Evangelos Bekiaris, Director of HIT

Dr. E. Bekiaris, the Director of HIT, has mentioned that *"the Traffic Police Department of Thessaloniki has performed holistic actions to promote child safety by combining pedagogical leaflets and books, experiential activities, software, Dissemination in social media, as well as use of Virtual Reality (VR) gadgets. This model of combined activities is a good example of pan-European level"*.

On the second day of the event, a Round Table discussion took place on "Upcoming Development in Research and Industry in Transport and Urban Mobility". The event brought together represent-

atives from relevant companies and a number of researchers with the aim to share proposals and requirements for infrastructure, as well as discuss incentives to support business innovation in transport and green mobility.

Afterwards, HIT welcomed the public who wanted to get acquainted with the research equipment of the Institute, as well as with its activities.

Next year, HIT will open its doors to welcome the public again, with the promise of new research challenges and research results interesting to the participants.

The Information Technologies Institute of CERTH contributes to the EU Trustworthy AI Assessment List



The High Level Expert Group on Artificial Intelligence which has been set up by the European Commission (hereinafter, the AI HLEG), introduced an initiative called "Deep dive interview to pilot the Trustworthy AI Assessment List". On April 9, 2019 the AI HLEG released the "Ethics Guidelines for Trustworthy AI". The AI HLEG selected suitable candidates from different sectors over the world to participate in a "deep dive" interview, aiming at collecting detailed feedback on the Trustworthy AI Assessment list that forms part of the [Ethics Guidelines for Trustworthy AI](#). The Guidelines set as an aspirational goal for Europe the development and deployment of Trustworthy AI. To this end, the Guidelines propose an assessment framework that guides AI practitioners in assessing whether their AI systems are aligned with Trustworthy AI conditions.

A total of 50 deep dive interviews were con-

ducted during the second half of 2019, starting at the end of September by a group of researchers that participate to the AI4EU project (www.ai4eu.eu).

In terms of this initiative, CERTH/ITI has been selected as one of the suitable candidates to participate in the "deep dive" interview. The interview has been carried out on 9/10/2019, by Dr. Andrea Theodorou and lasted one full day at the CERTH/ITI premises.

CERTH scientific team was consisted by Dr. Konstantinos Votis, Dr. Kalamaras Ilias, Dr. Anastasios Alexiadis and Dr. Segkouli Sofia.

Following the request of the AI HLEG, the scientific team of CERTH selected the Intelligent Personal Agent CIPA (CERTH) which is applied in the domain of the CERTH Smart Home, to be presented and subjected to the deep dive interview.

ITI nZEB Smart Home ecosystem

A rapid prototyping & novel technologies demonstration infrastructure resembling a real domestic building where occupants can experience actual living scenarios while exploring various innovating smart IoT-based technologies.



Evaluation of Ethics in respect to the Intelligent Personnel Agent in terms of the Smart Home Infrastruc-

“ The example of the **Intelligent Personnel Agent** highlighted the **potential ethical consequences** of intelligent personal – vocal or textual – agents, such as **human control in artificial intelligence systems and management of potential risks**, Dr. Sofia Segkouli, member of CERTH’s scientific team

During the interview the survey on the Trustworthy AI Assessment has been answered, as well as additional general questions about the quality of the assessment list.

“ITI contributed to the evaluation of the Trustworthy AI Environments evaluation list through the example of the Intelligent Personnel Agent, highlighting the potential ethical consequences of intelligent personal – vocal or textual – agents, such as human control in artificial intelligence systems and management of potential risks”, underlines Dr. Segkouli.

“In addition, the structure of the assessment list itself was also evaluated, highlighting the

importance of these initial general guidelines. However, as it has been stressed, there is still need for ethics guidelines adapted to specific domains of research. Moreover, emphasis has been put into the importance of constant education in respect to ethics and AI as an effective tool to support researchers in artificial intelligence development”.

The information collected in the *deep dives* will be analyzed and published in aggregate form by researchers from the AI4EU project (see www.ai4eu.eu).





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Hellenic Precision Medicine Network on Cancer: a new era in healthcare

The Hellenic Precision Medicine Network on Cancer (HPMN), coordinated by the Institute of Applied Biosciences of the Centre for Research and Technology Hellas (INAB | CERTH), completed its first year of operation **responding to its commitment and mission in providing high quality services to cancer patients**

Interview **Amalia Drosou**

From idea conception to implementation

Having as an ultimate goal to upgrade diagnosis, predict correctly the disease outcome and achieve targeted treatment of cancer patients, tailored to the genetic and molecular profile of each patient, HPMN has adopted a new approach to patient management, that is already practiced. *“We create standards, adopt and promote reliable analytical procedures, that can then be exploited by any interested relevant stakeholder. Network Units follow homogeneous methods and, most importantly, they provide reliable patient services”*, points out Kostas Stamatopoulos, Director of INAB | CERTH and Coordinator of the HPMN.

Anastasia Chatzidimitriou, Senior Researcher at INAB | CERTH and Head of the Technical Committee of HPMN, also highlights as a major accomplishment of the HPMN the development and operation of the required infrastructures and software for data processing, analysis and storage. *“All the bioinformatics analysis workflows used by the Network, as well as the data it generates are already in the public domain, hosted by the GRNET.”* Accreditation of laboratory analytical procedures applied by the HPMN Units is a further significant development. Dr. Chatzidimitriou points out that INAB *“has received both ISO 15189 accreditation for molecular diagnostics in cancer and ISO 27001 accreditation for production, management and analysis of biodata originated from bioanalysis and real world evidence.”*



Challenges and solutions

The transition from development to validation to practical implementation has been a demanding task. According to Dr. Stamatopoulos *“Concerted effort was required to ensure compliance with quality standards, and smooth communication between research centers on the one hand and hospitals and physicians on the other, that are the final user of HPMN services. This convergence between the Units as well as the adoption of the*

same approaches are a prerequisite for achieving the main objectives of the Network concerning both accurate diagnostic services to cancer patients and novel research opportunities.”

HPMN activities also brought to the fore new fields in the Greek health sector: *“Bioethics, data security, data ownership, cost analysis, amongst others, are all highly critical topics that must be thoroughly explored and put into a relevant context in Greece,”* points out Dr. Chatzidimitriou.

“The convergence between the Units as well as the adoption of the same approaches are a prerequisite for achieving the main objectives of the Network concerning both accurate diagnostic services to cancer patients and novel research opportunities, Dr. Stamatopoulos, Director of INAB and Coordinator of the HPMN



High throughput next generation sequencing (NGS) techniques, as tool for precision medicine, offer rapid, precise and affordable screening for mutations in many genes in many patients at the same time

“ Bioethics, data security, data ownership, cost analysis, amongst others, are all highly critical topics that must be thoroughly explored and put into a relevant context in

Greece, Dr. Chatzidimitriou, Senior Researcher at INAB I CERTH and Head of the Technical Committee of HPMN

Growth prospects

In its first year of operation, the HPMN has attracted the interest of and collaborated with patients (Hellenic Cancer Federation) and relevant scientific societies, i.e. the Hellenic Society of Medical Oncology, the Hellenic Society of Hematology and the Hellenic Society of Pathology. It has also been recognized as attractive to the pharmaceutical industry whereby *“key players in the field have expressed their view that HPMN is an important potential partner with the pharmaceutical industry both for clinical trials and for studies regarding real-world evidence generation,”* says Dr Stamatopoulos. *“Cooperation between the pharmaceutical industry and the HPMN may also extend to the provision of diagnostic services, health economics and health technology assessment studies. This adds to the dynamics of the Network because it demon-*

strates that we are conducting research that is of value to the individual citizen while also contributing to the formulation of new health policies.”

Drs Stamatopoulos and Chatzidimitriou did not fail to mention that the HPMN is fully aligned with the new EU framework programme for research and, more specifically, the new “Horizon Europe” funding programme: *“From the inception of the HPMN idea by former Minister Costas Fotakis, the Network was envisioned as a flagship initiative, corresponding to what the EU considers as a “mission”, i.e. a novel type of funding tool of the new EU funding package for research initiatives that respond to specific social needs.”*

As for their personal vision for the future evolution of the Network, Drs Stamatopoulos and Chatzidimitriou expressed their desire that HPMN will serve as a role model and a platform for cooperation and development in Greece.



“The young researcher should be constantly primed to receive new knowledge”

Dr Dimitrios Rakopoulos, Senior Researcher at the Chemical Process & Energy Resources Institute (CPERI) of the Centre for Research & Technology Hellas (CERTH) is at the Top 1% Highly Cited Researchers list and subsequently among the World’s most influential scientific minds for the 5th year in a row (2015 – 2019) according to Thomson Reuters, now represented by Clarivate Analytics. In the following interview he talks about the contribution of his research to the energy research worldwide, for the things that triggered his interest in science and shares his thoughts about young researchers

Interview **Amalia Drosou**

Dr Rakopoulos, you are at the top 1% Highly Cited Researchers list and subsequently among most influential scientific minds for the 5th year in row in the field of Engineering. In which way do your research outcomes contribute to the energy research worldwide?

My research interests fall within the area of Energy Engineering and, in particular, primarily include so far Diesel engines, Thermal Power plants, Combined Heat and Power (CHP) plants, District Heating, biomass exploitation, biofuels, renewable and alternative fuels utilization, novel energy systems, buildings energy upgrade, Smart Buildings and Smart Grids. These research topics are studied either through steady-state and transient-state modeling and simulations and/or through experimentation as appropriate per case. Main objectives of my research activity is the optimal utilization of the energy resources and the efficient, clean and as green as possible energy generation and management, focusing on the

design, development and optimization of energy systems and processes. The findings of my research are disseminated to the research and academic community mainly through the channel of the publications in international scientific indexed journals and in conferences with full paper peer review. These outcomes propose and describe methods and solutions that can contribute to the emerging, pressing societal need for reduced-carbon-footprint energy conversion and for reduction of the dependency from the conventional fossil fuels and their imports.

How did all this begin? What first got you interested in science?

What triggered my interest in science were, on the one hand, the principles of Physics that explain the various physical, every-day phenomena happening around us and, on the other hand, the challenge of solving problems in Mathematics.

“ Working in the field of Research is by default unique.

You do not just apply the principles of science, replicating already developed and validated good practices, but you strive **to discover new paths**, sometimes different from your recent activities or specialization area

The combination of these two fundamental sciences helped me understand how various systems we use every day in our life are operating, e.g. from a simple system such as a bicycle to a complex one such as a car. Exploring how all these systems operate and giving solutions to their problems was the impetus behind my desire to become an Engineer and in particular a Mechanical Engineer.

And then how did your own career progress?

When studying in the School of Mechanical Engineering of the National Technical University of Athens (NTUA) between late 90's and early 00's (1997-2002), the Energy issue, i.e. the effort for a cleaner, greener and more efficient energy generation, was starting to emerge worldwide. This motivated me, firstly, to choose the specialization direction of Energy within the School and, later on, to proceed to a Ph.D. degree at the Internal Combustion Engines (ICE) Laboratory, in the topic of the biofuels' utilization in Diesel en-

gines, shedding light on how such a widespread, indispensable energy system can operate in a more efficient and environmental-friendly way. The research and academic experience I acquired during the PhD years was reinforced later by industrial and administrative experience within various private and public entities, concluding to my election as Researcher C' at the Chemical Process & Energy Resources Institute (CPERI) of the Centre for Research & Technology Hellas (CERTH).

**What is special about working in this field?
What is about this topic that particularly fascinates you?**

Working in the field of Research is by default unique. You do not just apply the principles of science, replicating already developed and validated good practices, but you strive to discover new paths, sometimes different from your recent activities or specialization area. In Research, you never know the outcome.

This is a point that brings insecurity to the whole project, along with the uncertainty of attracting research funding, especially in today's difficult economic environment. Nevertheless, this is at the same time the fascinating element of Research. When it turns out that your efforts are meaningful and other researchers make reference to your scientific work (this is exactly the criterion of the award as a Highly Cited Researcher by Thomson Reuters), practically recognizing that you have played a part in scientific progress, it is a significant reward and motivation for consistent follow-up.

In particular regarding the topic of Energy, where my research interests are based on, it is exciting to be able to contribute, even to a minimum, to critical energy issues discussed globally, such as the environmental-friendly energy conversion in order to reduce the effects of climate change, as well as the dependency reduction from the fossil fuel reserves and their imports with a view to energy security, self-sufficiency and independence.

“ The Energy sector is nowadays flourishing in research field, thanks to the worldwide urgent need for more **efficient, economic and environmental-friendly energy production and management**, mainly due to climate change

What would be your advice to younger researchers starting out in your field?

My advice to young researchers is to follow the Research path only if they really love the subject and are determined to confront the difficulties, uncertainties and frustrations they are likely to face, especially under the current difficult economic conditions in our country. The Energy sector is nowadays flourishing in research field, thanks to the worldwide urgent need for more efficient, economic and environmental-friendly energy production and management, mainly due to climate change. Nonetheless, the young researcher needs to be

aware that technology is evolving so rapidly that she/he should be constantly primed to receive new knowledge and be willing to continuously endeavor to prove her/his skills at new topics, perhaps even beyond her/his specialization ones. In order for a young researcher to choose and succeed in the field of Research, especially in such a progressing technology sector as Energy, the quest for the new, the difficult and the unexplored needs to be her/his main pursuit and what primarily attracts her/him in her/his career, possibly above any financial ambition.

Dr Dimitrios Rakopoulos has 75 refereed-papers in International Indexed Scientific Journals and 10 in International Conferences with full paper peer-review, over 4700 citations according to Scopus (excluding citations of all co-authors), with H-index=33. He is Associate Editor or Editorial Board Member in 6 International Indexed Scientific Journals and Guest co-Editor in 6 Special Issues and Reviewer in 17 International Scientific Indexed Journals and 4 Conferences.

Measuring exhaust nanoparticles from modern vehicles

The implementation of the European H2020 project “SUREAL-23, which was coordinated by the Centre for Research and Technology Hellas pointed out the simplification as well as the significant improvement of the process sampling and measuring particulate pollutants. To this end, the future legislation can include emission limits also for particulates smaller than 23 nm.



The SUREAL-23 project is funded by the European research and innovation program, Horizon 2020, under contract no. 724136.

Text Eleni Papaioannou, Penelope Baltzopoulou

Editing Amalia Drosou

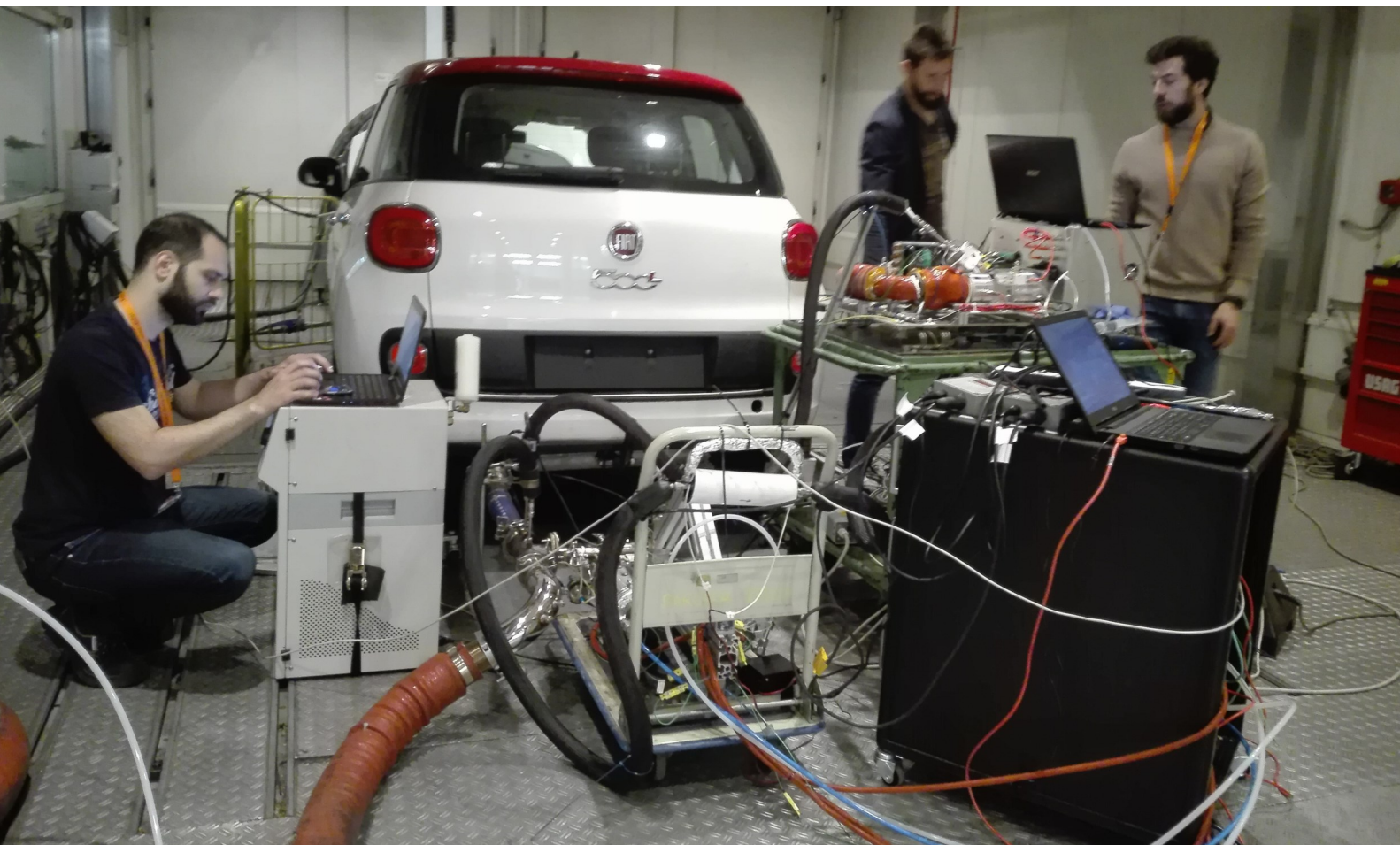
The European H2020 project “**SUREAL-23: Understanding Measuring and Regulating Sub-23 nm Particle Emissions from Direct Injection Engines Including Real Driving Conditions**” has been successfully completed with notable recognition among the scientific community and the relevant EC authorities. The project was coordinated by the Aerosol & Particle Technology Laboratory (APTL) of CPERI/CERTH.

The need for reliable detection of nanoparticle emissions

Direct-injection vehicles are considered to be an important source of nanoparticle emissions and contribute significantly to air pollution and climate change and have a serious impact on public health. For this reason, in June 2012, the World Health Organization classified the particles from burning Diesel as "carcinogenic to humans" (Group 1). These negative impacts have led many countries - on both sides of the Atlantic - to establish vehicle emission limits. In Europe, these

limits were initially set based on the particulate matter mass (Euro 1 to Euro 4 legislative frameworks). Meanwhile, numerous studies have shown that tiny particles, while not having significant mass, are more dangerous to human health than larger particles. This has resulted in the introduction of a limit on the number of **solid particles larger than 23nm** (Euro 5b for diesel engines and Euro 6 for direct injection gasoline engines). This limit applies only to solid particles (amorphous or graphitised carbon, metals, etc.) and not to volatile or semi-volatile particles consisting mainly of hydrocarbons as the latter are very difficult to measure reliably.

The specific 23nm limit was set to avoid the possibility of measuring non-real particles (artefacts), that is, particles that do not come from the exhaust but are created during standard sampling and measuring conditions. The difficulties of measuring these solid particles (<23 nm) with existing technologies have led regulators to underestimate their contribution to environmental pollution and health so far.



SUREAL-23 research team during experimental / testing campaign for the assessment of sub-23nm particle emissions, using innovative measurement techniques developed within the project

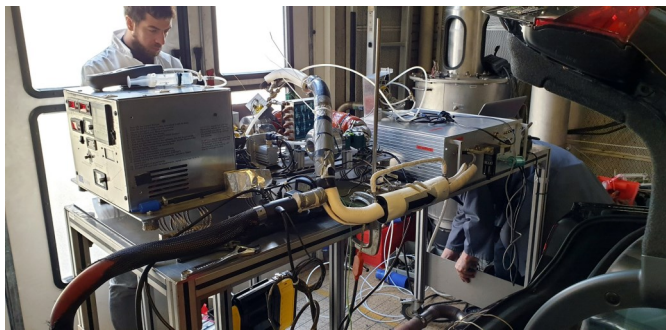
However, recent measurements show that the fraction of solid particles less than 23 nm in diameter emitted by direct injection gasoline engines (GDIs) accounts for up to 40% of the total, while for diesel engines up to 20%. There is, therefore, an urgent need for reliable measurement of emitted solid particles below 23 nm. The SUREAL-23 project has addressed this need.

The fraction of solid particles less than 23 nm in diameter emitted by direct injection gasoline engines (GDIs) accounts for up to 40% of the total, while for diesel engines up to 20%.

The project SUREAL-23

The main objective of SUREAL-23 was to study particulate pollutants below the legislative limit of 23 nm emitted by vehicles with direct injection engines.

In this context, innovative sampling techniques and innovative instruments for measuring the number, size distribution and particle composition have been developed. The development of these novel instruments was based on earlier work by Prof. Heinz Burtscher (FHNW), Juan Fernandez de la Mora (Yale University & SEADM SL) and Athanasios G. Konstandopoulos (APTL-CPERI/CERTH). **An important innovation of the technologies developed is their ability to operate at temperatures corresponding to the hot stream of exhaust, thereby prohibiting the formation of volatile artefact particles.** The project managed to simplify and significantly improve the process for sampling and measuring particulate pollutants so that future legislation can include emission limits also for particulates smaller than 23 nm.



The project delivered a prototype Portable Emissions Measurement System (PEMS) for real-time nanoparticle concentration counting (Rüggeberg & Burtscher, 2019) **(1)**. Compared to existing systems that can measure only down to 23 nm, the developed system measures particles down to 10 nm in size, with comparable accuracy but much lower requirements in space and electrical power making it ideal for on-road measurements (Real Driving Emissions, RDE). Also of much importance was the development of a highly-efficient catalytic system for the removal of volatiles. The system, which was optimized for lab-measurements, was developed with enhanced features for adapting to particulate measurements down to 10nm while again minimising the likelihood of generating artefacts (Melas *et al.*, 2020) **(2)**.

In parallel, using the sampling and measurement systems developed, the effect of operating con-

ditions of different engines and vehicles on particulate pollutant emissions was investigated. The parametric study included both research and commercial models of engines and vehicles, various fuels (oil, gasoline, compressed gas) and additives, various injection technologies, as well as various emission control technologies (Zinola *et al.*, 2019 **(3)**; Di Iorio *et al.*, 2019 **(4)**). The vehicles were evaluated in both laboratory and real driving conditions (RDE) (Papaioannou *et al.* 2020) **(5)**. These results are a crucial step towards understanding the emission of particles smaller than 23 nm from modern vehicles/engines.

The impact

Particular interest in the research results of SUREAL-23 was demonstrated by EU bodies, involved in the formulation of relevant legislation, such as the European General Secretariat for Development (DG GROW) currently working on the formulation of post-EURO 6 legislation on vehicle emissions, as well as the Particle Measurement Program (PMP) group of the United Nations' Economic Commission for Europe (UNECE) that develops emission measurement protocols for vehicles of all categories.

(1) Rüggeberg T. *et al.*, 2019, , 23rd ETH Conf. on Combustion Generated Nanoparticles

(2) Melas, A.D. *et al.*, 2020, *Aerosol Sci. Technol.*

(3) Zinola *et al.*, 2019, SAE Tech. Paper 2019-01-2195

(4) Di Iorio *et al.*, 2019, SAE Tech. Paper 2019-24-0155

(5) Papaioannou *et al.*, 2020, , Proceed. of TRA 2020

(6) Baltzopoulou P. *et al.*, 2019, SAE Tech. Paper 2019-24-0052

(7) Chasapidis L. *et al.*, 2019, SAE Tech. Paper 2019-24-0154

(8) EC website, "Detecting tiny exhaust particles to improve human health": https://ec.europa.eu/research/infocentre/article_en.cfm?&artid=48059&caller=other

(9) EGVI website: <https://egvi.eu/project-highlight/sureal-23/>

(10) SUREAL-23 website: <http://sureal-23.cperi.certh.gr/sureal-23-final-workshop-completed-great-success/>



SUREAL-23 partners and attendees of project's Final Workshop that took place at IFPEN premises in Lyon, France

The scientific and research communities have also appreciated the project outcome providing distinctions such as the honorary publication of the work of Baltzopoulou *et al.* SAE Technical Paper 2019-24-0052 **(6)**, and Chasapidis *et al.*, SAE Technical Paper 2019-24-0154 **(7)** in the journal *SAE International Journal of Advances and Current Practices in Mobility* and the *Trojan Horse Award* in the Baltzopoulou *et al.*, 21st ETH Conf. on Combustion Generated Nanoparticle 2017. H2020 officers and the European Green Vehicles Initiative Association (EGVIA) distinguished SUREAL-23 by including the project in the relative lists of "H2020 SUCCESS STORY!"**(8)** and "Projects Highlight"**(9)** respectively.

Information

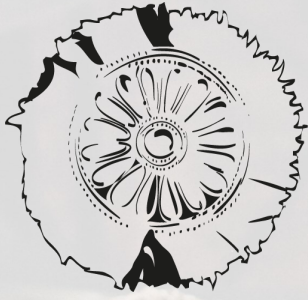
Project website: <http://surreal-23.cperi.certh.gr/>

Project promotion video: https://www.youtube.com/watch?time_continue=3&v=1K9RRNq_XpU&feature=emb_logo

Follow on Twitter: #SUREAL23, #SUREAL-23

Postscript

The project ended with the successful organisation of the Workshop on "*Measuring and regulating sub-23 nm particulate emissions from light-duty powertrains: Questions and Answers from 3 years Horizon 2020 research!*", on December 10th, 2019, at the IFPEN premises, in Lyon, France. The Workshop has been a success, giving the opportunity for interaction between EU representatives, other relevant research projects, the automotive industry and companies providing particulate measurement instruments **(10)**.



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The **Centre for Research and Technology-Hellas (CERTH)** founded in 2000 is one of the leading research centres in Greece and listed among the TOP-20 E.U. institutions with the highest participation in competitive research grants.

Today CERTH includes the following five institutes with indicated major fields of research:

- **Chemical Process and Energy Resources Institute (CPERI)** Sustainable & Clean Energy, Environmental Technologies, Chemical & Biochemical Processes, New Functional Materials
- **Information Technologies Institute (ITI)** Informatics, Telematics and Telecommunication Technologies, Safety and Security
- **Hellenic Institute of Transport (HIT)** Smart Sustainable Mobility, Transport Safety
- **Institute of Applied Biosciences (INAB)** Agri-biotechnology, Health Translational Research, Informatics for big bio-data

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