

An aerial night photograph of a city, likely Tokyo, showing a dense grid of illuminated buildings and a complex network of highways. Long-exposure light trails from vehicles create vibrant orange and white streaks across the roads. The overall color palette is dominated by deep blues and purples, punctuated by the warm yellows and oranges of city lights.

March 14th & 15th, 2019  
Bourns Technology Conference  
Center

# 9TH ANNUAL INTERNATIONAL PEMS CONFERENCE

EVOLVING FROM THE  
LABORATORY TO THE REAL  
WORLD



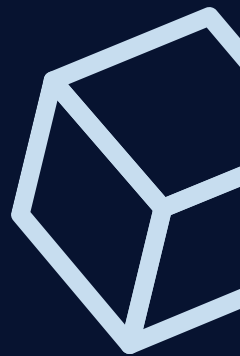
# WELCOME

Welcome to the 9th Annual International Portable Emission Measurement Systems (PEMS) Conference, presented by the University of California at Riverside (UCR) Bourns College of Engineering Center for Environmental Research and Technology (CE-CERT). For nine years, the PEMS International Conference has served as a highly recognized forum that gathers leaders and 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 measurement systems (PAMS), to Real Emissions Assessment and Logging (REAL).

At this year's conference, we will explore the application and benefit of all measurement systems that are portable for the characterization and compliance of internal combustion sources under in-use conditions. The idea is to accurately measure these sources where, when, and how much they occur so data driven policies can be developed to protect the climate and health. The focus in 2019 will be on Evolving from the Laboratory to the Real-World, with various topics that will seek to answer the most pressing questions in today's world. 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.

We would also like to extend a special thank you to our sponsors of this year's conference. Their support and participation is instrumental in our ability to present a successful and world-renowned conference that will continue to host leaders from all areas of measurement systems for many years to come. Thank you, also, to our CE-CERT faculty, staff, and students who work vigorously behind the scenes to coordinate the implementation of the PEMS conference. Finally, thank you to you, our participants—through your continued support of this academic conference, we have been able to explore some of the most pressing questions surrounding PEMS, cultivate cutting edge technology, and begin development of the next generation of on-board sensors, analysis, and reporting algorithms.

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



# AGENDA DAY 1

**7:00 AM**

**Breakfast and Registration**

**8:00 AM**

**Opening Remarks and Keynote**

**9:00 AM**

**Government Policy**

**10:00 AM**

**Break**

**10:30 AM**

**Policy and Technology**

**11:30 AM**

**Lunch**

**12:30 PM**

**Sensors and Mini-PEMS**

**2:30 PM**

**Break**

**2:50 PM**

**International Research Developments**

**3:50 PM**

**Break**

**4:00 PM**

**Panel Discussion**

**6:00 PM**

**Evening Reception**

# AGENDA DAY 2

**7:30AM**      **Breakfast**

**8:00AM**      **Research Developments**

**10:20AM**      **Break**

**10:50AM**      **2019 Exposure Measurements**

**11:50AM**      **Lunch**

**12:00PM**      **2019 Featured Lecture**  
**Spatial Big Data Management: A Brief**  
**History, State, and Applications**

**1:00PM**      **Closing Remarks**

Poster Presentations will be on display during both days of the conference during breakfast, lunch, and breaks.

Please visit with our exhibitors throughout both days of the conference during breakfast, lunch, and breaks to learn more about their organization and available products.

# DAY 1 - THURSDAY MARCH 14, 2019

7:00AM – 8:00AM

## CHECK-IN AND BREAKFAST

8:00AM – 9:00AM

## OPENING STATEMENTS AND INTRODUCTIONS

**Matthew Barth**

Director and Professor, UCR  
Center for Environmental  
Research and Technology

Welcome and Opening Remarks

**Mark Fuentes,**

California Air Resources Board

Key Note Presentation

9:00AM – 10:00AM

## GOVERNMENT POLICY

**Paul Henderick**

California Air Resources Board

California's Real Emissions Assessment Logging  
(REAL) Initiative: On-road Vehicles Will Track  
Their Own NOx and GHG Emissions

**Ricardo Suarez-Bertoa**

European Commission - Joint  
Research Center

On-road Emissions of Passenger Cars Beyond  
Real-Driving Emissions Test

**Kent Johnson**

University of California,  
Riverside

UCR's Vision for in-use Emissions and their  
Measurement

10:00AM –  
10:30AM

## BREAK

10:30AM – 11:30AM

## POLICY AND TECHNOLOGY

**John Needham**

U.S. Environmental Protection  
Agency

Challenges in Developing and Advancing Mini-  
PEMS for Gathering Emission and Activity Data  
for Nonroad, Light- and Heavy- Duty Vehicle  
Collection Programs

**Matthew Spears**

Engine Manufacturers  
Association

Assessment of a Candidate Metric for a New  
Paradigm of Real-World NOx Emissions  
Compliance for Heavy-Duty on-Highway  
Engines

**Dave Miller**  
3DATX

Equipment Miniaturization & Big Data: Meeting  
Global Emissions Monitoring Challenges

11:30AM – 12:30PM

LUNCH

12:30PM – 2:30PM

SENSORS AND MINI-PEMS

**Frank Heepen**  
HORIBA Europe GmbH

HORIBA's Micro Smart Emissions Measurement  
System

**Matti Maricq**  
Ford Motor Company

Investigating Measurement Uncertainties  
Related to the Use of Miniature PEMS for Direct  
Tailpipe Emissions Under Controlled Laboratory  
Conditions

**Gloria Pak**  
California Air Resources Board

NH<sub>3</sub> Cross-Sensitivity of a NO<sub>x</sub> sensor and  
NH<sub>3</sub> Measurements of Newer-Model  
Gasoline Light-Duty Vehicles

**Christian Adams**  
Multicore Photonics

NSF Sponsored NO<sub>x</sub> Sensor Research for Diesel  
Combustion Exhaust Monitoring

**Imad A. Khalek**  
SwRI

Spark-Plug Sized Exhaust Emission Sensors:  
Progress Made and Next Steps

**Ehsan Hosseini**  
California Air Resources Board

Application of Machine Learning Methods for  
Development of Heavy Duty Vehicle Emission  
Inventories

2:30PM – 2:50PM

BREAK

2:50PM – 3:50PM

INTERNATIONAL RESEARCH DEVELOPMENTS

**Carol Wong**  
Environmental Protection  
Department, Hong Kong SAR  
Government, China

Recent Findings in on-Board Vehicle Emission  
Measurement in Hong Kong

**Rasik Pondicherry**  
West Virginia University

On-board Sensor-based Characterization of  
Real-World NO<sub>x</sub> Emissions and Heavy-duty  
Vehicle Activity in California

**Victor Valverde**  
European Commission - Joint  
Research Center

Pollutant Emissions From Road Transport: State  
of Play of the European Union Regulations

3:50PM – 4:00PM

BREAK

4:00PM – 5:00PM

PANEL DISCUSSION

Kent Johnson

University of California, Riverside

Carl Fulper

U.S. Environment Protection Agency

Matthew Spears

Engine Manufacturers Association

Mark Fuentes

California Air Resources Board

5:00PM

END OF DAY 1

6:00PM – 9:00PM

EVENING RECEPTION: JOIN US AT THE COLLEGE OF ENGINEERING  
–CENTER FOR ENVIRONMENTAL RESEARCH AND TECHNOLOGY  
(CE-CERT) LOBBY FOR AN EVENING NETWORKING RECEPTION.

**Make sure to visit our exhibitors  
and view our poster  
presentations throughout both  
days of the conference.**

# DAY 2 - FRIDAY MARCH 15, 2019

7:30AM – 8:00AM

## BREAKFAST

8:00AM – 10:20AM

## RESEARCH DEVELOPMENTS

**Christopher Frey**  
North Carolina State University

Variability in Vehicle Energy Use and Emissions Based on Cycle Average Speed and Vehicle Specific Power

**Carl Fulper,**  
U.S. Environmental Protection Agency

Challenges in and Approaches for Conducting Heavy-Duty Truck Activity Collection Programs

**Daryl Bear**  
Mesilla Valley Transportation Solutions

Avoiding or Correcting In-Use Test Variability for Improved Detection of Fuel-Efficiency and Emissions Differences

**Cody Howard**  
California Air Resources Board

Approaches to Determining Threshold Values for Snap-Shot Emissions Measurements

**Hiroaki Minoura**  
Asia Center for Air Pollution Research

Transient RDE NOx Emissions from Diesel City Bus in Xiamen, China

**Karl Ropkins**  
University of Leeds

Real-World Motorcycle Emissions

**Susumu Sato**  
Tokyo Institute of Technology  
Department of Systems and Control Engineering

The Estimation and the Prediction of Real World Driving Emission from Diesel Passenger Vehicle Based on

10:20AM –  
10:50AM

## BREAK

10:50AM – 11:50AM

## EXPOSURE MEASUREMENTS

**Nick Molden**  
Emissions Analytics

The Importance of Particles and Carbon Dioxide in Air Pollution and In-Vehicle Human Exposure

**Douglas Booker**  
National Air Quality Testing Services Ltd

Introducing PIMS: The Pollution In-Cabin Measurement System



**Heejung Jung**  
UC Riverside

Development of a Standard Testing Method for  
Vehicle Cabin Air Quality Index

11:50AM – 12:00PM

## LUNCH

(SIT DOWN TO CONTINUE INTO FEATURED LECTURE)

12:00PM – 1:00PM

## 2019 FEATURED LECTURE

**Amr Magdy Ph.D,**  
UC Riverside, Assistant Professor,  
Computer Science & Engineering  
Co-founder, Center for Geospatial  
Sciences

Spatial Big Data Management: A Brief History,  
State, and Applications

1:00PM – 1:15PM

## CLOSING REMARKS

1:15PM

## END OF DAY 2

# 2019 POSTER PRESENTATIONS

CARL DESOUZA	Kings College London	REAL-WORLD IN-USE PORTABLE EMISSION MEASUREMENTS OF NON-ROAD MOBILE MACHINERY USED ON ACTIVE CONSTRUCTION SITES IN LONDON
BATISHAHE SELIMI	West Virginia University	MACHINE LEARNING APPROACHES TO HANDLE "BIG DATA" FROM PAMS DEVICES
CHAS FREDERICKSON	UC Riverside	MEASUREMENT OF PARTICULATE MATTER AND GASEOUS EMISSIONS FROM COMMERCIAL HARBOR CRAFT DURING REAL-WORLD OPERATION
FILIZ KAZAN	West Virginia University	EVALUATION OF MINIATURE, IN-SITU GAS SENSORS USING THE DYNAMIC ENVIRONMENTAL SIMULATION CHAMBER (DESC)
MEET PATEL	Michigan Technological University	COMPARISON OF HORIBA PN-PEMS WITH LABORATORY GRADE PN SYSTEMS
JAMIE PARNELL	Cambustion	HIGH-RESOLUTION NOX EMISSIONS MEASUREMENT FROM IN-SERVICE BUSES DURING TRANSIENTS
SEBASTIÁN TOLVETT CARO	Universidad Tecnológica Metropolitana, Chile	PORTABLE SYSTEM FOR MEASUREMENT OF VEHICULAR EMISSIONS IN CHILE
ROBERT ANDERSON	TSI	A NEW PORTABLE TEST INSTRUMENT FOR THE RELIABLE MEASUREMENT OF PARTICLE NUMBER EMISSIONS FROM COMBUSTION ENGINES DURING PERIODIC TECHNICAL INSPECTION

# THANK YOU TO OUR SPONSORS

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