

# 10TH ANNUAL INTERNATIONAL PEMS VIRTUAL CONFERENCE

*From the Laboratory to the Real World:  
Understanding Community Impacts*



**March 11th & 12th, 2021**





# 10<sup>th</sup> ANNUAL INTERNATIONAL PEMS CONFERENCE

March 11th & 12th  
2021

FROM THE LABORATORY TO THE REAL WORLD:  
UNDERSTANDING COMMUNITY IMPACTS



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Thank you for your interest in 10th Annual International Portable Emissions Measurement Systems (PEMS) Virtual Conference, presented by the University of California at Riverside (UCR) Bourns College of Engineering Center for Environmental Research and Technology (CE-CERT). For ten years, the PEMS International Conference has served a highly recognized forum that gathers top researchers from industry, government, and academia to discuss the evolving nature, application and significance of PEMS in emission and fuels research. Participants and presenters over the course of this conference have ranged in background bringing together individuals working with a broad range of measurement systems, including fully compliant regulatory PEMS (1065 Compliant PEMS) and small systems, which include everything from micro PEMS ( $\mu$ PEMS), nano PEMS (nPEMS), in-situ sensors, portable activity measuring systems (PAMS), to Real Emissions Assessment and Logging (REAL).

At this year's conference we will explore the notion of *From the Laboratory to the Real World: Understanding Community Impacts*. The focus in 2021 will be on seeking answers to the most pressing questions in today's world pertaining to climate and health. Topics covered will include the latest developments in compliant and non-compliant PEMS; the benefits of PAMS and prediction of in-use emissions; and new developments for on-road measurements from an international perspective, such as Real Driving Emissions.

Thank you,  
Kent Johnson, Ph.D.  
Principal Investigator, Emissions and Fuels Research  
UC Riverside CE-CERT





# AGENDA DAY 1

All times are in Pacific Time (PT)

9:00 AM

## Opening Remarks and Keynote

### Matthew Barth

Director and Professor, University of California, Riverside CE-CERT

*Opening Remarks*

### Sterling Imfeld

Engine Testing Center at the National Vehicle and Fuel Emissions Laboratory, EPA

*Keynote Presentation*

10:00 AM

## Exposure & Measurements

### Daisy Thomas

3DATX

*New Approaches to Periodic Technical Inspection (PTI) Vehicle Emission Tests*

### Nick Molden

Emissions Analytics, Ltd.

*Vehicle Interior Air Quality, Pollution Exposure in the Cabin and the Opportunity for Standardized International Ratings Transport Energy / Emissions Research (TER)*

### Sebastián Tolvett

Metropolitan University of Technology, Chile

*Evaluation of TDI Engine No Emissions in Chile Measured with PEMS*

10:50 AM

## Government Policy

### Tim Dallman

International Council on Clean Transportation (ICCT)

*Using Vehicle Remote Sensing Emissions Data to Inform Low-emission Transportation Policies and Actions*

### William (Bill) Robertson

California Air Resources Board (CARB)

*Sensor Based Emissions: A Regulator Perspective On 'REAL' and Future Directions*

### Kent Johnson

University of California, Riverside CE-CERT

*On-Board Sensing, Analysis, and Reporting (OSAR)*

12:00 PM

## Break

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# AGENDA DAY 1

All times are in Pacific Time (PT)

1:00 PM

## Research & Development

### Kotaro Tanaka

Ibaraki University, Japan

*Ammonia Measurement in Exhaust using SEMS and PEMS*

### Susumu (Mu) Sato

Tokyo Institute of Technology

*The Real-world Emissions Prediction with Deep Learning Based on the SEMS Measurement Data*

### Robin Smit

Transport Energy / Emission Research (TER)

*An Overview of Measuring and Modelling Real-world Vehicle Emissions in Australia*

### Imad Khalek

Southwest Research Institute (SwRI)

*Laboratory Investigation of NOx/NH3 Sensors for Onboard Emissions Monitoring*

2:05 PM

## Panel Discussion

### Kent Johnson

University of California, Riverside, CE-CERT

### Tim French

Truck & Engine Manufacturers Association & Chicago Law Partners

### Sterling Imfeld

United States Environmental Protection Agency

### William (Bill) Robertson

California Air Resources Board (CARB)



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# AGENDA DAY 2

All times are in Pacific Time (PT)

9:00 AM

## Research & Development

**Zissis Samaras**

Aristotle University of Thessaloniki

*Measuring Automotive Exhaust Particles Down to 10nm - "DownToTen" Project*

**Kay-Oliver Denking**

CPK Automotive

*NOx-Sensor for Emission - and Immission - Measurement*

**Ehsan Hosseini**

California Air Resources Board (CARB)

*Calculation of a GHG Emissions Rate for Transportation Network Companies in California*

**Karl Ropkins**

University of Leeds

*Progress: AQEval and Early Research Outputs*

**André Forcetto**

Environmental Company of Sao Paulo State  
CETESB

*Advances in Real Driving Emissions in Brazil*

**Phil Roberts**

Horiba

*RDE Plus - A Road to Rig Development Methodology for Whole Vehicle RDE Compliance*

10:40 AM

## Sensing & Policy

**Zissis Samaras**

Aristotle University of Thessaloniki

*On-board Monitoring with Advanced Exhaust Sensors*

**Yi Tan**

California Air Resources Board

*Assessing the Ability of On-board NOx Sensors to Reflect Full Cycle NOx Emissions*

**Cavan McCaffery\***

University of California, Riverside

*PEMS testing studies at UC Riverside CE-CERT*

**Chris Ruehl**

California Air Resources Board

*Comparison of Early (model yr. 2010-11) and Later (2013-14) On-road Performance of Selective Catalytic Reduction (SCR) on Heavy-duty Engines*

11:45 AM

## Closing Remarks

**Kent Johnson**

University of California, Riverside, CE-CERT



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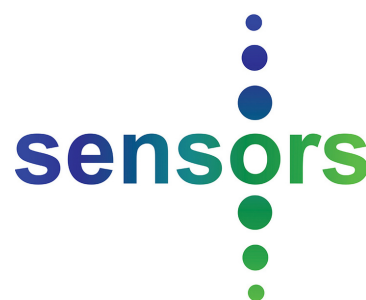


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## Bronze Level

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## Keynote

### **Sterling Imfeld**

Director, Engine Testing Center at the National Vehicle and Fuel Emissions Laboratory, Environmental Protection Agency

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Sterling Imfeld has nearly 20 years of experience in vehicle and engine testing at the EPA. After spending his early years focused on hybrid vehicle and controls development, Sterling is now the Director for the Engine Testing Center at the National Vehicle and Fuel Emissions Laboratory. As Director, he leads the testing activities related to regulatory development and compliance testing for engines ranging from heavy duty on-road and nonroad diesel to small gasoline handheld engines, and he is also responsible for PEMS testing in the Laboratory.

Sterling and his wife have three boys who keep life busy, with lots of soccer, hiking and time on the water. The family also enjoys traveling, including a yearly summer trip to visit family in Scotland.



# SPEAKERS



**Tim Dallman**, Compliance & Enforcement Program Lead, International Council on Clean Transportation

Dr. Tim Dallmann is the Compliance & Enforcement Program Lead at ICCT. He leads projects involving the evaluation of real-world emissions and efficiency performance of motor vehicles, as well as collaboration with government agencies and other stakeholders in developing effective solutions to ensure that efficiency and pollution standards are met in practice as well as theory. Tim also leads ICCT's activities in The Real Urban Emissions (TRUE) Initiative, which applies real-world emissions data to support the development of low-emission transport policies in cities around the world. He has expertise in measurement and analysis of vehicle emissions and their impacts on air quality and climate. Tim holds a B.S. in Civil and Environmental Engineering from the University of Wisconsin, Madison, as well as an M.S. and a Ph.D. in Civil and Environmental Engineering from the University of California, Berkeley.



**Kay-Oliver Denking**, Sales Manager, CPK Automotive

Kay-Oliver earned a Master Degree in Mechanical Engineering at the University of Stuttgart (Germany). He has several years of experience primarily in the field of Diesel exhaust aftertreatment in Application Engineering, Project Management and Sales. In 2019 he joined CPK Automotive, Münster (Germany), an automotive supplier providing data acquisition and data handling systems for OEM and retrofit applications.



**André Forcetto**, Technologist, Environmental Company of Sao Paulo State - CETESB

André is a Technologist at Environmental Company of Sao Paulo State - CETESB where he is a technical analysis of vehicular pollution (gases and noise) for type-approval purposes and collaborates with the Brazilian Technical Normative Institute. His current research is developing a portable emissions measurement system for flexfuel vehicles. Specifically, this multidisciplinary research is developing on-board systems to measure vehicular pollutants of flexfuel cars and motorcycles.



**Tim French**, Truck & Engine Manufacturers Association & Chicago Law Partners

Timothy A. French is a founding Member of Chicago Law Partners, LLC. Tim has earned a national reputation for his experience in matters arising under the Clean Air Act and related state and local air quality statutes and regulations. On behalf of leading trade associations and other clients, he has represented the interests of major stakeholders in rulemakings before the U.S. EPA and the California Air Resources Board. He also has litigated Clean Air Act and related state law issues before the U.S. Supreme Court, the D.C. Circuit Court of Appeals, the Ninth Circuit Court of Appeals and other federal and state courts, and has successfully advocated a number of significant preemption claims.



# SPEAKERS



**Ehsan Hosseini**, Air Pollution Specialist, California Air Resources Board

Ehsan Hosseini is a Staff Air Pollution Specialist working for California Air Resources Board (CARB) in the on-road model development section. He contributes to development of the EMFAC model, and provides regulatory and inventory support to various CARB programs. Ehsan received a Ph.D. in Mechanical Engineering from University of California, Riverside in 2012 for his work in the field of characterization of emissions from biomass burning.



**Kent Johnson**, Associate Researcher, Center for Environmental Research & Technology, UCR

Dr. Kent Johnson joined CE-CERT's research faculty in 2010 after serving on the Center's staff as Principal Development Engineer and manager of the Mobile Emissions Laboratory (MEL). He is an Associate Researcher and Assistant Adjunct Professor for the Emission and Fuel Research Lab. Dr. Johnson received his Ph.D. in chemical and environmental engineering from UC Riverside where his doctoral research focused on the impact of emissions on ambient air quality. More specifically Johnson's research interests include: 1) quantification of in-use emission measurements; 2) advancement of measurement techniques; and 3) study of fuel impacts on emissions for diesel engines.



**Imad Khalek**, Sr. Program Manager, Southwest Research Institute

Dr. Imad A. Khalek is a Sr. Program Manager at the Powertrain Engineering Division of Southwest Research Institute. He has been with SwRI for 22 years. He manages the Particle Science & Technology section in the Department of Engine and Emissions R&D. He is the founder of SwRI Particle Laboratory that recently became the world only ISO 17025 particle calibration laboratory accredited by A2LA for four distinct particle number and size calibration processes. Dr. Khalek has run numerous programs focusing on emissions from engines such as CRC ACES and measurement method development such as CRC Project E-66 and EPA/EMA/CARB PM-PEMS measurement allowance. He is the founder of SwRI Particle Sensor Performance and Durability (PSPD) Consortium. He has over 55 publications and numerous presentations in the public domain. He served as Chairman of SAE Exhaust Emissions and Aftertreatment Committee 2017-2019. He is also an Associate Editor of the SAE Journal of Engines and the founding organizer of the SAE Particle Emissions from Combustion Sources session.



**Cavan McCaffery**, Graduate Student, University of California, Riverside

Cavan McCaffery is a graduate student researcher at the University of California, Riverside – College of Engineering Center for Environmental Research and Technology (CE-CERT) where he works with the Emission and Fuels Research Group. His focus is in Mechanical Engineering and his research provides data on how different renewable fuel sources and after-treatment systems affect the overall emissions provided by different mobile sources in real world situations. Cavan plans to complete his graduate program in the Spring of 2021.



# SPEAKERS



**Nick Molden**, Founder & CEO, Emissions Analytics

Nick founded Emissions Analytics in 2011 in order to understand real-world fuel economy and emissions from vehicles. The concept was to find a way to characterize vehicles in a relatively short test, and be able to conduct a large number of comparable tests. The resulting database is now a platform for analyzing and modelling emissions performance, from which the EQUA Index was created, which is used and published in the UK, across Europe and the USA.

He is a specialist in data analytics, particularly in the automotive market, through his prior work at Oxford Indices Ltd, a data specialist, United Business plc and Haymarket Media Group. Nick is a graduate of the University of Oxford, with an MA in Philosophy, Politics and Economics.



**Phil Roberts**, Technical Specialist, Horiba

Phil is a chartered engineer with a PhD in fundamental engine combustion from the University of Leeds, England. He has worked for JCB Power Systems in mainstream diesel engine development and calibration and Jaguar Land Rover in Powertrain Research looking after gasoline combustion research using single cylinder thermodynamic and optical research engines.

He currently works at HORIBA MIRA in the UK as a Technical Specialist in Propulsion Research and Development responsible for all technical input for customer engine development projects as well as the technical lead for engine development, calibration and Engine-in-the-Loop activities within the RDE+ programme.



**William (Bill) Robertson**, Program Specialist, California Air Resources Board

Dr. Bill Robertson is CARB's Vehicle Program Specialist for Heavy Duty Programs including efforts related to the Heavy Duty Low NOx Omnibus. Bill has been with CARB for 16 years working on a variety of projects to quantify environmental impact of engine technology, exhaust aftertreatment and alternative fuels. Prior to CARB he studied aerosol chemistry as a post doc with UC Irvine and received a PhD in Physical Chemistry from Yale University.



**Karl Ropkins**, Senior Research Fellow, University of Leeds

Karl is an applied analytical chemist with interests in vehicle emissions and pollutant source apportionment. Karl has held posts in commercial consultancy and academia (currently University of Leeds; previously Wye College, Imperial College and Birmingham University). His research focuses on the measurement, characterization and quantification of transport-related emissions and the relationship between emissions and real-world impacts.



# SPEAKERS



**Chris Ruehl**, Air Pollution Specialist, California Air Resources Board

Chris Ruehl is a Staff Air Pollution Specialist at the California Air Resources Board, where he collects and analyzes vehicular emissions and activity data. He previously worked at Lawrence Berkeley Laboratory, studying aerosol-cloud interactions and their impact on climate, and has taught Environmental Management courses at the University of San Francisco. He has a B.S. in Chemical Engineering from Rice University and a Ph.D. in Earth Sciences from U.C. Santa Cruz.



**Zissis Samaras**, Professor, Aristotle University

Professor Zissis Samaras is Director of the Lab of Applied Thermodynamics, Aristotle University. His research work deals with engine and vehicle emissions testing and modeling. He coordinated a number of large European projects, such as "Characterisation of Particulate Emissions from Road Vehicles", "Methodology to evaluate the impact of ICT on road emissions", "OBD systems and limits for Euro 6/VI", "Measuring exhaust particles down to 10nm". He is elected Vice Chairman of the European Road Transport Research Advisory Council and co-led for many years the UN-ECE Topic Group "Mobile Sources". He provided expert advice to a number of organisations, including the World Bank, ACEA, Concawe. He co-authored more than 250 publications, with more than 4400 citations (author h index 35) and holds four international patents. He is the co-founder of three spin-off companies Exothermia (exhaust aftertreatment simulation), Emisia (transport emission inventories) and Bio2CHP (biomass gasification).



**Susumu (Mu) Sato**, Professor, Tokyo Institute of Technology

Dr. Susumu Sato is an Associate Professor at Tokyo Institute of Technology, Department of Systems and Control Engineers. His research fields range from On-board emission measurement, real-world emission modeling, HCCI combustion, PCCI combustion and Diesel combustion, and aftertreatment system. In 2019-2020 he was a Visiting Scholar at CE-CERT, University of California.



**Yi Tan**, Engineer, California Air Resources Board

Yi Tan is an Air Resources Engineer in the Research Division at California Air Resources Board. His current research focuses on real-world mobile source emissions. He manages related research projects and perform analyses on the data collected by these projects. He previously worked in the Monitoring and Laboratory Division and conducted on-road emission testing of light-duty diesel vehicles. He was a postdoctoral researcher at Carnegie Mellon University where he worked on community air quality monitoring and environmental justice. He received his Ph.D. in atmospheric chemistry from Rutgers University in 2010.



# SPEAKERS



**Kotaro Tanaka**, Professor, Ibaraki University

Dr. Kotaro Tanaka is a Professor at Ibaraki University. His main research focus is in fuel combustion in engine and emission measurement, using laser spectroscopic technique, mass spectrometry and sensors. He is also currently interested in non-regulated emission measurements using near-IR and mid-IR laser spectroscopy and sensors.



**Daisy Thomas**, Lead Automotive Research Engineer, 3DATX

Dr. Daisy Thomas works for 3DATX Corporation as their Lead Automotive Research Engineer. She recently completed her PhD in Engineering at the University of Leeds, UK, studying the tailpipe emissions from hybrid vehicles and those using biofuels. Daisy has experience in both the light-duty and heavy-duty vehicle emissions sectors from on-road and chassis dynamometer testing, including performing regulatory RDE and WLTC tests in both the UK and China.



**Sebastián Tolvett**, Universidad Tecnológica Metropolitana, Chile

Sebastián Tolvett (M.Sc.) has more than 15 years of experience working in the field of transport emissions. His career began at the International Center for Sustainable Systems Research in California, through the Center he collaborated on more than 15 emissions projects in Brazil, China, Chile, Colombia, Guatemala, Mexico, Turkey and the United States. Since 2015, he has held an academic position at the Universidad Tecnológica Metropolitana, Chile, where he established the mobile source emissions research area in the department of mechanical engineering. Currently, he works as an assistant researcher at the CMT-Motores Institute of the Polytechnic University of Valencia, Spain, where he deepens his knowledge of European engine calibration and emission control.



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PERSON IN 2022!**

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