

# Programme • Tuesday June 7, 2016



## Chair of the day:

**Eshan Dave**, TG1 leader of the Rilem TC241-MCD, University of New-Hampshire, USA

**8:00** Registration and gathering

**8:20** **Opening session Auditorium**

**Chair: Armelle Chabot**, Ifsttar / Mast, France

8:20 Welcome words from the Rilem TC241-MCD - **Bill Buttlar** and **Armelle Chabot**

8:30 Welcome words from the Scientific Director of Ifsttar - **Serge Piperno**

8:40 Welcome words from the DGITM, MEEM French Ministry - **Christine Bouchet**

**9:00** **Plenary Lectures Auditorium**

Cracking the past, the present and the future, a never ending story

9:00 **Andre Molenaar**, TU Delft, The Netherlands

New frontiers in fracture and fragmentation simulations

9:45 **Glaucio Paulino**, Georgia Institute of Technology, USA

**10:30** Coffee Break



**11:00** **Parallel Podium Sessions 1,2 and 3**

**Podium session 1: Pavement Fatigue Performance Salle GH**

**Chair: Cédric Sauzéat**, laboratoire Génie Civil Bâtiment (UMR 5513), ENTPE, France

11:00 EME2 Fatigue Properties and Pavement Design in a Sub-Tropical Climate  
Laszlo Petho, ARRB Group - Peter Bryant, Department of Transport and Main Roads

11:20 Effect of temperature and traffic speed on the asphalt moduli for fatigue cracking  
and pavement structural design considerations  
Didier Bodin, Australian Road Research Board

11:40 Comparative Assessment of Pavement Fatigue Life Prediction  
Approaches for Use in Performance Based Specification  
Jo Daniel, University of New Hampshire

12:00 Coupling a multi-linear fatigue model and a pavement model to estimate truck aggressiveness  
Farah Homsy, Beirut Arab University

12:20 Prediction of Thermally-induced Reflective Cracking using Full-scale Test Data  
Hao Yin, GeminiTechnologies

**Podium session 2: Material Crack Characterization – I Auditorium**

**Chair: Christiane Raab**, EMPA, Switzerland

11:00 Effect of fiber grid reinforcement on crack initiation and propagation in asphalt concrete  
Xiaofeng Gao, ICUBE-GCE

11:20 Fracture characterization of grid-reinforced asphalt pavements  
Andrea Graziani, Università Politecnica delle Marche

11:40 Impact of Loading Rate and Temperature on Tensile Strength  
of Asphalt Mixtures at Low Temperatures  
Daniel Steiner, Vienna University of Technology

12:00 Numerical correlation between low temperature SCB fracture  
and IDT strength of asphalt mixture using FEM analysis  
Augusto Cannone Falchetto, Technische Universität Braunschweig

12:20 Analysis of Cracking Resistance of Bituminous Mixtures under Monotonic and Cyclic Loads  
Adriana Martínez, Ramón Botella, Technical University of Catalonia

**Podium session 3: Thermal Crack Mechanisms Salle I**

**Chair: Hassan Baaj**, *University of Waterloo, Canada*

- 11:00 Understanding the effects of ageing and temperature on the fatigue cracking resistance of bituminous mixtures  
Fernando Moreno-Navarro  
*Laboratory of Construction Engineering of the University of Granada*
- 11:20 Multiplicative viscoelastic-viscoplastic damage-healing model for Asphalt-Concrete materials  
Romain Balieu, *Royal Institute of Technology*
- 11:40 Self-healing of dense asphalt concrete by two different approaches: electromagnetic induction and infrared radiation  
Harith Ajam, *Nottingham Transportation Engineering Centre, The University of Nottingham*
- 12:00 Mechanisms in Healing of Bitumen and the Impact of Normal Force  
Greet Leegwater, *Delft University of Technology*
- 12:20 Assessment of Healing Properties of Asphalt Mixtures  
Ivan Isailovic, *Braunschweig Pavement Engineering Centre*

**12:45** *Lunch and Coffee*

**14:00** **Parallel Poster Sessions A,B,C and D Mezzanine**

**Poster session A: Fundamental bituminous material characteristics**

**Chair: Andrea Graziani**, *Università Politecnica delle Marche, Italy*

Cracking and Linear Visco Elastic Binder Properties  
Geoffrey Rowe, *Abatech*

Evaluation of Fatigue Behavior of Aged Asphalt Mixtures Using the Simplified Viscoelastic Continuum Damage Model  
Jorge Soares, *Universidade Federal do Ceará, Campus do Pici*

GB5® Mix Design: a new approach for aggregate grading optimization for heavy duty flexible pavements  
Simon Pouget, *EIFFAGE Infrastructures*

Modelling the Hysteresis Loops of Hot Mix Asphalt  
Taher Ahmed, *University of Liverpool*

Prediction of Hot Mix Asphalt Stiffness behavior by Means of Multiscale Modeling  
Ronald Blab, *Vienna University of Technology*

Simulation of the asymptotic behaviour of bituminous mixtures using the Discrete Element Method  
Minh Duc NGuyen, *ENTPE-Univ. of Lyon, LGCB-LTDS (UMR 5513)*

Visco-plastic behavior of bituminous mixtures: experiments and modeling  
Pierre Gayte, *Cerema, Direction Technique Infrastructures de Transport et Matériaux*

**Poster Session B: Pavement Fatigue Performance**

**Chair: Andreas Loizos**, *National Technical University of Athens, Greece*

A comprehensive study about stresses in upside-down pavements  
Ana Paula Furlan, *Department of Transportation, Engineering School of Sao Carlos, University of Sao Paulo*

Developing an Indicator for Fatigue Cracking in Hot Mix Asphalt Pavements Using Viscoelastic Continuum Damage Principles  
Jo Daniel, B. for Mensching David J., *Federal Highway Administration*



Effect of Heavy Traffic Loading on Predicted Pavement Fatigue Life  
Yared Dinegdae, *Royal Institute of Technology*

Flexural Properties of Cemented Granular Materials for Pavement Design  
Arooran Sountharajah, *Monash University*

Mechanistic Evaluation of the Long Term Performance Characteristics  
of Warm Mix Additives in Modified Asphalt Mixtures  
Mena Souliman, *The University of Texas at Tyler*

Performance Assessment of JPCP and CRCP Rigid Pavements Implementing M-E Analysis  
Michele Agostinacchio, *Università degli Studi della Basilicata - UNIBAS, Italy*

Weak Interlayers found in Flexible and Semi-Flexible Road Pavements  
Morris De Beer, *Built Environment, CSIR*



### Poster Session C: Material Crack Characterization

**Chair: Eshan Dave**, *University of New Hampshire, USA*

Effect of ageing and water action on the cracking resistance of asphalt mixtures  
Teresa López-Montero, *Technical University of Catalonia*

Effect of stress singularity on the scaling law of asphalt mixture strength at low temperature  
Augusto Cannone Falchetto, *Technische Universität Braunschweig*

Low Temperature Cracking Problem for Asphalt Pavements in Kazakhstan  
Bagdat Teltayev, *Kazakhstan Highway Research Institute*

Research of Cracks Formation at Transport Facilities of Azerbaijan  
Valery Vyrozhemsky, M.P. Shulgin, *State Road Research Institute - DerzhdorNDI*

### Poster Session D: Material Crack Performance

**Chair: Gordon Airey**, *The University of Nottingham, United Kingdom*

Combined Effect of SBS and Devulcanized Rubber (DVR)  
Modification on Performance Grade and Fatigue Cracking Resistance of Asphalt Binder  
Muhammed Kutay, *Department of Civil and Environmental Engineering, East Lansing*

Cracking Performance of Lower Asphalt Binder Coarse Hot Mix Asphalt Mixes  
Eshan Dave, *University of New Hampshire*

Determining the allowable content of RAP in HMA with regard to fatigue resistance  
Chiara Riccardi, *University of Pisa - Department of Civil and Industrial Engineering*

Effect of Bitumen Type and Content on the Cracking Resistance  
of Asphalt Mixtures at Different Temperatures  
Adriana Martínez, Ramón Botella, *Technical University of Catalonia*

Effects of Recycled Shingle and Virgin Asphalt Binder Mixing on Mixture Performance  
Brian Hill, *The University of Illinois at Urbana-Champaign*

Impact of additives on the cracking resistance of asphalt mixtures  
Peter Sebaaly, *University of Nevada, Reno*

Mixture and Production Parameters Affecting Cracking Performance of Mixtures with RAP and RAS  
Jo Daniel, *University of New Hampshire*

Shrinkage Characteristics of Alkali-activated Slag Mortar with SAP  
Youngcheol Choi, *Korea Conformity Laboratories*

The Impact of Homogeneity of High Modulus Asphalt Concrete Layer on Low-temperature cracking  
Piotr Jaskula, Dawid Rys, *Gdańsk University of Technology*

The influence mineral additions on the failure properties of bitumen emulsion mortars  
Andrea Graziani, *Università Politecnica delle Marche*

15:45

Coffee Break



**16:15 Parallel Podium Sessions 4,5 and 6**

**Podium session 4: Structural Crack Characterisation Auditorium**

**Chair: Cristina Plati**, *National Technical University of Athens, Greece*



- 16:15 Influence of SAMI on the performance of reinforcement grids  
Christiane Raab, *Federal Swiss Laboratories for Materials Science and Technology*
- 16:35 Investigating SAMI System Performance through pilot-scale testing  
Nick Thom, *Nottingham Transportation Engineering Centre*
- 16:55 Fast and easy road renovation through a steel based anti-reflective cracking interlayer for asphalt overlays  
Frederik Vervaecke, *NV Bekaert SA*
- 17:15 Reflective Cracking Included into Routine Design of new Asphaltic Pavements  
Jeroen Schrader, *Ooms Civiel bv*
- 17:35 M4-5n numerical solution using the Mixed FEM, validation against the Finite Difference Method  
Hanan Nasser, *Ifsttar / Mast*

**Podium session 5: Material Crack Characterization - II Salle I**

**Chair: Liedi Legi Bariani Bernucci**,

*Escola Politécnica da Universidade de São Paulo, EPUSP, Brasil*

- 16:15 A Study of Longitudinal Crack which Occurs to the Surface of Asphalt Pavement by Wheel Tracking Test  
Toshiaki Hirato, *Chuo University*
- 16:35 Effects of Ageing on Warm Mix Asphalts with High Rates of Reclaimed Asphalt Pavement  
Miguel Perez-Martinez, *Ifsttar / Mast*
- 16:55 Fracture Energy Evaluation of "Interstitial Asphalt Mixtures"  
Simone Musetti, *Università degli Studi di Parma*  
Gabriele Tebaldi, *University of Florida, Università degli Studi di Parma*
- 17:15 Significance of Oxidative Aging on the Thermal Cracking Predictions in Asphalt Concrete Pavements  
Mohammad Zia Alavi, *University of California*,  
Davis-Elie Hajj, Peter Sebaaly, *University of Nevada, Reno*
- 17:35 Viscoelastic properties of bituminous composites using multiscale heterogeneous numerical simulation and micromechanical analytical self-consistent model  
Fateh Fakhari Tehrani, *Conservatoire National des Arts et Métiers, Paris, GEMH*

**Podium session 6: Material Crack Propagation Salle GH**

**Chair: Ramón Botella Nieto**, *Universitat Politècnica de Catalunya, Spain*

- 16:15 Crack Evolution of Asphalt Mixtures under Compressive Monotonic and Repeated Loads  
Yuqing Zhang, *Aston University*
- 16:35 A Simple Fracture Model for Hot Mix Asphalt Based on Fundamental Fatigue Parameters  
Taher Ahmed, *University of Anbar, University of Liverpool*
- 16:55 Low Temperature Cracking Properties of Asphalt Mixtures Containing Rubber Bitumen Pellets  
Ignacio Artamendi, *Aggregate Industries UK*
- 17:15 Reinforcement of a cracked steel plate using CFRP bonding  
Emilie Lepretre, *Ifsttar / Mast*
- 17:35 Characterizing non-linear fatigue crack growth and size effect in plain concrete beams with a hybrid effective crack and cohesive zone model  
Karim Chatti, *Michigan State University*
- 18:00 End

**18:45 Wine and Cheese Reception Mezzanine**



# Programme • Wednesday June 8, 2016



## Chair of the day:

**Christophe Petit**, TG2 leader of the Rilem TC241-MCD, Université de Limoges, France

- 7:45** Registration and Gathering
- 8:05** Welcoming and Cluster F news from the Rilem Convener  
**Hervé Di Benedetto**, Université de Lyon / ENTPE (UMR 5513), France *Auditorium*
- 8:30** **Plenary Lectures** *Auditorium*
- 8:30** Characterization and Detection of Debonding Phenomena in Asphalt Pavements and on Concrete Bridge Decks  
**Manfred Partl**, EMPA materials science and technology, Switzerland
- 9:15** The Thick Level Set (TLS) damage model for quasi-brittle fracture: state of the art  
**Nicolas Moës**, GeM: Institut de Recherche en Génie Civil et Mécanique (UMR 6183), Ecole Centrale de Nantes, France
- 10:00** Coffee Break 
- 10:30** **Parallel Workshops 1 and 2**
- Workshop 1** *Salle GH*  
Theoretical and numerical modeling of interface debonding for various materials  
**Chair: Nicolas Moës**  
GeM: Institut de Recherche en Génie Civil et Mécanique (UMR 6183), Ecole Centrale de Nantes, France
- Workshop 2** *Auditorium*  
New approaches to address pavement failure more realistically in asphaltic pavement design methods  
**Co-chairs: Jorge Soares**, Universidade Federal do Ceara, Brazil  
**Michael Wistuba**, TU Braunschweig, Germany
- 12:45** Lunch and Coffee
- 14:00** **Parallel Poster Sessions E,F,G and H** *Mezzanine*
- Poster session E: Material Crack Propagation**  
**Chair: Manfred Partl**, EMPA materials science and technology, Switzerland
- A new approach for the study of fatigue cracking phenomenon in bituminous mixtures  
Fernando Moreno-Navarro  
Laboratory of Construction Engineering of the University of Granada
- Bump formation on a semi-rigid pavement: interpretation and modeling using the Thick Level Set (TLS) approach for damage growth  
Olivier Chupin, Ifsttar / Mast
- Modelling of the fatigue damage of geogrid reinforced asphalt concrete  
Cyrille Chazallon, Institut National des Sciences Appliquées de Strasbourg
- Predicting the Performance of SAMI Systems  
Nick Thom, Nottingham Transportation Engineering Centre
- Reflective Cracking in Asphalt Overlays Reinforced with Geotextiles  
Paulina Leiva-Padilla  
Laboratorio Nacional de Materiales y Modelos Estructurales de la Universidad de Costa Rica



### Poster Session F: Bond Characterization

**Chair: Alexandra Destrée**, *BRRC: Belgian Road Research Centre, Belgium*

Adhesion Between Asphalt Layers Through the Leutner Shear Test  
Matheus Gaspar, *Escola Politécnica da Universidade de São Paulo*

Advanced Characterisation Methods for Interface Shear Resistance for Airport Overlays  
Greg White, *Fulton Hogan*

Analysis of the draft European Standard on Interlayer Bonding  
and Understanding of the Influencing Factors  
Bernard Yvinec, *Campus Scientifique et Technique de Colas*

Comparative Analysis of Interlayer Bonding Behaviour of Different Types of Pavement Interfaces  
Ana Cristina Freire, *National Laboratory of Civil Engineering*

Investigation of Bond between Asphalt Layers in Flexible Pavement  
Ngoc Lan Nguyen, *The section of Construction materials,  
Institute of Construction Engineering, University of Transportation and Communications*

Performance-based Test Regime for High Friction Surfacing Systems on Asphalt Pavements  
Jeremy Wu, *Opus Research, Opus International Consultants Ltd.*

Round Robin Tests on Reflective Cracking Laboratory Tools  
Antoine Martin, *Eurovia Research Center*

The Effect of Interface Bonding Criterion on Pavement Design Reinforcement  
Andreas Loizos, *National Technical University of Athens*

### Poster Session G: Debonding Mechanisms (bituminous and various interfaces)

**Chair: Johan L Silfwerbrand**, *KTH: Kungliga Tekniska Högskolan, Sweden*

Effect of Hydrodemolition and Cutting Diameter of Pull-off Test  
on the Bond Strength of LMC Bridge Deck Pavement  
Kyong-Ku Yun, *Department of Civil Engineering, Kangwon National University*

Experimental Characterization of the Interface Damage between Bituminous Layers:  
from the Interphase to the Interface Properties  
Rahma Ktari, *Groupe d'Etudes des Matériaux Hétérogènes, Université de Limoges*

Mixed-Mode Debonding Approach to Evaluate Water Sensibility in Bi-Layer Composite Pavement  
Armelle Chabot and Ferhat Hammoum, *Ifsttar / Mast*

Moisture-induced Debonding Mechanisms in Asphalt Mixtures  
Alex Apeageyi, *University of Nottingham*

### Poster Session H: Advanced and Optical Measurements

**Chair: Gabriele Tebaldi**, *University of Parma, Italy and University of Florida, USA*

Automatic Crack Detection on Pavement Images for Monitoring Road Surface Conditions  
Some Results from the Collaborative FP7 TRIMM Project  
Vincent Baltazart, *Ifsttar / Cosys*

Damage Detection in Pavement Structures Using Self-Powered Sensors  
Karim Chatti, *Michigan State University*

Detection and Survey of Interface Defects within a Pavement Structure  
with Ultrasonic Pulse Echo  
Jean-Michel Simonin, *Ifsttar / Mast*

Digital Image Correlation to Monitor Cracking and Induction Healing of Asphalt Road  
Moises Bueno, *Empa, Swiss Federal Laboratories for Materials Science and Technology*

Digitized Measurement of the Microcracking Index on the Facings of Concrete Structures  
Jean-Marc Moliard, *Ifsttar / Cosys*



Mechanical Behavior of Asphalt Mixture based on X-ray Computed Tomography Images and Random Generation of Aggregates Skeleton  
Fateh Fakhari Tehrani, *Conservatoire National des Arts et Métiers, Paris, GEMH*

Monitoring of Debonding or Cracking in Bending Tests by Virtual Image Correlation  
Marc François, *Institut de Recherche en Génie Civil et Mécanique, Université de Nantes*

15:45 Coffee Break 

16:15 **Parallel Podium Sessions 7,8 and 9**

**Podium session 7: Debonding Mechanisms (bituminous interface) – I Salle GH**

**Chair: Daniel Perraton**

*Ecole de Technologie Supérieure de Montréal - Université du Québec, Canada*

16:15 Development of a Pull-Off Test to Measure the Bond Strength of Bituminous Emulsions  
Lucas Leprince, *Belgian Road Research Centre*

16:35 Debonding in Airfield Pavement Hot Mix Asphalt Layers  
Navneet Garg, *Federal Aviation Administration*

16:55 Impact of new High Inflation Pressure Aircraft Tyres on Asphalt Overlay Interface Debonding  
Greg White, *Fulton Hogan*

17:15 Localized Debonding as a Potential Mechanism for Near-Surface Cracking  
David Hernando, *University of Florida*

17:35 Experimental Evidence of the Viscoelastic Behavior of Interfaces in Bituminous Pavements  
An Explanation to Top-Down Cracking?  
Damien Grellet, *Department of Civil Engineering, Laval University, Québec*

**Podium session 8: Bond Characterization Auditorium**

**Chair: Anne Millien, Université de Limoges, France**

16:15 Influence of Specimen Dimension and Test Speed on the Shear Strength of Bituminous Interfaces  
Abuaddous Musad, *Università Politecnica delle Marche*

16:35 Investigation of the Impact of Conditions of Application of Tack Coats on the Interlayer Bond Strength  
Alexandra Destrée, *Belgian Road Research Centre*

16:55 Damage Modeling of Asphaltic Pavement Rough Interfaces under Tensile and Shear Loading  
Rahma Ktari, *Groupe d'Etudes des Matériaux Hétérogènes*

17:15 Effect of Reinforced Asphalt Pavements on Reflective Crack Propagation and Interlayer Bonding Performance  
Christiane Raab, *Federal Swiss Laboratories for Materials Science and Technology*

17:35 Role of Concrete-Asphalt Interface in Bonded Concrete Overlays of Asphalt Pavements  
Angel Mateos, *University of California Pavement Research Center, Berkeley*

**Podium session 9: Debonding Mechanisms (various interfaces) - II Salle I**

**Chair: Julie Marie Vandebossche, University of Pittsburgh, USA**

16:15 Is Debonding in Concrete Pavements Unavoidable?  
Johan Silfwerbrand, *Royal Institute of Technology*

16:35 Durability of FRP to Concrete Bonded Interface under Accelerated Ageing  
Marc Quiertant, *Ifsttar / Mast*

16:55 Effect of Incorporating Rubber Aggregates and Fiber Reinforcement on the Durability of thin bonded Cement-Based Overlays  
Syed Asad Ali Gillani, *University of Engineering and Technology, Laboratoire Matériaux et Durabilité des Constructions, Toulouse*

17:15 Debonding Mechanism of Bonded Concrete Overlay according to Horizontal Traffic Loading  
Young Kyu Kim, *Gangneung-Wonju National University*



17:35 Study of Delamination and Cracking of Multilayered Systems used as Waterproofing and Wearing Course Solutions for Orthotropic Steel Bridge Decks: 10 Years Feedback  
Bertrand Pouteau, *Eurovia Research Center*

18:45 Departure by bus from the Cité Nantes events Center



*Conference banquet in the Creative Arts District of Nantes (FilMeZoArT show)*



18:00 End





# Programme • Thursday June 9, 2016



## Chair of the day:

**Gabriele Tebaldi**, *University of Parma, Italy and University of Florida, USA*

**9:00** Gathering and coffee break

**9:30** **Plenary Lectures Auditorium**

9:30 Observations, analyses and developmental tech. associated with a full-scale Heavy Vehicle Simulator on pavement structures  
**Morris De Beer**, *University of Pretoria, South Africa*

10:15 Oxidative Damage Quantification of Aged and Rejuvenated Asphalt Concrete Pavements,  
**Henrique M. Reis**, *University of Illinois at Urbana-Champaign, USA*

**11:00** **Parallel Podium Sessions 10, 11 and 12**

**Podium session 10: Advanced Measurements Auditorium**

**Chair: Sofiane Guessasma**

*BIA: Biopolymères, Interactions Assemblages (UR1268) de l'INRA, France*

11:00 Instrumentation of large scale direct shear test to study the progressive failure of concrete/rock interface  
Hussein Mouzannar, *Laboratory of rock hazards and geotechnical structures, Ifsttar / Gers*

11:20 Investigation of Energy-based Crack Initiation Threshold from Meso-scale Asphalt Concrete Response  
Ibrahim Onifade, *Royal Institute of Technology*

11:40 Assessment of Low-Temperature Cracking in Asphalt Concrete Pavements using an Acoustic Emission Approach  
Behzad Behnia, *The University of Illinois at Urbana-Champaign*

**Podium session 11: Optical Measurements Salle GH**

**Chair: Emin Kutay**, *Michigan state University, USA*

11:00 Determination of Asphalt Pavements Fracture Parameters using Optical Approaches  
Octavian Pop, *Groupe d'Études des Matériaux Hétérogènes, Université de Limoges*

11:20 Applying a Full-Field Measurement Technique to Study the Mechanical Behavior of Asphalt Mixtures  
Mohamed Cheikh Teguedi, *Institut Pascal*

11:40 Application of a Coupled Digital Image Correlation and Discrete Element Method Approach to Model Low Temperature Asphalt Concrete Fracture  
Brian Hill, *The University of Illinois at Urbana-Champaign*

**Podium session 12: Field Measurements and Back Calculations Salle I**

**Chair: Karim Chatti**, *Michigan State University, USA*

11:00 Progress in Monitoring the Debonding within Pavement Structures During Accelerated Pavement Testing on the Fatigue Carousel  
Jean-Michel Simonin, *Ifsttar / Mast*

11:20 Relative near Surface Pavement Performance for Dual and Wide-base tyre Assemblies using a Finite Element Method  
Dermot Casey, *Mott MacDonald*

11:40 Assessment of HWD ability to detect debonding of pavement layer interfaces  
Michael Broutin, *French Civil Aviation Technical Center*

**12:00** *Lunch and Coffee*

13:15 **Parallel Workshops 3 and 4**

**Workshop 3 Auditorium**

Roads of the future:  
towards durable and multi-functional infrastructures

**Co-chairs: Nicolas Hautière** and **Pierre Hornych**, *Ifsttar, France*

**Workshop 4 Salle GH**

Recent progress in Digital Image Correlation:  
towards integrated identification?

**Co-chairs: Marc François**, *GEM/Université de Nantes, France* and  
**Gabriele Tebaldi**, *University of Parma, Italy - University of Florida, USA*



15:30 *Coffee Break*



16:00 **Closing Ceremony Auditorium**

**Chair: Bill Buttlar**, *Missouri Asphalt Pavement and Innovation Lab (MAPIL)*  
*of the University of Missouri-Columbia, USA*



17:00 End

