9TH ANNUAL INTERNATIONAL PEMS CONFERENCE
EVOLVING FROM THE LABORATORY TO THE REAL WORLD

March 14th & 15th, 2019
Bourns Technology Conference Center
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 (µPEMS), nano PEMS (nPEMS), in-situ sensors, portable activity measurement systems (PAMS), to Real Emissions Assessment and Logging (REAL).

In 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 PEMS and noncompliant PEMS; the benefits of portable activity measurement systems (PAMS) and prediction of in-use emissions; and new developments for on-road measurements from an international perspective, such as RDE.

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

7:00AM  Breakfast and Registration
8:00AM  Opening Remarks and Keynote
9:00AM  Government Policy
10:00AM Break
10:30AM Policy and Technology
11:30AM Lunch
12:30PM Sensors and Mini-PEMS
2:30PM  Break
2:50PM  International Research Developments
3:50PM  Break
4:00PM  Panel Discussion
6:00PM  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 out 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 MiniPEMS for Gathering Emission and Activity Data for Nonroad, Light- and Heavy- Duty Vehicle Collection Programs

- **Matthew Spears**
  Engine Manufactures Association
  Assessment of a Candidate Metric for a New Paradigm of Real-World NOx Emissions Compliance for Heavy-Duty on-Highway Engines
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Affiliation/Title</th>
<th>Presentation Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:30 AM – 12:30 PM</td>
<td></td>
<td>Dave Miller 3DATX</td>
<td>Equipment Miniaturization &amp; Big Data: Meeting Global Emissions Monitoring Challenges</td>
<td></td>
</tr>
<tr>
<td>12:30 PM – 2:30 PM</td>
<td></td>
<td>Frank Heepen HORIBA Europe GmbH</td>
<td>HORIBA’s Micro Smart Emissions Measurement System</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Matti Maricq Ford Motor Company</td>
<td>Investigating Measurement Uncertainties Related to the Use of Miniature PEMS for Direct Tailpipe Emissions Under Controlled Laboratory Conditions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gloria Pak California Air Resources Board</td>
<td>NH3 Cross-Sensitivity of a NOX sensor and NH3 Measurements of Newer-Model Gasoline Light-Duty Vehicles</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Christian Adams Multicore Photonics</td>
<td>NSF Sponsored NOx Sensor Research for Diesel Combustion Exhaust Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imad A. Khalek SwRI</td>
<td>Spark-Plug Sized Exhaust Emission Sensors: Progress Made and Next Steps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ehsan Hosseini California Air Resources Board</td>
<td>Application of Machine Learning Methods for Development of Heavy Duty Vehicle Emission Inventories</td>
<td></td>
</tr>
<tr>
<td>2:30 PM – 2:50 PM</td>
<td></td>
<td></td>
<td></td>
<td>BREAK</td>
</tr>
<tr>
<td>2:50 PM – 3:50 PM</td>
<td></td>
<td>Carol Wong Environmental Protection Department, Hong Kong SAR Government, China</td>
<td>Recent Findings in on-Board Vehicle Emission Measurement in Hong Kong</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rasik Pondicherry West Virginia University</td>
<td>On-board Sensor-based Characterization of Real-World NOx Emissions and Heavy-duty Vehicle Activity in California</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Victor Valverde European Commission - Joint Research Center</td>
<td>Pollutant Emissions From Road Transport: State of Play of the European Union Regulations</td>
<td></td>
</tr>
</tbody>
</table>
3:50PM – 4:00PM

BREAK

4:00PM – 5:00PM

PANEL DISCUSSION

Kent Johnson
Carl Fulper
Matthew Spears
Mark Fuentes
University of California, Riverside
U.S. Environment Protection Agency
Engine Manufacturers Association
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

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30AM – 8:00AM</td>
<td><strong>BREAKFAST</strong></td>
</tr>
<tr>
<td>8:00AM – 10:20AM</td>
<td><strong>RESEARCH DEVELOPMENTS</strong></td>
</tr>
<tr>
<td><strong>Christopher Frey</strong>&lt;br&gt;North Carolina State University</td>
<td>Variability in Vehicle Energy Use and Emissions Based on Cycle Average Speed and Vehicle Specific Power</td>
</tr>
<tr>
<td><strong>Carl Fulper</strong>&lt;br&gt;U.S. Environmental Protection Agency</td>
<td>Challenges in and Approaches for Conducting Heavy-Duty Truck Activity Collection Programs</td>
</tr>
<tr>
<td><strong>Daryl Bear</strong>&lt;br&gt;Mesilla Valley Transportation Solutions</td>
<td>Avoiding or Correcting In-Use Test Variability for Improved Detection of Fuel-Efficiency and Emissions Differences</td>
</tr>
<tr>
<td><strong>Cody Howard</strong>&lt;br&gt;California Air Resources Board</td>
<td>Approaches to Determining Threshold Values for Snap-Shot Emissions Measurements</td>
</tr>
<tr>
<td><strong>Hiroaki Minoura</strong>&lt;br&gt;Asia Center for Air Pollution Research</td>
<td>Transient RDE NOx Emissions from Diesel City Bus in Xiamen, China</td>
</tr>
<tr>
<td><strong>Karl Ropkins</strong>&lt;br&gt;University of Leeds</td>
<td>Real-World Motorcycle Emissions</td>
</tr>
<tr>
<td><strong>Susumu Sato</strong>&lt;br&gt;Tokyo Institute of Technology Department of Systems and Control Engineering</td>
<td>The Estimation and the Prediction of Real World Driving Emission from Diesel Passenger Vehicle Based on</td>
</tr>
<tr>
<td>10:20AM – 10:50AM</td>
<td><strong>BREAK</strong></td>
</tr>
<tr>
<td>10:50AM – 11:50AM</td>
<td><strong>EXPOSURE MEASUREMENTS</strong></td>
</tr>
<tr>
<td><strong>Nick Molden</strong>&lt;br&gt;Emissions Analytics</td>
<td>The Importance of Particles and Carbon Dioxide in Air Pollution and In-Vehicle Human Exposure</td>
</tr>
<tr>
<td><strong>Douglas Booker</strong>&lt;br&gt;National Air Quality Testing Services Ltd</td>
<td>Introducing PIMS: The Pollution In-Cabin Measurement System</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>11:50 AM - 12:00 PM</td>
<td>LUNCH (SIT DOWN TO CONTINUE INTO FEATURED LECTURE)</td>
</tr>
<tr>
<td>12:00 PM - 1:00 PM</td>
<td>2019 FEATURED LECTURE</td>
</tr>
<tr>
<td>Amr Magdy Ph.D, UC Riverside, Assistant Professor, Computer Science &amp; Engineering Co-founder, Center for Geospatial Sciences</td>
<td>Spatial Big Data Management: A Brief History, State, and Applications</td>
</tr>
<tr>
<td>1:00 PM - 1:15 PM</td>
<td>CLOSING REMARKS</td>
</tr>
<tr>
<td>1:15 PM</td>
<td>END OF DAY 2</td>
</tr>
</tbody>
</table>

### 2019 POSTER PRESENTATIONS

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

The Bourns College of Engineering – Center for Environmental Research and Technology would like to thank the sponsors of the 2019 International PEMS Conference.

GOLD SPONSORS

AVL

HORIBA

South Coast AQMD

Automotive Test Systems

SILVER SPONSORS

California Air Resources Board

3DATX Corporation

Sensors

BRONZE SPONSORS

HEM Data

RA Automotive Software Solutions, Inc. www.ra-automotive.net

NGK NTK Spark Plugs Technical Ceramics

NGK Spark Plug Co., Ltd

Innovative Hydrogen Solutions

CONFERENCE SPONSORS

TSI

CAMBUSTION