9th International Workshop on Structural Health Monitoring

IWSHM 2013

"A Roadmap to Intelligent Structures"

September 10 – 12, 2013
Stanford University

www.iwshm.org

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Keynote Presentations

Memorial Auditorium (Tuesday – Thursday, September 10th-12th)

"NASA Applications of Structural Health Monitoring Technology"

Sept. 10th, 08:15-08:45

Lance Richards

Aerospace Research Technical Manager - NASA Dryden Flight Research Center, USA

Dr. W. Lance Richards joined NASA's Dryden Flight Research Center in 1983 and has served as technical leader of various research groups in the Research Engineering Directorate since 1995. He currently serves as Aerospace Research Technical Manager and leads NASA Dryden's research and development efforts for fiber optic sensing, structural health monitoring, and nondestructive evaluation technology. Dr. Richards has conducted research in fiber-optic smart structures and served as Principal Investigator of structural health monitoring flight experiments at NASA Dryden since 1999. He has authored more than 80 technical reports and serves as Session Organizer and Chair for several conferences and symposia. His talk will highlight some of the recent applications of SHM technology within NASA.

"The Need for Guidance on Integrating SHM within Military Aircraft Systems"

Sept. 10th, 08:45:00-09:15

Matthias Buderath

Head of Technology Development – EADS Cassidian, Germany

Head of Technology Development, responsible for provision of the EADS Cassidian research and technology roadmap as well the development and maturation of technologies related to: Sensor, Avionics and Communication equipment, Aircraft systems, including design, production, MRO and related services (fighter and mission aircrafts), and large integrated system solution. He is also Senior Expert for Integrated System Health Monitoring and Management.

He has more than 20 years of experience in aircraft engineering and technology development. He started his professional life in the Helicopter Division of EADS as System Engineer responsible for Flight Mechanics. Afterwards he moved to the Fixed Wing Military Division of EADS and worked for more than 8 years in Fatigue and Damage Tolerance supporting various Mission and Fighter aircraft development programs including the responsibility for the Tri-National Tornado Structural Integrity Program. In the year 2000 he became Chief Engineer responsible for structural and system integrity for all new major Cassidian military platform developments.

"Industrial Age NDE to Information Age SHM"

Sept. 10th, 09:15-09:45

Mark M. Derriso

Technical Advisor - Warfighter Interface Division, 711th Human Performance Wing, AFRL, USA

Mark M. Derriso is an accomplished researcher and technical leader with more than 24 years of experience in technology development of data acquisition, controls and system automation. He has broad experience in developing, conducting, coordinating, and directing research and development programs for the United States Air Force. Mark is particularly effective in directing multidisciplinary research projects requiring hardware and software integration. He spent the last 14 years directing health management research and development programs for current and future aerospace systems at the Air Force

Research Laboratory (AFRL). Currently, he serves as the Technical Advisor for the Warfighter Interface Division in the 711th Human Performance Wing at AFRL where he leads the core technical area of decision making for Air, Space, and Cyber domains.

"On the Search for Optimal Damage Precursors"

Sept. 11th, 08:30-09:00

Volker Weiss

Professor Emeritus – Syracuse University, USA

Dr. Volker Weiss, Prof. Emeritus of Syracuse University, is currently the Senior Scientist at the Vehicle Technology Directorate. Dr. Weiss previously served as the Associate Director for Science and Technology at the U.S. Army Research Laboratory from March 2007 to March 2011. Dr. Weiss served at ARL as a research professor from Syracuse University, under the Intergovernmental Personnel Act (IPA). He served as the senior advisor to the ARL Director on the quality and direction of the ARL technical program in basic research, applied research and technical analysis.

"Validation, Verification and Implementation of SHM at Airbus"

Sept. 11th, 09:00-09:30

Holger Speckmann

CEO – Testia GmbH, Germany

& Clemens Bockenheimer

Leader for Structural Health Monitoring (SHM) and Extended NDT - Airbus Operations SAS, France

Holger Speckmann is the Chief Executive Officer of Testia GmbH, Germany, a newly founded EADS/Airbus company. He is responsible for performing the NDT training formerly done by Airbus Operations in Bremen and building up the company providing all kind of service related to NDT and SHM for Engineering, Manufacturing and Service for all EADS Business Units (Airbus, Eurocopter, Astrium, etc.) and other external customer (Airlines, Suppliers, MRO,etc.). For nearly 25 years, he has also been working for AIRBUS in the field of structures,

materials, processes, NDE (Non-Destructive Engineering) and SHM. He initiated, built up and led SHM in Airbus for more than 10 years and is the Co-Founder of the Aerospace Industry Steering Committee for SHM (AISC-SHM) which develops the first Standard document, the SAE ARP6461 (SHM Guidebook) in the field of Aerospace.

Dr. Clemens Bockenheimer is the currently the leader for Structural Health Monitoring (SHM) and Extended NDT at Airbus Operations SAS in Toulouse, France. He is also the head of A350 Testing, Surface Technology and Standardisation. He holds the Doctor of Material Science Engineering Degree (Dr.-Ing.) and the Engineer in Material Science Degree (Dipl.-Ing.). Dr. Bockenheimer is also a qualified EWF-DVS European Adhesive Engineer (EWF-DVS EAE).

"A Vision of SHM for Intelligent Structures"

Sept. 11th, 09:30-10:00

Fu-Kuo Chang

Professor in the Aeronautics and Astronautics Department – Stanford University, USA

Dr. Fu-Kuo Chang is a Professor and the Director of Structures and Composites Laboratory in the Department of Aeronautics and Astronautics at Stanford University. His research interests include structural health monitoring, design of integrated structures, smart structures, design and damage tolerance of composites structures, and multifunctional materials. He is the Editor in Chief of the international Journal of Structural Health Monitoring (SHM), the recipient of 2004 SHM Life-time Achievement Award, and 2010 SPIE Smart

Structures/NDE Life-Time Achievement Award. Founding Chair of International Industry Steering Committee for SHM, the Founding Director of Japan Smart Structures and Materials Research Center at AIST; Fellows of AIAA and ASME.

"Robust Sensors for Structural Health Monitoring within Harsh Environments"

Sept. 12th, 08:30-09:00

Debbie G. Senesky

Assistant Professor in the Aeronautics and Astronautics Department – Stanford University, USA

Debbie G. Senesky is an Assistant Professor at Stanford University in the Aeronautics and Astronautics Department. She received the B.S. degree in mechanical engineering from the University of Southern California in 2001. She received the M.S. degree and Ph.D. degree in mechanical engineering from the University of California, Berkeley in 2004 and 2007, respectively. She was a Design Engineer in 2007 for GE Sensing (formerly known as NovaSensor). She was a researcher specialist in 2008 at the Berkeley Sensor and Actuator Center (BSAC) developing silicon carbide (SiC) sensing technology for extreme harsh environments. Her research interests include the development of micro- and nano-scale sensors, wide bandgap electronics and ceramic materials for operation within extreme harsh environments. In recognition of her research, she has received the Space Technology Research Opportunities Early Faculty Career Award from the National Aeronautics and Space Administration.

"Prevalent Intelligence – from Edge to Cloud"

Sept. 12th, 09:00-09:30

Link C. Jaw

Intel Fellow, Datacenter and Connected Systems Group - Intel Corporation (USA)

Link Jaw is an Intel Fellow focusing on data analytics in end-to-end (edge device to datacenter) architectures and application frameworks. Link joined Intel in 2012 when his company Scientific Monitoring Inc. (SMI) was acquired. Link has 30 years of experience in system analysis, data analysis, modeling and simulation, control of dynamic systems, and predictive maintenance. He is the inventor of 11 U. S. patents. He was recommended by the U. S. Air Force and NASA to write a comprehensive book on aircraft engine controls, entitled Aircraft Engine Controls: Design, System Analysis, and Health Monitoring and published in 2009. This book has also been selected by China's aviation industry to be translated and published in March 2011. Link received a Ph.D. degree from Stanford, an M.S. degree from the University of Michigan, and a certificate of executive management short courses from Dartmouth College.

"Activities on Standardization of Civil SHM Methodologies in Europe"

Sept. 12th, 09:30-10:00

Helmut Wenzel

President – VCE (Vienna Consulting Engineers), Austria

Helmut WENZEL (born in 1950) is one of Europe's top experts in structural health monitoring, life cycle engineering and asset management. He coordinates major research projects in this domain in the 7th framework program of the European Commission, particularly the IRIS Project. He published 3 relevant text books on life cycle engineering (2013), structural health monitoring of bridges (2009) and on ambient vibration monitoring (2005). He is appointed professor for structural health monitoring and asset management at the University of Civil Engineering in Vienna. In his capacity as director of VCE, a global player in structural health monitoring, he has been working for the transportation and energy infrastructure performing, design, monitoring, assessment and management for over 30 years.

Technical Sessions at-a-Glance

Monday, September 9th

15:00 ~ 17:00	**Early Registration**	*Location: Crowne Plaza Hotel Cabana, Palo Alto*
17:00 ~ 19:00	**Reception**	*Location: Crowne Plaza Hotel Cabana, Palo Alto*

Tuesday, September 10th

	Room: HC 200-002	Room: HC 200-030	Room: HC 200-034	Room: HC 200-203	Room: HC 200-205	Room: HC 200-303	Room: HC 200-305	Room: ART 2	Room: ART 4
07:00 ~ 08:00	**Registration**		Light Continental Breakfast					*Location: Dohrmann Grove*	
08:00 ~ 08:15	**Opening Remarks**		Speaker: James Plummer		Chair: F.-K. Chang & Co-chair: F. P. Kopsaftopoulos			*Location: Memorial Auditorium*	
08:15 ~ 09:45	**Keynote Presentations** Chair: P. Foote	08:15 ~ 08:45	Speaker: Lance Richards [NASA Dryden, USA]				*Location: Memorial auditorium*		
		08:45 ~ 09:15	Speaker: Matthias Buderath [Cassidian, Germany]						
		09:15 ~ 09:45	Speaker: Mark Derriso [Air Force Research Laboratory, USA]						
09:45 ~ 10:05	**Coffee Break**							*Location: Dohrmann Grove*	
10:05 ~ 11:45	Advanced Diagnostics for Damage Assessment-I Chiar：S. Galea & Co-chair: T. Papulak	**SPECIAL SESSION** Impairment Detection; Chair: G.T.Fry & Co-chair: F. Wu	Sensor Network Optimization Chair: P. Masson & Co-chair: R. Vepa	Modelling / Simulation-I Chair: D. Soeffker & Co-chair: S. Wu	**SPECIAL SESSION** SHM Technology in Wind Turbines-I; Chair: W. Ostachowicz & Co-chair: K. Kuang	Smart Sensors/Actuators and Energy Harvesting-I Chair: A.Knobloch & Co-chair: R. Rulli	Mechanical Systems / Offshore / Marine Structures; Chair: B.Yu & Co-chair: K.-Q. Ding	**SPECIAL SESSION** Optical Fiber Sensing Based SHM-I; Chair: N. Takeda & Co-chair: C. Bockenheimer	Novel Signal Processing Techniques-I Chair: H. Pfeiffer & Co-chair: L. Salvino
11:45 ~ 13:45	**Poster Sessions: Q & A**		**(Display starts at 11:45; Q&A 12:30 ~ 13:45)**					*Location: Dohrmann Grove*	
12:00 ~ 13:30	IJSHM Board Meeting							*Location: HC 200-107*	
12:00 ~ 13:30	**Lunch at the Oval**							*Location: The Oval*	
13:45 ~ 15:45	Advanced Diagnostics for Damage Assessment-II Chair: K. Dragan & Co-chair: A. Kumar	Autonomous Sensing: Monitoring to Control Chair: M. D. Todd & Co-chair: S. Zedek	**SPECIAL SESSION** Source Localization; Chair: T. Kundu	Modelling / Simulation-II Chair: C. P. Fritzen & Co-chair: S. Hurlebaus	**SPECIAL SESSION** SHM Technology in Wind Turbines-II; Chair: W. Ostachowicz & Co-chair: K. Peters	Smart Sensors/Actuators and Energy Harvesting-II Chair: M. Wang & Co-chair: M. Frövel	**SPECIAL SESSION** POD and Reliability of SHM for Aerospace Structures; Chair: J.B. Ihn & Co-chair: C.S. Kabban	**SPECIAL SESSION** Optical Fiber Sensing Based SHM-II; Chair: N. Takeda & Co-chair: X. Chapeleau	Novel Signal Processing Techniques-II Chair: W.K. Chiu & Co-chair: P. Foote
18:30 ~ 22:00	**Banquet/Welcome Night: San Francisco Cruise**							*Location: San Francisco Pier 3*	

HC: History Corner (200) / **ART**: Cummings (Nathan) Art Building

Wednesday, September 11th

	Room: HC 200-002	Room: HC 200-030	Room: HC 200-034	Room: HC 200-203	Room: HC 200-205	Room: HC 200-303	Room: HC 200-305	Room: ART 2	Room: ART 4
08:30 ~ 10:00	**Keynote Presentations** Chair: A. Gumes	08:30 ~ 09:00	Speaker: Volker Weiss [Army, USA]				*Location: Memorial Auditorium*		
		09:00 ~ 09:30	Speakers: Holger Speckmann & C. Bockenheimer [Airbus, Germany]						
		09:30 ~ 10:00	Speaker: Fu-Kuo Chang [Stanford University, USA]						
10:00 ~ 10:15		**Coffee Break**						*Location: Dohrmann Grove*	
10:15 ~ 12:15	Advanced Diagnostics for Damage Assessment-III Chair: J. Lougheeds & Co-chair: B. Eckstein	SHM for Rotorcraft & Aerospace Structures: Field Evaluation and Validation Chair: M. Bach & Co-chair: M. Davis	Prognostics and Data Mining for Health Management Chair: D. Adams & Co-chair: L. Mevel	Operational Effects Consideration in SHM Chair: V. Le Cam & Co-chair: Y.-Q. Ni	**SPECIAL SESSION** SHM Technology in Wind Turbines-III; Chair: W. Ostachowicz & Co-chair: E.Flynn	Smart Sensors/Actuators and Energy Harvesting-III Chair: A. Vechart & Co-chair: J. Santos	**SPECIAL SESSION** SHM of Space Systems; Chair: A. Zagrai & Co-chair: L. Richards	Civil Structures: Field Evaluation and Validation I Chair: Z. Wu & Co-chair: C.-H. Loh	**SPECIAL SESSION** Next-Gen Sensing Sys. for SHM; Chair: Y. Wang & Co-chair: K. Loh
12:15 ~ 13:15		**Lunch at the Oval**						*Location: The oval*	
13:15 ~ 14:55	Advanced Diagnostics for Damage Assessment-IV Chair: R. Ikegami & Co-chair: A. Srivastava	**SPECIAL SESSION** Aerospace Structures-Standards and V&V; Chair: H. Speckmann & Co-chair: S. Huang	**SPECIAL SESSION** Novel SHM/NDE Tech. for Material Damage Quantification-I; Chair: S.Banerjee & Co-chair: T. Uhl	Advanced Monitoring for Loads/Environments-I Chair: C.-K. Soh & Co-chair: S. Huang	**SPECIAL SESSION** Data Interpretation and Modeling for SHM; Chair: H. Li & Co-chair: S. Hurlebaus	**SPECIAL SESSION** Very Dense Arrays of Sensors; Chair: B. Glisic & Co-chair: F. Dotta	**SPECIAL SESSION** Guided Waves in Structures for SHM-I; Chair: W. Ostachowicz & Co-chair: E. Cross	Civil Structures: Field Evaluation and Validation II Chair: A. Kiremidjian & Co-chair: E. Figueiredo	**SPECIAL SESSION** Monitoring for High Precision Manufacturing Sponsored by The Advanced Institute of Manufacturing with High-tech Innovations, AIM-HI Chair: M.-S. Tsai & Co-chair: Y. Huang
14:55 ~ 15:10		**Coffee Break**						*Location: Dohrmann Grove*	
15:10 ~ 17:35		**SHM in Action**		Chair: C.Boller Co-chair: B. Glisic				*Location: Memorial Auditorium*	
19:00 ~ 22:00		**BBQ Networking Night**						*Location: Terman Park*	

Thursday, September 12th

	Room: HC 200-002	Room: HC 200-030	Room: HC 200-034	Room: HC 200-203	Room: HC 200-205	Room: HC 200-303	Room: HC 200-305	Room: ART 2	Room: ART 4
08:30 ~ 10:00	**Keynote Presentations** Chair: A. Hess	08:30 ~ 09:00	Speaker: Debbie G. Senesky [Stanford University, USA]				*Location: Memorial Auditorium*		
		09:00 ~ 09:30	Speaker: Link C. Jaw [Intel Corporation, USA]						
		09:30 ~ 10:00	Speaker: Helmut Wenzel [Vienna Consulting Engineers, Austria]						
10:00 ~ 10:15		**Coffee Break**						*Location: Dohrmann Grove*	
10:15 ~ 12:15	**SPECIAL SESSION** V&V/Standardization for Civil Infrastructure Chair: H. Wenzel	Aerospace Structures: Laboratory Demonstration-I Chair: C. Stolz & Co-chair: L. Richards	Civil Structures: Laboratory Demonstration-I Chair: X. Chapeleau & Co-chair: P. Peres	Advanced Monitoring for Loads/Environments-II Chair: L. Wenk & Co-chair: V. Lopes	**SPECIAL SESSION** Sensing Strategy for Wave-based SHM-I; Chair: Z. Su & Co-chair: M. Meo	**SPECIAL SESSION** Statistical Methods for SHM-I; Chair: D. Zonta & Co-chair: J. Hwang	**SPECIAL SESSION** Guided Waves in Structures for SHM-II; Chair: C. Lissenden & Co-chair: W. Ostachowicz	**SPECIAL SESSION** SHM/NDE for Civil Infrastructures-I; Chair: S. Salamone & Co-chair: X. Yu	**SPECIAL SESSION** Novel SHM/NDE Tech. for Material Damage Quantification-II; Chair: S. Banerjee & Co-chair: H. Sohn
12:15 ~ 13:30		**Lunch Box Mini Forum: V&V/Standardization for Civil Infrastructure**		Chair: J. Lynch Co-chair: H. Wenzel				*Location: Memorial Auditorum*	
12:15 ~ 13:30		**Faculty / Student Panel**		Chair: C. Farrar				*Location: HC 200-002*	
12:15 ~ 13:30		**Lunch at the Oval**						*Location: The Oval*	
13:30 ~ 15:30	**SPECIAL SESSION** SHM for Harsh Environments; Chair: D. G. Senesky & Co-chair: C. Roof	**SPECIAL SESSION** Aerospace Structures: Laboratory Demonstration-II Chair: J. Michaels & Co-chair: A. Srivastava	Civil Structures: Laboratory Demonstration-II Chair: H. Y. Noh & Co-chair: L. Cheng	SHM-based Structural Design/Intelligent Structures Chair: O. Venta & Co-chair: J. Yang	**SPECIAL SESSION** Sensing Strategy for Wave-based SHM-II; Chair: Z. Su	**SPECIAL SESSION** Statistical Methods for SHM-II; Chair: M. Pozzi & Co-chair: F.G. Yuan	**SPECIAL SESSION** Guided Waves in Structures for SHM-III; Chair: W. Ostachowicz & Co-chair: R. Zemcik	**SPECIAL SESSION** SHM/NDE for Civil Infrastructures-II; Chair: S. Salamone & Co-chair: N. Hoult	**SPECIAL SESSION** Material State Awareness and Damage Precursors Chair: C. Larrosa
15:30 ~ 15:45		**Coffee Break**						*Location: Dohrmann Grove*	
15:45 ~ 17:00		Panel Discussion : SHM Roadmap		Chair: C. Farrar				*Location: Memorial Auditorium*	

Technical Program (Tuesday, September 10th)

Welcome Session

Chair: F.-K. Chang (Stanford University, USA) & **Co-chair**: F. P. Kopsaftopoulos (Stanford University, USA)

Location: Memorial Audi.

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
08:00 ~ 08:15	**Opening Remarks** James Plummer [Dean of Engineering, Stanford University, USA]	

Keynotes

Chair: P. Foote (Cranfield University, UK)

Location: Memorial Audi.

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
08:15 ~ 08:45	**NASA Applications of Structural Health Monitoring Technology** L. Richards [NASA Dryden, USA]	
08:45 ~ 09:15	**The Need for Guidance on Integrating SHM within Military Aircraft Systems** M. Buderath, J. McFeat, H. Azzam [Cassidian, Germany]	3
09:15 ~ 09:45	**Industrial Age NDE to Information Age SHM** M. M. Derriso, M. P. DeSimio, C. D. McCurry, C. M. S. Kabban, S. E. Olson [Air Force Research Laboratory, USA]	15

Advanced Diagnostics for Damage Assessment - I

Chair: S. Galea (Defence Science and Technology Organisation, Australia) & **Co-chair**: T. Papulak (ATK Aerospace Structure, USA)

Location: HC 200-002

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
10:05 ~ 10:25	**Damage Detection at an Aluminum Beam from Discrete and Continuous Strain Measurements** J. Sierra-Pérez[1], A. Güemes[2] [1) Universidad Pontificia Bolivariana, Colombia; 2) Universidad Politécnica de Madrid, Spain]	53
10:25 ~ 10:45	**Detecting and Locating Fatigue Cracks in a Complex Wing-box Structure using the Acoustic Emission Technique: A Verification Study** D. Gagar[1], M. Martinez[2], M. Yanishevsky[3], B. Rocha[3], J. McFeat[4], P. Foote[1], P. Irving[1] [1) Cranfield University, UK; 2) Delft University of Technology, The Netherlands; 3) National Research Council of Canada, Canada; 4) BAE Systems, UK]	65
10:45 ~ 11:05	**Oriented Wireless Sensing for Structural Health Monitoring** M. Mollineaux, R. Rajagopal, A. Kiremidjian, K. Balafas [Stanford University, USA]	73
11:05 ~ 11:25	**Smart, Tough, and Successful: Three New Innovative Approaches for Diagnosis and Prognosis of Technical Systems** D. Söffker, S. Rothe, S. Schiffer, H. Aljoumaa, D. Baccar [University of Duisburg-Essen, Germany]	81
11:25 ~ 11:45	**A Novel Approach for Quantitative Assessment of Delamination Damage Based on Vibration Response** S. He[1,2], L.R. Francis Rose[1], C. H. Wang[1] [1) RMIT University, Australia; 2) Cooperative Research Centre for Advanced Composite Structures, Australia]	89

SPECIAL SESSION

Impairment Detection

Chair: G.T.Fry (Texas A&M University, USA) & **Co-chair**: F. Wu (Shanghai Jiao Tong University, China)

Location: HC 200-030

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Vehicle-Bourne Autonomous Railroad Bridge Impairment Detection Systems** J. Orsak, B. A. Story [Texas A&M University, USA]	1713
10:25 ~ 10:45	**Structural Impairment Detection of Tunnel Linings Using Ultrasonic Sensors** J. White[1], S. Hurlebaus[1], A. Wimsatt[2] [1) Texas A&M University, USA; 2) Texas A&M Transportation Institute, USA]	1721
10:45 ~ 11:05	**Implementation of Structural Impairment Detection System on a 100 Year-Old Bascule Bridge** B. A. Story, G. T. Fry [Texas A&M University, USA]	1729
11:05 ~ 11:25	**Structural Health Monitoring of Cracked Railway Axle Journals Using Ultrasonic Phased Array Technique** J. Baik, S. Hurlebaus [Texas A&M University, USA]	1737
11:25 ~ 11:45	**SHM System of the Roof Structure of Sports Arena "Olivia"** K. Wilde, M. Miśkiewicz, J. Chróścielewski [Gdansk University of Technology, Poland]	1745

Sensor Network Optimization

Chair: P. Masson (Universite de Sherbrooke, Canada) & **Co-chair**: R. Vepa (University of London, UK)

Location: HC 200-034

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Beamforming in Plates using Embedded Acoustic Metamaterial Lenses** F. Semperlotti, H. Zhu [University of Notre Dame, USA]	1387
10:25 ~ 10:45	**New Proposal for Improvements in Communication and Power Systems for SHM Aircraft Networks** P. M. Monje[1], G. Aranguren[1], V. Cokonaj[2], E. Barrera[3], M. Ruiz[3] [1) University of Basque Country, Spain; 2) AERnnova Engineering Solutions Ibérica S.A., Spain; 3) Technical University of Madrid, Spain]	1395
10:45 ~ 11:05	**Energy Efficient Wireless Sensor Network Architecture for Aircraft Structure Health Monitoring: from Sensor to Data Collect** D. Dragomirescu[1,2], F. Perget[1], F. Camps[1], R. Plana[3], A. De Luca[4], F. Udrea[4] [1) CNRS LAAS, France; 2) Univ de Toulouse, France; 3) Alstom Corporate, France; 4) University of Cambridge, UK]	1403
11:05 ~ 11:25	**Structural Condition Monitoring of Helicopter Components** D. Parker[1], P. Dussault[2] [1) AVNIK Defense, USA; 2) AMRDEC, USA]	1411
11:25 ~ 11:45	**Decentralized Health Monitoring for Beam-Like Truss Structure using Wireless Acceleration Lab Measurements** Z. Sun, B. Zhou [Tongji University, China]	1419

Modelling / Simulation - I

Chair: D. Soeffker (U Duisburg-Essen, Germany) & **Co-chair**: S. Wu (Dalian University of Technology, China)

Location: HC 200-203

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Hybrid Global Matrix/Local Interaction Simulation Approach for Damage Modeling in Composites** M. B. Obenchain, K. S. Nadella, C. E. S. Cesnik [University of Michigan, USA]	1057

10:25 ~ 10:45	**Modeling Dislocation Mechanisms of the Acoustic Nonlinearity in Metallic Crystals** W. D. Cash[1], W. Cai[2] [1) Exponent Inc., USA; 2) Stanford University, USA]	1065
10:45 ~ 11:05	**2D Numerical Modeling of Pipeline Structures with Non-Axisymmetric Loads and Spectral Elements for Identifying Reliable Sensor Spacing** Z. Heidary, D. Ozevin, H. Yalcinkaya [University of Illinois at Chicago, USA]	1073
11:05 ~ 11:25	**Condition Monitoring for Hydraulic Systems in Rolling Mills using Unscented Kalman Filter** J. Gedenk, S. Zareba, M. Jelali [Cologne University of Applied Sciences, Germany]	1081
11:25 ~ 11:45	**Development of Data-Driven Reduced-Order Models for Complex Nonlinear Systems from Experimental Data** F. Tasbihgoo[1], J. P. Caffrey[2], S. F. Masri[3], M. A. Wahbeh[1] [1) Alta Vista Solutions Inc., USA; 2) California State Polytechnic University, USA; 3) University of Southern California, USA]	1089

SPECIAL SESSION

SHM Technology in Wind Turbines - I

Chair: W. Ostachowicz (Polish Academy of Sciences, Poland) & **Co-chair**: K. Kuang (NUS, Singapore)

Location: HC 200-205

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Using diffused fields for monitoring the structural health of wind turbine blades** J. Tippmann, F. L. di Scalea [UC San Diego, USA]	2369
10:25 ~ 10:45	**Validation of Vibro-Acoustic Modulation of Wind Turbine Blades for Structural Health Monitoring Using Operational Vibration as a Pumping Signal** S. Kim[1], D. E. Adams[2], H. Sohn[3], G. Rodriguez-Rivera[1], J. Vitek[1], S. Carr[1], A. Grama[1] [1) Purdue University, USA; 2) Vanderbilt University, USA; 3) KAIST, South Korea]	2376
10:45 ~ 11:05	**Approaches to Acoustic Emission Monitoring with Applicability to Key Components in Wind Turbines** K. Holford, M. Eaton, A. Clarke, M. Pearson, C. Featherston, R. Pullin [Cardiff School of Engineering, UK]	2384
11:05 ~ 11:25	**Virtual Assessment of Structural Health Monitoring Techniques for Wind Turbines Using Vibration Data** E. Di Lorenzo, S. Manzato, B. Peeters [LMS International, Belgium]	2392
11:25 ~ 11:45	**Cointegration for the Removal of Environmental and Operational Effects using a Single Sensor** I. Antoniadou, E. J. Cross, K. Worden [University of Sheffield, UK]	2400

Smart Sensors/Actuators and Energy Harvesting - I

Chair: A. Knobloch (General Electric, USA) & **Co-chair**: R. Rulli (Embraer, Brazil)

Location: HC 200-303

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Electrospun Nanofiber Based Strain Sensorsfor Structural Health Monitoring** P. Servati, S. Soltanian, F. Ko [University of British Columbia, Canada]	1535
10:25 ~ 10:45	**Screen Printed Piezoceramic Actuators/Sensors Microfabricated on Organic films and Stretchable Networks** N. Salowitz, Z. Guo, S. Kim, Y. Li, G. Lanzara, F.-K. Chang [Stanford University, USA]	1543
10:45 ~ 11:05	**A Four-Channel, ±36 V SHM Piezo Driver Chip in 0.25-um BCD Technology** Y. Guo[1], C. Aquino[2], D. Zhang[2], B. Murmann[1] [1) Stanford University, USA; 2) Acellent Technologies, USA]	1551

11:05 ~ 11:25	**Exploration of Ultrasonic Guided Wave Detection with Optical Fiber Sensors and Piezoelectric Transducers** B. Lin, V. Giurgiutiu [University of South Carolina, USA]	1559
11:25 ~ 11:45	**Embedded Data Processing in Wireless Sensor Networks for Structural Health Monitoring** N. de Battista[1], J. A. Rice[2], S. Sim[3], J. M. W. Brownjohn[4], H. Tan[5] [1) University of Sheffield, U.K.; 2) University of Florida, USA; 3) UNIST, U.K.; 4) University of Exeter, U.K.; 5) A*STAR, Singapore]	1567

Mechanical Systems / Offshore / Marine Structures

Chair: B.Yu (Case Western Reserve University, USA) & **Co-chair**: K.-Q. Ding (Chinese Special Equipment Inspection and Research Instit

Location: HC 200-305

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Improved Sensitivity of Condition Monitoring Features via Hölder Exponent Analysis** L. Robinson, M. Todd [University of California – San Diego, USA]	1023
10:25 ~ 10:45	**Multi-Sensing SMART Layer Technology for Vehicle Protective Systems** S. Beard[1], R. Brennan[2], P. Pollock[1], S. Das[1] [1) Acellent Technologies, Inc., USA; 2) U.S. Army Research Laboratory, USA]	1031
10:45 ~ 11:05	**Design Framework for Vibration Monitoring Systems for Helicopter Rotor Blade Monitoring using Wireless Sensor Networks** A. Sanchez Ramirez, R. Loendersloot, J. M. Jauregui Becker,T. Tinga [University of Twente, The Netherlands]	1039
11:05 ~ 11:25	**Substructure Model Updating through Modal Dynamic Residual Approach** D. Zhu, X. Dong, Y. Wang [Georgia Institute of Technology, USA]	1047
11:25 ~ 11:45	**Active Structural Integrity Monitoring of the Aircraft Based on the PZT Sensor Network – SYMOST Project** K. Dragan[1,2], M. Dziendzikowski[1], A. Kurnyta[1], A. Leski[1], T. Uhl[2] [1) Air Force Institute of Technology, Poland; 2) AGH University of Science and Technology, Poland]	1015

SPECIAL SESSION

Optical Fiber Sensing Based SHM - I

Chair: N. Takeda (The University of Tokyo, Japan) & **Co-chair**: C. Bockenheimer (Airbus, Germany)

Location: ART 2

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
10:05 ~ 10:25	**Outline of the Japanese National Project on Structure Health Monitoring System for Aircraft Composite Structures and JASTAC Project** N.Takeda[1], K. Enomoto[2], M. Yoshida[2] [1) University of Tokyo, Japan; 2) OKEZAI Center, Japan]	2042
10:25 ~ 10:45	**Developmental Status of SHM Applications for Aircraft Structures Using Distributed Optical Fiber** N. Saito[1], T. Yari[1], K. Hotate[2], M. Kishi[2], S. Matsuura[3], Y. Kumagai[3], K. Enomoto[4] [1) Mitsubishi Heavy Industries, Japan; 2) The University of Tokyo, Japan; 3) Yokogawa Electric Co., Japan; 4) The Materials Process Technology Center, Japan]	2011
10:45 ~ 11:05	**Development Status of Optical Fiber Sensor Based Impact Damage Detection System for Composite Airframe Structures** N. Hirano[1], R. Yoshimura[1], J. Kimoto[1], T. Itoh[1], N. Takeda[2], M. Yoshida[3] [1) Kawasaki Heavy Industries, Japan; 2) The University of Tokyo, Japan; 3) SOKEIZAICenter, Japan]	2019
11:05 ~ 11:25	**Damage Detection Technology for CFRP Structure Using MFC/FBG Hybrid Sensor System** K. Takahashi[1], H. Soejima[1], A. Sakabe[1], Y. Okabe[2], N. Takeda2[2], M. Yoshida[3] [1) Fuji Heavy Industries, Japan; 2) The University of Tokyo, Japan; 3) SOKEIZAI Center, Japan]	2027
11:25 ~ 11:45	**Ultrasensitive Optical-fiber Ultrasonic Sensor Based on Phase-shifted Fiber Bragg Gratings** Q.Wu, Y. Okabe, F. Yu, K. Saito [University of Tokyo, Japan]	2063

Novel Signal Processing Techniques - I

Chair: H. Pfeiffer (KU Leuven, Belgium) & **Co-chair**: L. Salvino (USWC, USA)

Location: APT 4

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
10:05 ~ 10:25	**A Vibro-Haptic Human-Machine interface for Structural Health Monitoring** D. Mascarenas, Y. Choi, H. Cheol Kim, M. Pekedis, H. Yildiz, C. A. Plont, C. Brown, M. Cowell, G. Park, H. Hahn, J. Lee, C. Farrar [Los Alamos National Laboratory, USA]	1171
10:25 ~ 10:45	**Automated Near-Optimal Feature Extraction Using Genetic Programming with Application to Structural Health Monitoring Problems** D. Y. Harvey, M. D. Todd [University of California - San Diego, USA]	1179
10:45 ~ 11:05	**High-speed, Non-contact, Baseline-free Imaging of Hidden Defects Using Scanning Laser Measurements of Steady-State Ultrasonic Vibration** E. B. Flynn, G. S. Jarmer [Los Alamos National Laboratory, USA]	1186
11:05 ~ 11:25	**Blind Identification of Structural Damage via Independent Component Analysis** Y. Yang, S. Nagarajaiah [Rice University, USA]	1194
11:25 ~ 11:45	**Identification of Bending Stiffness Distribution in RC Plate using Distributed Fiber Optics** Y. Goldfeld, D. Rony [Technion-Israel Institute of Technology, Isreal]	1251

Advanced Diagnostics for Damage Assessment - II

Chair: K. Dragan (Air Force Institute of Technology, Poland) & **Co-chair**: A. Kumar (Acellent Technologies, USA)

Location: HC 200-002

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
13:45 ~ 14:05	**Detection of Instability for Civil Large-scale Space Structures** C. Carrasco1, C. Fang1, R. Feng1, G. Yan2 [1) University of Texas at El Paso, USA; 2) Southeast University, People's Republic of China]	96
14:05 ~ 14:25	**Crack Detection in Metallic Plate Elements using a Point-based Thermal Measurement Strategy** N. R. Johnson, J. Lynch, A. Jeffers [University of Michigan, USA]	104
14:25 ~ 14:45	**Detection, Localization and Quantification of Anomalies in Mass, Stiffness and Damping Based on Time Series Modelling using Output-only Data** Q. Mei, M. Gul [University of Alberta, Canada]	112
14:45 ~ 15:05	**Detection and Quantification of a Disbonded Aluminum Honeycomb Panel using Nonlinear Superhamonic Frequencies** E. Dittman[1], D. E. Adams[2] [1) Purdue University, USA; 2) Vanderbilt University, USA]	120
15:05 ~ 15:25	**Bayesian Inference Based Model Calibration for the Dynamic Analysis of Seismic Isolated Bridges** M. Nishio, T. Onishi, H. Katsuchi, H. Yamada [Yokohama National University, Japan]	128
15:25 ~ 15:45	**Curing Strength Monitoring of Early-age Concrete using Embedded Piezoelectric Sensors for Ubiquitous Construction Process Management** J.-W. Kim, C. Lee, S. Park [Sungkyunkwan University, Republic of Korea]	136

Autonomous Sensing: Monitoring to Control

Chair: M. D. Todd (UC San Diego, USA) & **Co-chair**: S. Zedek (LAAS-CNRS, France)

Location: HC 200-030

TIME	TUESDAY, SEPTEMBER 10	PAGE NO.
13:45 ~ 14:05	**Application of Incremental Gaussian Mixture Models for Characterization of Wind Field Data** J. Park[1], K. Smarsly[1], K. Law[1], D. Hartmann[2] [1) Stanford University, USA ; 2) Ruhr University Bochum, Germany]	553

14:05 ~ 14:25	**Wireless Active Sensing Platform for Structural Infrastructure Monitoring** S. Taylor[1], E. Raby[1], G. Park[2], K. Farinholt[3], M. Todd[4] [1) Los Alamos National Laboratory, USA; 2) Chonnam National University, Korea; 3) Commonwealth Center for Advanced Manufacturing, USA; 4) University of California – San Diego, USA]	561
14:25 ~ 14:45	**Unmanned Robot System for Structure Health Monitoring and Non-Destructive Building Inspection, Current Technologies Overview and Future Improvements** C.-H. Kuo[1], A. Leber[2], C.-M. Kuo[1], C. Boller[1,2], C. Eschmann[2], J. Kurz[2] [1) Saarland University, Germany; 2) Fraunhofer Institute for Nondestructive Testing, Germany]	569
14:45 ~ 15:05	**Wireless Chipless Passive Electromagnetic Transducers for SHM Applications** P. Pons[1,2], H. Aubert[1,2], M. Tentzeris[3] [1) Le Centre National de la Recherche Scientifique, France; 2) University de Troulouse, France; 3) Georgia Institute of Technology, USA]	577
15:05 ~ 15:25	**Structural Health Monitoring During Assembly of Aerospace Structures** V. Cokonaj[1], Á. Alcaide[1], B. Fogeda[1], P. Monje[2], G. Aranguren[2], E. Barrera[3], M. Ruiz[3], R. Meléndez[3] [1)AERnnova Engineering Solutions, Spain; 2) University of the Basque Country, Spain; 3) Technical University of Madrid, Spain]	585
15:25 ~ 15:45	**A Wireless Data Acquisition System for Acoustic Emission Monitoring** A. T. Zimmerman [Civionics LLC, USA]	593

SPECIAL SESSION

Source Localization

Chair: T. Kundu (Univeristy of Arizona, USA) & **Co-chair**: R. Loendersloot (University of Twente, The Netherlands)

Location: HC 200-034

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Impact Sensing in Sandwich Structures using Highly Nonlinear Solitary Waves** M. Uddin[1], A. Shelke[1], J. Yang[1,2] [1) University of South Carolina, USA; 2) University of Washington, USA]	2617
14:05 ~ 14:25	**Acoustic Emission Source Localization in Anisotropic Structures Through Nonlinear Kalman Filtering Estimation** E. Dehghan-Niri, A. Farhidzadeh, S. Salamone [University at Buffalo, USA]	2624
14:25 ~ 14:45	**Piezoelectric Rosettes for Acoustic Source Location in Composite Structures: Results from "Blunt" Impact Tests** C. Nucera, S. White, H. Kim, F. L. di Scalea [University of California San Diego, USA]	2635
14:45 ~ 15:05	**Novel Approach for Acoustic Source Localization using Spiral Sensing** R. A. Rima, S. Banerjee [University of South Carolina, USA]	2643
15:05 ~ 15:25	**Difficulties Associated with the Acoustic Source Localization in Anisotropic Plates and its Solution** H. Nakatani[1],T. Kundu[2],K. Ito[3], N. Takeda[3] [1) Osaka City University, Japan; 2) University of Arizona, USA; 3) The University of Tokyo, Japan]	2651
15:25 ~ 15:45	**Near-field 2D-MUSIC Algorithm Based Impact Localization using Linear Array** Y. Zhong, S. Yuan, L. Qiu [Nanjing University of Aeronautics and Astronautics, China]	2659

Modeling / Simulation - II

Chair: C. P. Fritzen (University of Siegen, Germany) & **Co-chair**: S. Hurlebaus (Texas A&M University, USA)

Location: HC 200-203

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Time Domain Response Surface Model Updating for Nonlinear Structures** G. Shahidi, S. Pakzad [Lehigh University, USA]	1097

14:05 ~ 14:25	**Adaptive Multi-scale Modeling of Structures under Earthquake Loads** Y. Huang[1], G. Chen[2] [1) North Dakota State University, USA; 2) Missouri University of Science and Technology, USA]	1105
14:25 ~ 14:45	**Model Updating of Aero-Elastic Spinning Finite Elements for SHM of HAWT Blades** A. Velazquez, R. Swartz [Michigan Technological University]	1113
14:45 ~ 15:05	**Contribution of Fundamental Lamb Wave Modes to the Voltage Signal Output of a Piezoeletric Transducer** J. Royo[1], G. López[1], M. Jiménez[1], V Cokonaj[2] [1) Instituto Tecnológico de Aragón, Spain; 2) AERnnova Engineering Solutions Ibérica S.A., Spain]	1121
15:05 ~ 15:25	**Analytical and Spectral Methods for Lamb Wave Simulations** J. M. Vivar-Perez [German Aerospace Center, Germany]	1129
15:25 ~ 15:45	**Identification and Monitoring of Structural Parameters as Damage Indicators for Plates in the Post-buckling Regime** K.-U. Schroeder, C. Viechtbauer, M. Schagerl [Johannes Kepler University Linz, Austria]	1137

SPECIAL SESSION

SHM Technology in Wind Turbines - II

Chair: W. Ostachowicz (Polish Academy of Sciences, Poland) & **Co-chair**: K. Peters (NCSU,USA)

Location: HC 200-205

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Composite Bonds Assessment using EMI Technique** P. Malinowski[1], K. Tserpes[2], T. Wandowski[1], L. Skarbek[1], W. Ostachowicz[1] [1) Polish Academy of Sciences, Poland; 2) University of Patras, Greece]	2407
14:05 ~ 14:25	**Structural Health Monitoring of Offshore Wind Turbines using Automated Operational Modal Analysis** C. Devriendt[1], F. Magalhães[2], W. Weijtjens[1], G. De Sitter[1], Á. Cunha[2], P. Guillaume[1] [1) Vrije Universiteit Brussel, Belgum; 2) University of Porto, Portugal]	2415
14:25 ~ 14:45	**Optimizing the Information Needed for Wind Turbine Health Monitoring** C. Boussion, G. van Bussel [Delft University of Technology, The Netherlands]	2423
14:45 ~ 15:05	**Structural Health Control – A Comprehensive Concept for Observation and Assessment of Damages Applied on a Darrieus Wind Turbine** C. Viechtbauer, K.-U. Schroeder, M. Schagerl [Johannes Kepler University Linz, Austria]	2431
15:05 ~ 15:25	**A Study Investigating the Inter-correlation of Wind Speed and Turbulence on the Accuracy of SCADA Based Wind Turbine Blade Load Reconstructions** C. Hofemann [TU Delft, The Netherlands]	2440
15:25 ~ 15:45	**Monitoring the Structural Integrity of Wind Turbine Blades Subcomponents using Advanced Signal Processing Techniques** D.S. Zarouchas, D. van Hemelrijck [Vrije Universitait Brussel, Belgum]	2448

Smart Sensors/Actuators and Energy Harvesting - II

Chair: M. Wang (Northeastern University, USA) & **Co-chair**: M. Frövel (INTA, Spain)

Location: HC 200-303

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Intelligent Material Actuators and Their Applications for Structural Dynamic Control** K. Majewska[1], M. Krawczuk[1,2], L. Skarbek[1], A. Zak[1], W. Ostachowicz[1,3] [1) Polish Academy of Sciences, Poland; 2) University of Gdansk, Poland; 3) University of Warszaw, Poland]	1575

14:05 ~ 14:25	**Multiple PAMELA SHM™ System for Automated SHM Control during Fatigue Tests of Aircraft Structures** E. Barrera[1], M. Ruiz[1], R. Meléndez[1], N. Fernández[1], V. Cokonaj[2], A. Alcaide[2], G. Aranguren[3], P. M. Monje[3] [1) Technical University of Madrid, Spain; 2) AERnnova Engineering Solutions Ibérica S.A., Spain; 3) University of the Basque Country, Spain]	1583
14:25 ~ 14:45	**Optical Fiber Sensor for Corrosion Detection and Evolution Monitoring in Reinforced Concrete Structures** S. Ali-Alvarez[1], P. Ferdinand[1], S. Magne[1], R. Nogueira[2] [1) French Alternative Energies and Atomic Energy Commission, France; 2) University Joseph Fourier, France]	1591
14:45 ~ 15:05	**Multichannel Energy Harvesting Electronic Device for Structural Health Monitoring Systems** J. Ortiz[1], P. M. Monje[1], G. Aranguren[1], S. Corbo[2], V. Cokonaj[2], E. Barrera[3], M. Ruiz[3] [1) University of the Basque Country; 2)AERnnova Engineering Solutions Ibérica S.A., Spain; 3) Technical University of Madrid, Spain]	1597
15:05 ~ 15:25	**Impedance-Based Structural Health Monitoring System Using Wireless Sensor Networks** N. E. Cortez[1,2], R. P. Ferreira[2], F. G. Baptista[2], J. Filho[2] [1) Universidad Nacional de San Cristóbal de Huamanga, Perú; 2) Universidade Estadual Paulista, São Paulo, Brazil]	1605
15:25 ~ 15:45	**Using Wireless Sensor to Solve the False Alarm of Earthquake Early Warning System** K. Lu, H. Chiang, P. Lin, S. Huang [National Center for Research on Earthquake Engineering, Taipei, Taiwan]	1613

SPECIAL SESSION

POD and Reliability of SHM for Aerospace Structures

Chair: ***Location:***

J.B. Ihn (Boeing, USA) & **Co-chair**: C.S. Kabban (Air Force Institute of Technology, USA) HC 200-305

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Understanding Probability of Detection in Structural Health Monitoring Systems** L. E. Pado, J.B. Ihn, J. P. Dunne [Boeing, USA]	2107
14:05 ~ 14:25	**A Novel Approach for Structural Health Monitoring using In Situ Thermoelastic Stress Analysis** S. Galea, N. Rajic [Australian Defence Science and Technology Organisation, Australia]	2115
14:25 ~ 14:45	**Development and Validation of Acoustic Emission Structural Health Monitoring for Aerospace Structures** R. Austin, P.Ziehl, J. (P.) Yu, D. Forsyth [Texas Research International, Austin, USA]	2123
14:45 ~ 15:05	**Structural Health Monitoring Using Percolation Sensors – New User Cases from Operational Airliners and Chemical Plants** H. Pfeiffer[1], P. Heer[2], H. Sekler[2], M. Winkelmans[3], M. Wevers[1] [1) KU Leuven, Belgium; 2) Lufthansa Technik AG, Germany; 3) BASF Antwerp, Belgium]	2130
15:05 ~ 15:25	**Feasibility Analyses of Carbon Nanotubes for the Design of a New Hair Flow Sensor** J. Huang, J. Tao, X. Yu [Case Western Reserve University, USA]	2138
15:25 ~ 15:45	**Sensor Network Configuration Effect on Detection Sensitivity of an Acousto-Ultrasound-based Active SHM System** V. Janapati[1], F. Kopsaftopoulos[2], S. Roy[2], I.Mueller[2], S. Lee[1], P. Ladpli[2], F.K. Chang[2] [1) Acellent Technologies, USA; 2) Stanford University, USA]	2147

SPECIAL SESSION

Optical Fiber Sensing Based SHM - II

Chair: ***Location:***

N. Takeda (The University of Tokyo, Japan) & **Co-chair**: X. Chapeleau (IFSTTAR Nantes, France) ART 2

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Development of Scour Monitoring Methods Based on Scour Effect Analysis** X. Kong, C.S. Cai, S. Hou [Louisiana State University, USA]	2003

14:05 ~ 14:25	**Fabrication and Test of a Low-cost Intensity-based Optical Fibre Accelerometer for Wind Turbine Blade Monitoring Application** Y. Ge, K.S.C. Kuang, S. T. Quek [National University of Singapore, Singapore]	2048
14:25 ~ 14:45	**Evaluation of the SDDLV Method for Damage Detection on a Full-scale Highway Sign Support Truss** Z. Sun, S. J. Dyke [Purdue University, USA]	2055
14:45 ~ 15:05	**Distributed Fiber-Optic Vibration Sensor for Gas Pipeline Leak Detection Using Hybrid Interferometer** Q. Wang, Q. Yang, C. Yuan [China Jiliang University, China]	2035
15:05 ~ 15:25	**Identification of Structural Damage Based on a 'Weak' Formulation of Locally Perturbed Structural Vibration** H. Xu[1], L. Cheng[1], Z. Su[1], J. Guyader[2] [1) Hong Kong Polytechnic University, Hong Kong; 2) Institut National des Sciences Appliquées de Lyon, France]	2071
15:25 ~ 15:45	**Investigation of Shear Force Mechanism in Electro-mechanical Impedance (EMI) Technique for Structural Health Monitoring** S. Moharana, S. Bhalla [Indian Institute of Technology Delhi, India]	2079

Novel Signal Processing Techniques - II

Chair: W.K. Chiu (Monash University, Australia) & **Co-chair**: P. Foote (Cranfield University, UK)

Location: APT 4

TIME	*TUESDAY, SEPTEMBER 10*	*PAGE NO.*
13:45 ~ 14:05	**Embedded Modal Analysis Algorithms on the Smart Wireless Sensor Platform PEGASE** V. Le Cam[1], M. Döhler[2], M. Le Pen[1], L. Mevel[3] [1) IFSTTAR, France; 2) BAM Federal Institute for Materials Research and Testing, Germany; 3) INRIA, France]	1210
14:05 ~ 14:25	**Application of Acoustic Emission Technique for Online Evaluation and Classification of Wear State** D. Baccar, D. Söffker [University of Duisburg-Essen, Germany]	1218
14:25 ~ 14:45	**Detection of Structural Damages Using the Exponential Sine Sweep Method** M. Rébillat, R. Hajrya, N. Mechba [Paris Institute of Technology, France]	1226
14:45 ~ 15:05	**Sparse Signal Processing Technique in Multimodal Dispersive SHM** J. Cai, X. Qing, L. Gao, M. Lu [Beijing Aeronautical Science and Technology Research Institute of COMAC, China]	1243
15:05 ~ 15:25	**A Non-dispersive Signal Construction Method for High Resolution Lamb Wave Damage Imaging** M. Zhariy, J. Himmelbauer, M. Scheerer [Software Competence Center Hagenberg, Austria]	1235
15:25 ~ 15:45	**Design of Observer Based Crack Detection Filters and Their Application to Crack Detection and Isolation** R. Vepa [University of London, U.K.]	1202

Technical Program (Wednesday, September 11th)

Keynote Presentations		
Chair: A. Gumes (Universidad Politecnica De Madrid, Spain)		***Location:*** Memorial Audi.
TIME	***WEDNESDAY, SEPTEMBER 11***	***PAGE NO.***
08:30 ~ 09:00	**On the Search for Optimal Damage Precursors** V. Weiss, A. Ghoshal [Army, USA]	27
09:00 ~ 09:30	**Validation, Verification and Implementation of SHM at Airbus** H. Speckmann, C. Bockenheimer [Airbus, Germany]	
09:30 ~ 10:00	**A Vision of SHM for Intelligent Structures** N. Salowitz, Z. Guo, S. Roy, R. Nardari, Y.-H. Li, S.J. Kim, F. Kopsaftopoulos, F.K. Chang [Stanford University, USA]	35

Advanced Diagnostics for Damage Assessment - III		
Chair: J. Lougheed (Lockheed Martin Corporation, USA) & **Co-chair**: B. Eckstein (Airbus, Germany)		***Location:*** HC 200-002
TIME	***WEDNESDAY, SEPTEMBER 11***	***PAGE NO.***
10:15 ~ 10:35	**Bridge Pier Scour Prediction by Multi-Objective Optimization Using the Genetic Algorithm** I. Kim, M. Y. Fard, A. Chattopadhyay [Arizona State University, USA]	143
10:35 ~ 10:55	**Corrosivity Sensor Suite for Measuring Damage Accumulation from Corrosion in Aircraft Applications** M. Shedd, J. Demo, F. Friedersdorf, C. Andrews [Luna Inc, USA]	151
10:55 ~ 11:15	**Statistical Based Decision Making for Damage Localization with Influence Lines** L. Marin[1], M. Döhler[2], D. Bernal[3], L. Mevel[1] [1) Centre Rennes-Bretagne Atlantique, France; 2) BAM, Germany; 3) Northeastern University, USA]	159
11:15 ~ 11:35	**Characterisation of Part-Through Damage in a Stiffened Panel by a Time-Reversal Based Imaging Method** E. Chan, C.H. Wang, L.R.F. Rose [RMIT University, Australia]	167
11:35 ~ 11:55	**Distortion Index for Assessment of Damage Growth in a Composite Structure using Spectral Distortion of Embedded FBG Sensors** G. C. Kahandawa[1], J. A. Epaarachchi[1], J. Canning[1], K.T. Lau[2] [1) University of Southern Queensland, Australia; 2) The Hong Kong Polytechnic University, Hong Kong]	175
11:55 ~ 12:15	**Supervised and Unsupervised Machine Learning Approaches for Bridge Damage Prediction** S. Tamura, B. Zhang, Y. Wang, F. Chen, K. Nguyen [National ICT Australia, Australia]	182

SHM for Rotocraft & Aerospace Structures: Field Evaluation and Validation

Chair: M. Bach (Airbus, Germany) & **Co-chair**: M. Davis (Sikorsky Aircraft Corporation, USA)

Location: HC 200-030

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Wireless Sensing System for Rotorcraft SHM** C. P. Townsend[1], S. J. DiStasi[1], J. Bessette[1], D. Liebschutz[2], and N. Phan[2] [1) MicroStrain, Inc., USA; 2) Navy/NAVAIR, USA]	1429
10:35 ~ 10:55	**Flight Demonstration of a SHM System on an OH-58 Aircraft** W. Girard[1], B. Tucker[1], N. Bordick[2], D. Zhang[3], H. Chung[3], P. Pollock[3], F. Li[3], S. J. Lee[3], A. Kumar[3] [1) Bell Helicopter,USA; 2) U.S. Army Aviation Development Directorate, USA; 3) Acellent Technologies, USA]	1437
10:55 ~ 11:15	**An SHM System for Detecting Corrosion Damage in Aging Aircraft** S. J. Beard, A. Kumar, D. Zhang, H. Chung, S. J. Lee, R. Ikegami [Acellent Technologies, USA]	1444
11:15 ~ 11:35	**Prediction of Landing Gear Loads from Flight Test Data Using Gaussian Process Regression** E. J. Cross[1], P. Sartor[2], K. Worden[1], P. Southern[2] [1) University of Sheffield, UK; 2) Messier-Bugatti-Dowty, UK]	1452
11:35 ~ 11:55	**Structural Airframe Maintenance Strategy Comparison: A New Approach** L. D. COT, C. BES, C. GOGU [Universite de Toulouse, France]	1460
11:55 ~ 12:15	**Damage Sensitive Features of a Repaired Helicopter Tail** B. Dorfman[1], J. Balter[1], N.Y.N. Shemesh[2], B. Glam[2], S. Kedem[2], I. Kressel[1], M. Tur[3] [1) Ben-Gurion International Airport, Israel; 2) Thie Israel Air Force, Israel; 3) Tel-Aviv University, Israel]	1468

Prognostics and Data Mining for Health Management

Chair: D. Adams (Vanderbilt University, USA) & **Co-chair**: L. Mevel (Universitaire de Beaulieu, France)

Location: HC 200-034

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**A Notional Framework and Model to Improve Monitoring of Structural Health Systems** C.M.S. Kabban[1], A. King[1], M.M. Derriso[2] [1)Air Force Institute of Technology,USA; 2)Air Force Research Laboratory,USA]	1337
10:35 ~ 10:55	**Non-Destructive Detection of Crack Initiation using Acoustic Emission** A. Keshtgar, M. Modarres [University of Maryland,USA]	1345
10:55 ~ 11:15	**Bayesian Updating of Detection Capability with Frequency Response Function Related Structural Health Monitoring Features** Z. Mao, M. Todd [University of California San Diego,USA]	1353
11:15 ~ 11:35	**Modular Signal-based Condition Monitoring of a Hydraulic Servo-system** L. Al-Shrouf[1], J. Gedenk[1], M. Jelali[1], D. Söffker[2] [1)Cologne University of Applied Science,Germany; 2)University of Duisburg-Essen,Germany]	1360
11:35 ~ 11:55	**Fatigue Damage Prognosis in FRP Composites by Combining Multi-scale Degradation Fault Modes in an Uncertainty Bayesian Framework** M. Ruano[1,2], J. Ruano[1,2], A. Saxena[2,3], G. Carlborg[2], K Goebel[3] [1) University of Granada,Spain; 2) NASA,USA; 3) SGT Inc.,USA]	1368
11:55 ~ 12:15	**Triboluminescent Optical Nerves for Smart Concrete Structures** D. Olawale[1,2], K. Kliewer[1], T. Dickens[1,2], M. Uddin[1], O. Okoli[1] [1) FAMU-FSU College of Engineering, USA; 2) Nanotechnology Patronas Group Inc.,USA]	1376

Operational Effects Consideration in SHM

Chair: V. Le Cam (IFSTTAR Nantes, France) & **Co-chair**: Y.-Q. Ni (Hong Kong Polytechnic University, Hong Kong)

Location: HC 200-203

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Effect of Applied Load on Guided Wave Monitoring of a Composite Bolted Joint** C. Haynes, M. Todd [University of California – San Diego, USA]	1269
10:35 ~ 10:55	**Adaptive Regression for Damage Detection in Bridges Under Environmental Influence** H. Nandan[1], M. P. Singh[2] [1) SC Solutions Inc., USA; 2) Virginia Polytechnic Institute and State University, USA]	1277
10:55 ~ 11:15	**Structural Damage Detection Using Ultrasonic Guided Waves Under Varying Ambient Temperature and Loading Environments** S. Roy, P. Ladpli, K. Lonkar, F.-K. Chang [Stanford University, USA]	1284
11:15 ~ 11:35	**Characterizing Variability in Strain Measurements Resulting from Temperature Changes Affecting Data Acquisition Equipment** D. K. McNeill, E. A-iyeh [University of Manitoba, Canada]	1294
11:35 ~ 11:55	**Critical Issues Affecting the Performance of PWAS Based SHM Systems for Corrosion Detection of Aluminum Structures** P. A. da Silva[1], B. J. G. de Aragão[2], P. H. de O. Lopes[2], E. S. Silva[2], T. F. de A. Santos[2], V. A. de A. Jr.[2], G. da C. Vasconcelos[2], M. do Rosario F. Hurtado[2], A. Mazoni[2] [1) Embraer, Brazil; 2) Fundação CPqD, Brazil]	1302
11:55 ~ 12:15	**Long-term Monitoring of Modal- and Damage-Parameters for SHM at a 5 MW Offshore Wind Turbine** M. W. Häckell, R. Rolfes [Leibniz Universität Hannover, Germany]	1310

SPECIAL SESSION

SHM Technology in Wind Turbines - III

Chair: W. Ostachowicz (Polish Academy of Sciences, Poland) & **Co-chair**: E. Flynn (LANL, USA)

Location: HC 200-205

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Structural Health Monitoring of Major Wind Turbine Components** B. Frankenstein, E. Schulze, B. Weihnacht, N. Meyendorf, C. Boller [Fraunhofer Institute for Non-Destructive testing, Germany]	2456
10:35 ~ 10:55	**Ultrasonic Fields and Inspection of Huge Complex Composites** C. Xu, H. Wang, J.D. Achenbach, X. Zhao [Beijing Institute of Technology, China]	2463
10:55 ~ 11:15	**Inspection and Monitoring of Wind Turbine Blade Embedded Defects During Fatigue Testing** C. Niezrecki[1], P. Avitabile[1], J. Chen[1], J. Sherwood[1], T. Lundstrom[1], Bruce LeBlanc[3], S. Hughes[2], M. Desmond[2], A. Beattie[3], M. Rumsey[3], S. M. Klute[4], R. Pedrazzani[4], R. Werlink[5], J. Newman[6] [1) University of Massachusetts Lowell, USA; 2) National Renewable Energy Laboratory, USA; 3) Sandia National Laboratories, USA; 4) Luna, USA; 5) National Aeronautic and Space Administration, USA; 6)John Newman Laser Technology Inc., USA]	2471
11:15 ~ 11:35	**Novel Method for Simulation of Lamb Wave Propagation Generated by an Interdigital Transducer** M. Manka, M. Rosiek, A. Martowicz, Ł. Ambroziński, T. Uhl, T. Stepinski [AGH University of Science and Technology, Poland]	2488
11:35 ~ 11:55	**Reduction of Model Complexity in Aerospace Structures with the Help of Approximated Stiffeners** C. Heinze [German Aerospace Center, Germany]	2496
11:55 ~ 12:15	**Advanced Optimal Modal Reduction and Optimal Sensors Location Procedures for Structural Damage Identification** S. Ouaknin, Y. Goldfeld [Technion-Israel Institute of Technology, Israel]	2504

Smart Sensors/Actuators and Energy Harvesting - III

Chair: A. Vechart (Honeywell, USA) & **Co-chair**: J. Santos (Jacobs Technology, USA)

Location: HC 200-303

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**On Development of a Fully Operative Piezoelectric-based Vibration Energy Harvesting system** S. Corbo[1], V. Cokonaj[1], J. Ortiz[2], P. M. Monje[2], G. Aranguren[2] [1) AERnnova Engineering Solutions Ibérica S.A., 2) University of the Basque Country, Spain]	601
10:35 ~ 10:55	**A Case-Study for Structural Health and Propellant Monitoring Technologies** K. Chiu[1], T. Duenas[1], J. Smith[2], J. Roberts[2], S. Bland[1] [1)NextGen Aeronautics, Inc.,USA; 2) Aviation and Missile Research and Development Engineering Center, USA]	1629
10:55 ~ 11:15	**A 915 MHz Wireless Correlator Multi-Sensor System for SHM** D. Malocha, M. Gallagher, B. Fisher [University of Central Florida,USA]	1637
11:15 ~ 11:35	**3D Photovoltaic Sensors for In-situ Structural Health Monitoring of Advanced Composites** J. Yan[1], M. Uddin[1], T. Dickens[1,2], D. Olawale[1,2], O. Okoli[1] [1)FAMU-FSU College of Engineering,USA; 2)Nanotechnology Patronas Group Inc.,USA]	1645
11:35 ~ 11:55	**Wireless Acoustic Emission Sensor Powered by Microwave Energy** F. Zahedi, H. Huang [University of Texas at Arlington,USA]	1654
11:55 ~ 12:15	**Damage Detection in Composites by LAI-PZT Transducer** A. Mohammadabadi, R. Dugnani [UM-SJTU Joint Institute, China]	1661

SPECIAL SESSION

SHM of Space Systems

Chair: A. Zagrai (New Mexico Institute of Mining and Technology, USA) & **Co-chair**: L. Richards (NASA, USA)

Location: HC 200-305

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Structural Health Monitoring in Near-Space Environment, a High Altitude Balloon Test** A. Zagrai[1], B. Cooper[1], J. Schlavin[1], C. White[1], S. Kessler[2] [1)New Mexico Institute of Mining and Technology,USA;2)Metis Design Corporation,USA]	2317
10:35 ~ 10:55	**Hybrid Passive/Active Impact Detection & Localization for Aerospace Structures** S. Kessler, E. Flynn [Metis Design Corporation,USA]	2325
10:55 ~ 11:15	**Health Monitoring of Aerospace Bolted Lap Joints Using Nonlinear Ultrasonic Spectroscopy: Theory and Experiments** Y. Shen, J. Bao, V. Giurgiutiu [University of South Carolina,USA]	2333
11:15 ~ 11:35	**Damage Detection in Large Scale Composite Rocket Structures Using Modal Acoustic Emission and Phased Array Sensing Techniques** T. Papulak, C. Deemer [ATK Aerospace Structures,USA]	2341
11:35 ~ 11:55	**NASA Prototype All Composite Tank Cryogenic Pressure Tests to Failure with Structural Health Monitoring** R. Werlink [NASA,USA]	2349
11:55 ~ 12:15	**Life Cycle Monitoring of Thick CFRP Pipes for Spacecraft Structures** K. Takagaki, S. Minakuchi, N. Takeda [University of Tokyo,Japan]	2359

Civil Structures: Field Evaluation and Validation - I

Chair: Z. Wu (Lbaraki University, Japan) & **Co-chair**: C.-H. Loh (National Taiwan University, Taiwan)

Location: ART 2

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Quantifying Bridge Deck Corrosion With Ground Penetrating Radar** N. Martino[1], R. Birken[1], K. Maser[2], M. Wang[1] [1) Northeastern University, USA; 2) Infrasense, Inc, USA]	637
10:35 ~ 10:55	**Pavement Assessment Using a Dynamic Pressure Sensor System** Q. Wang, J. G. McDaniel, R. Birken, M. L. Wang [Northeastern University, USA]	645
10:55 ~ 11:15	**In Field Application of Rapid Roadway Inspection System Using Vehicle-Mounted Multi-Modal Sensing** D. Vines-Cavanaugh, R. Birken, M. Wang [Northeastern University, USA]	611
11:15 ~ 11:35	**Applied Element Method Framework for Vibration-Based Condition Assessment** T. P. Kernicky, M. J. Whelan, C. Rice, D. C. Weggel [University of North Carolina at Charlotte, USA]	620
11:35 ~ 11:55	**The Importance in Load Positioning During Experimental Load Testing of Highway Bridges** M. V. Gangone[1], M. J. Whelan[2], K. D. Janoyan[3], L. Minnetyan[3] [1) The University of Texas at Tyler, USA; 2) University of North Carolina at Charlotte, USA; 3) Clarkson University, USA]	628
11:55 ~ 12:15	**Verification of the Slope Stability of Flood Prevention Dams with Fiber Optic Sensors** W. Lienhart[1], F. Moser[1], G. Supp[2], R. Marte[2] [1) Graz University of Technology, Austria; 2) Graz University of Technology, Austria]	653

SPECIAL SESSION

Next-Gen Sensing Sys. for SHM

Chair: Y. Wang (Georgia Institute of Technology, USA) & **Co-chair**: K. Loh (University of California - Davis, USA)

Location: ART 4

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
10:15 ~ 10:35	**Multi-Physics Modeling and Simulation of a Slotted Patch Antenna for Wireless Strain Sensing** X. Yi[1], Y. Wang[1], M. Tentzeris[1], R. Leon[2] [1) Georgia Institute of Technology,USA; 2)Virginia Polytechnic Institute and State University, USA]	1857
10:35 ~ 10:55	**Characterizing the Self-sensing Properties of Photoactive P3HT-based Nanocomposites** D. Ryu, K. Loh [University of California, Davis,USA]	1865
10:55 ~ 11:15	**Dual Mode Sensing on Grout Structures with Piezoelectric Sensors** Z. Tian, L. Yu, M. EL-Batanouny, P. Ziehl [University of South Carolina,USA]	1873
11:15 ~ 11:35	**Mobile Sensors in Bridge Health Monitoring** T. Matarazzo, S. Pakzad [Lehigh University,USA]	1881
11:35 ~ 11:55	**Quadrotor-based Wall-climbing Robot for Structural Health Monitoring** J. Shin, D. Kim, J. Kim, H. Jeon, H. Myung [KAIST,Korea]	1889
11:55 ~ 12:15	**Performance Analysis for CNT-based SHM in Composite Structures** S. Kessler, G. Thomas, M. Borgen, C. T. Dunn [Metis Design Corporation,USA]	1895

Advanced Diagnostics for Damage Assessment - IV

Chair: R. Ikegami (Acellent Technologies, USA) & **Co-chair**: A. Srivastava (Verizon, USA)

Location: HC 200-002

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
13:15 ~ 13:35	**Damage Characterization by Model Updating Techniques Using a Derivative-Free Global Optimization Method** P. Antunes[1], I. Vaz[2], R. Guimarães[1], N. Ferreira[1], J. Viana[1], G. Dias[1] [1) Critical Materials, Portugal; 2) Universidade do Minho, Portugal]	190
13:35 ~ 13:55	**High Resolution Localization with Lamb Wave Sparse Wavenumber Analysis** J.B. Harley, C. Liu, I.J. Oppenheim, J.M.F. Moura [Carnegie Mellon University, USA]	198
13:55 ~ 14:15	**Damage Location of Civil Large-scale Space Structures based on Average Axial-strain Mode Shapes** G. Yan[1], J. Yu[1], R. Feng[2], C. Ferregut[1] [1) University of Texas at El Paso, USA; 2) Southeast University, China]	205
14:15 ~ 14:35	**Baseline-free Estimation of the Residual Fatigue Life using a Modulated Nonlinear Ultrasound Method** G.P.M. Fierro, M. Meo [University of Bath, UK]	213
14:35 ~ 14:55	**Performance Comparison of Different Autoregressive Damage Features using Acceleration Measurements from a Truss Bridge** R. Yao, S.N. Pakzad [Lehigh University, USA]	220

SPECIAL SESSION

Aerospace Structures-Standards and V&V

Chair: H. Speckmann (Airbus, Germany) & **Co-chair**: S. Huang (AHS International, USA)

Location: HC 200-030

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
13:15 ~ 13:35	**Aerospace Industry Steering Committee on Structural Health Monitoring (AISC-SHM): Efforts to Standardize and Streamline SHM Utilization** P. Foote [Cranfield University, UK]	511
13:35 ~ 13:55	**Validation and Verification Processes to Certify SHM Solutions for Commercial Aircraft Applications** D. Roach [Sandia National Labs, USA]	519
13:55 ~ 14:15	**Large Scale Monitoring of CFRP Structures by Acousto-Ultrasonics – a Flight Test Experience** B. Eckstein[1], M. Bach[1], C. Bockenheimer[2], C. Cheung3, H. Chung[3], D. Zhang[3], F. Li[3] [1) EADS Innovation Works, Germany; 2) Airbus Operations GmbH, France; 3) Acellent Technologies Inc., USA]	528
14:15 ~ 14:35	**Reliability of Co-bonded Piezoelectric Sensors on CFRP Structures** M. Bach[1], N. Dobmann[1], B. Eckstein[1], M.Moix-Bonet[2], C. Stolz[3] [1) EADS Deutschland GmbH, Innovation Works, Germany; 2) DLR, Germany; 3) EADS Deutschland GmbH, Cassidian, Germany]	536
14:35 ~ 14:55	**Method for Real-Time Health Monitoring of Large Polymer Composite Structures Using Carbon Nanotube Networks** A. Naghashpour, S.V. Hoa [Concordia University, Canada]	544

SPECIAL SESSION

Novel SHM/NDE Tech. for Material Damage Quantification - I

Chair: S. Banerjee (University of South Carolina, USA) & **Co-chair**: T. Uhl (University of Science and Technology AGH, Poland)

Location: HC 200-034

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
13:15 ~ 13:35	**Quantifying Damage Precursor Using Microcontinuum Physics** S. Banerjee, P. Ziehl [University of South Carolina, USA]	1913

13:35 ~ 13:55	**Reference-free Fatigue Crack Detection using Nonlinear Wave Modulation** H. J. Lim[1], H. Sohn[1], M. P. DeSimio[2], K. Brown[3], M. Derriso[3] [1) KAIST, Republic of Korea; 2) UDRI, USA; 3) AFRL, USA]	1920
13:55 ~ 14:15	**Nondestructive Detection of Nonlinear Behavior of Plain and Polymer Concrete under Cycling Loading** E. Mahmoudabadi[1], J. N. Eiras[2], U. Amjad[1], J. Payá[2], H. Saadatmanesh[1], T. Kundu[1] [1) University of Arizona, USA; 2) Universitat Politècnica de València, Spain]	1928
14:15 ~ 14:35	**Correlation-based Imaging Algorithm for Bolt Loosening Monitoring on Realistic Aerospace Structure** N. Quaegebeur, P. C. Ostiguy, P. Masson [Université de Sherbrooke, Canada]	1936
14:35 ~ 14:55	**Multimodal Non-destructive Evaluation Approach for Damage Quantification** R. Carmi, P. A. Vanniamparambil, U. Guclu, J. Cuadra, A. Kontsos [Drexel University, USA]	1944

Advanced Monitoring for Loads/Environments - I

Chair: C.-K. Soh (Nanyang Technological University Singapore) & **Co-chair**: S. Huang (Army Research Lab,USA)

Location: HC 200-203

TIME	*WEDNESDAY, SEPTEMBER 11*	*PAGE NO.*
13:15 ~ 13:35	**Development of Self-compensated Long-gage Carbon Sensor for Structural Health Monitoring** H. Huang, Z. Wu [Ibaraki University, Japan]	303
13:35 ~ 13:55	**Implementing the Surface Response to Excitation Method (SuRE) with Non-contact Sensor at Hard to Reach Locations** S. Gonzalez[1], J. Rojas[1], F. Hadi[1], I.N. Tansel[1], B. Uragun[2] [1) Florida International University, USA; 2)Space Technologies Research Institute, Turkey]	311
13:55 ~ 14:15	**Design and Characterization of Fiber-optic Interferometric Sensor for Deflection and Damage Detection of Morphing Wing Structures** Z. Djinovic, M. Scheerer, M. Tomic, M. Stojkovic, M. Schueller [IMA GmbH, Austria]	319
14:15 ~ 14:35	**Online Simultaneous Reconstruction of Wind Load and Structural Responses for High-Rise Structures** Y. Niu[1], C.P. Fritzen[1], Y.Q. Ni[2] [1) University of Siegen, Germany; 2) The Hong Kong Polytechnic University, Hong Kong]	327
14:35 ~ 14:55	**Sensor Capability Enhancement of PPP-BOTDA for Dynamic Distributed Strain Monitoring of Bridge Structures** Z. Wu[1], H. Huang[1], K. Kishida[2] [1) Ibaraki University, Japan; 2) Neubrex Co., Ltd., Japan]	335

SPECIAL SESSION

Data Interpretation and Modeling for SHM

Chair: H. Li (Harbin Institute Of Technology, China) & **Co-chair**: S. Hurlebaus (Texas A&M University, USA)

Location: HC 200-205

TIME	*WEDNESDAY, SEPTEMBER 11*	*PAGE NO.*
13:15 ~ 13:35	**Input Force Reconstruction Using Response Measurements** C.H. Loh[1], T.H. Wu[1], Y.Q. Ni[2] [1) National Taiwan University, Taiwan; 2) The Hong Kong Polytechnic University, Hong Kong]	1671
13:35 ~ 13:55	**Displacement of a Skyscraper using Various Types of Field Monitoring Data** Y. Xia, P. Zhang, Y.Q. Ni [The Hong Kong Polytechnic University, Hong Kong]	1679
13:55 ~ 14:15	**Influence Line-based Damage Detection Technique for Long-span Bridges** S. Zhu[1], Z.W. Chen[2], Y.L. Xu[1], Q. Li[3] and Q.L. Cai[2] [1) The Hong Kong Polytechnic University, Hong Kong; 2) Xiamen University, China; 3) Tongji University, China]	1686

14:15 ~ 14:35	**A Novel Bayesian Extreme Value Distribution Model of Vehicle Loads: Application to Nanjing 3rd Yangtze River Bridge** S. Li, Y.M. Gu, H. Li [Harbin Institute of Technology, China]	1694
14:35 ~ 14:55	**Design of Structure Health Monitoring System for Nanjing 4th Yangtze River Bridge** N. Li, Z. Liu, H. Xie, Z. Ye [CCCC Highway Consultants Co.,Ltd., China]	1702

SPECIAL SESSION

Very Dense Arrays of Sensors

Chair: B. Glisic (Princeton University, USA) & **Co-chair**: F. Dotta (Embraer, Brazil)

Location: HC 200-303

TIME	*WEDNESDAY, SEPTEMBER 11*	*PAGE NO.*
13:15 ~ 13:35	**Energy Harvesting and Power-management for Sensing Skins in SHM Applications** Y. Hu, L. Huang, W. Rieutort-Louis, J. Sanz-Robinson, S. Wagner, J. Sturm, N. Verma [Princeton University, USA]	2771
13:35 ~ 13:55	**Patterned Carbon Nanotube Sensing Skins for Strain Sensing** A. Burton, J. P. Lynch [University of Michigan, Ann Arbor, USA]	2779
13:55 ~ 14:15	**Towards Sensing Sheets Based on Large Area Electronics** Y. Yao, S. Tung, N. Verma, B. Glisic [Princeton University, USA]	2787
14:15 ~ 14:35	**Sensing Skin for Condition Assessment of Civil Structures** S. Laflamme, H. S. Saleem, C. Song, B. K. Vasan, R. L. Geiger, D. Chen, M. R. Kessler, N. Bowler, K. Rajan [Iowa State University, USA]	2795
14:35 ~ 14:55	**The Use of Localized Sensor Networks for Damage Detection: A Likelihood Ratio Test Control Chart** M. Nigro, S. N. Pakzad [Lehigh University, USA]	2803

SPECIAL SESSION

Guided Waves in Structures for SHM - I

Chair: W. Ostachowicz (Polish Academy of Sciences, Poland) & **Co-chair**: E. Cross (University of Sheffield, UK)

Location: HC 200-305

TIME	*WEDNESDAY, SEPTEMBER 11*	*PAGE NO.*
13:15 ~ 13:35	**Advancements on the Inspection of Underwater Plates by Means of Guided Waves** E. Pistone, A. Bagheri, K. Li, P. Rizzo [University of Pittsburgh, USA]	887
13:35 ~ 13:55	**Damage Detection and Localization Using Lamb Waves in Highly Anisotropic Structures with Multiple Curvatures** F. Raddatz[1], W. Hillger[2], A. Szewieczek[1] [1) German Aerospace Center, Germany; 2) Ingenieurbüro Dr. Hillger, Germany]	895
13:55 ~ 14:15	**Opportunities for Structural Health Monitoring of Composite Material Structures with Novel Microstructured Optical Fiber Sensors** F. Berghmans[1], C. Sonnenfeld[1], S. Sulejmani[1], T. Geernaert[1], G Luyckx[2], N. Lammens[2], J Degrieck[2], E. Voet[3], K Chah[4], F. Collombet[5], W. Urbanczyk[6], P. Mergo[7], M Becker[8], H Bartelt[8], H. Thienpont[1] [1) Vrije Universiteit Brussel, Belgium; 2) Universiteit Gent, Belgium; 3) Com&Sens, Belgium; 4) Université de Mons, Belgium; 5) Université de Toulouse, France; 6) Politechnika Wrocławska, Poland; 7) Uniwersytet Marii Curie-Skłodowskiej, Poland; 8) Institut für Photonische Technologien, Germany]	902
14:15 ~ 14:35	**In-situ Guided-wave-based Health Monitoring for Train Bogie Structures: Technique Development and Application to Beijing-Shanghai High-speed Railway** M. Hong[1], Q. Wang[2], Z. Su[1], L. Cheng[1], Y. Q. Ni[1] [1) The Hong Kong Polytechnic University, Hong Kong; 2) Nanjing University of Posts and Telecommunications, China]	948
14:35 ~ 14:55	**Compressive Sensing for Damage Detection in Composite Aircraft Wings** A. Perelli[1], L. De Marchi[1], A. Marzani[1], S. Freear[2] [1) University of Bologna, Italy; 2) University of Leeds, UK]	917

Civil Structures: Field Evaluation and Validation - II

Chair: A. Kiremidjian (Stanford University, USA) & **Co-chair**: E. Figueiredo (Catholic University of Portugal, Portugal)

Location: ART 2

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
13:15 ~ 13:35	**Validation of the Rotation Algorithm for Earthquake Damage Estimation** K. Balafas, A. Kiremidjian [Stanford University, USA]	662
13:35 ~ 13:55	**RAPID System for Crack Detection in Riser Pipes** S. Beard, A. Kumar, S.J. Lee, R. Banerjee, F. Lee [Acellent Technologies Inc., USA]	670
13:55 ~ 14:15	**Implementation of Digital Image Correlation for Structural Health Monitoring of Bridges** C. Nonis[1], C. Niezrecki[1], T.Y. Yu[1], S. Ahmed[1], C.F. Su[1], T. Schmidt[2] [1) University of Massachusetts Lowell, USA; 2) Trilion Quality Systems, USA]	679
14:15 ~ 14:35	**Dynamic Strain Measurements using Digital Image Correlation** K. Scully, A. Hoag, N.A. Hoult, W.A. Take [Queen's University, Canada]	688
14:35 ~ 14:55	**Reporting the Results of Two Experimental Campaigns on a Pedestrian Timber** D. Bortoluzzi[1], F. Casciati[1], S. Casciati[2], Z. Chen[1], L. Faravelli[1] [1) University of Pavia, Italy; 2) University of Catania at Siracusa, Italy]	696

SPECIAL SESSION

Monitoring for High Precision Manufacturing Sponsored by The Advanced Institute of Manufacturing with High-tech Innovations, AIM-HI

Chair: M.-S. Tsai (National Chung Cheng University, Taiwan) & **Co-Chair**: Y. Huang (North Dakota State University, USA)

Location: ART 4

TIME	WEDNESDAY, SEPTEMBER 11	PAGE NO.
13:15 ~ 13:35	**Monitoring of Friction Condition Using a System Identification Technique** M. Tsai[1], W. Yuan[1], H. Huang[1], C. Liu[1], F. C. Wang[2] [1) National Chung Cheng University, Taiwan; 2) HIWIN Technologies Corp., Taiwan]	1815
13:35 ~ 13:55	**Dynamic Monitoring and Study of Shaft Rotating Deviation Error Using Developed MEMS Gyroscope-Based Sensing Module** G. Feng, F. Chang, [National Chung Cheng University, Taiwan]	1823
13:55 ~ 14:15	**Development of AE Signal Based Tool Breakage Prognosis System in Micro Gun Drilling** L. Hsu, M. Lu [National Chung Hsing University, Taiwan]	1831
14:15 ~ 14:35	**Development of an Intelligent Shaft Fault Diagnosis System for Machine Tools** C. Wang, W. Y. Lin, H. T. Young [National Taiwan University, Taiwan]	1839
14:35 ~ 14:55	**Ball Screw Health Monitoring using Ball Pass Frequency Spectra** P. C. Tsai[1], C. C. Cheng[1], Y. C. Hwang[2] [1) National Chung Hsing University, Taiwan; 2) HIWIN Technologies Corp., Taiwan]	1847

Technical Program (Thursday, September 12th)

Keynote Presentations

Chair: A. Hess (Hess PHM Group, USA)

Location: Memorial Auditorium

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
08:30 ~ 09:00	**Robust Sensors for Structural Health Monitoring within Harsh Environments** D. G. Senesky [Stanford University, USA]	45
09:00 ~ 09:30	**Prevalent Intelligence – from Edge to Cloud** L. C. Jaw [Intel Corporation, USA]	
09:30 ~ 10:00	**Activities on Standardization of Civil SHM Methodologies in Europe** H. Wenzel [Vienna Consulting Engineers, Austria]	

SPECIAL SESSION
V&V/Standardization for Civil Infrastructure

Chair: H. Wenzel (VCE, Austria)

location: HC 200-002

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
10:15 ~ 10:25	**Current practical applications of SHM in China** H. Li [Harbin Institute Of Technology, China]	
10:25 ~ 10:35	**Current Practice in SHM in Italy** A. Del Grosso [University of Genova, Italy]	
10:35 ~ 10:45	**Experiences in the Standardization of Fiber Optic Sensing Systems** B. Glisic [Princeton University, USA]	
10:45 ~ 10:55	**SAMCO Recommendations for Dynamic Monitoring of Structures** S. Thöns [BAM, Germany]	
10:55 ~ 11:05	**Standardized Cyber-environments for SHM** J. Lynch [University of Michigan, USA]	

Aerospace Structures: Laboratory Demonstration - I

Chair: C. Stolz (EADS Germany GmbH / Cassidian, Germany) & **Co-chair**: L. Richards (NASA, USA)

Location: HC 200-030

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
10:15 ~ 10:35	**An Experimental Comparison of Modal-based SHM Techniques Using Strain or Acceleration Measurements** F. L. Marques Dos Santos[1,2], B. Peeters[1], H. Van der Auweraer[1], L. C. S. Goes[2] [1) LMS, Belgium; 2) ITA, Brazil]	403
10:35 ~ 10:55	**Acoustic Wave Propagation and Scattering for Fault Detection in Honeycomb Composite Panels** V. Hafiychuk[1], V. Smelyanskiy[1], D. Timucin[1], S. Schuet[1], K. Wheeler[1], R. Tyson[2], J. Walker[3] [1) NASA Ames Research Center; 2)University of Alabama, USA; 3) NASA Marshall Space Flight Center, USA]	411
10:55 ~ 11:15	**Structural Health Monitoring as an Enabling Technology for Active Compliant Systems** L. Lorenz[1], K. -D. Büchter[1], O. Boegler[1], U. Kling[2], A. T. Isikveren[2] [1) Future Technologies and Ecology of Aviation, Bauhaus Luftfahrt e.V., Germany; 2) Visionary Aircraft Concepts, Bauhaus Luftfahrt e.V., Germany]	419

11:15 ~ 11:35	**Development of SHM System Using Multiple FBG Sensors for Solid Rocket Motor Composite Chamber** T. Nakajima[1], E. Sato, H. Tsuda[2], A. Sato, N. Kawai[3] [1) IHI Inspection & Instrumentation Co., Ltd, Japan; 2) Institute of Space and Astronautical Science, Japan; 3) , IHI Aerospace Co., Ltd., Japan]	429
11:35 ~ 11:55	**Proof-of-concept Study of Smart Panel for Space Structures** T. Mizutani [Japan Aerospace Exploration Agency, Japan]	437
11:55 ~ 12:15	**Nonlinear Dynamic Behavior of Impact Damage in a Composite Skin-stiffener Structure** T.H. Ooijevaar[1 3], M.D. Rogge[2], R. Loendersloot[3], L. Warnet[1], R. Akkerman[1], A. de Boer[3] [1) University of Twente, The Netherlands; 2) NASA Langley Research Center, USA; 3) University of Twente, USA]	445

Civil Structures: Laboratory Demonstration - I

Chair: X. Chapeleau (IFSTTAR Nantes, France) & Co-chair: P. Peres (ASTRIUM Space Transportation, France)

Location: HC 200-034

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Integration of Fiber Optic Platform and Electro-Mechanical Sensors to Enhance Damage Detection Process** M. Azarbayejani, L. Galvan, S. Salinas [UT- Pan, USA]	767
10:35 ~ 10:55	**A Structural Health Monitoring Approach for Damage Detection in Wind Turbines Tlades Based on Compressed Sensing Acquisition of Acoustic Emission Events** A. Cattaneo, S. Taylor, G. Park, C. Farrar, D. Mascareñas [Los Alamos National Laboratory, USA]	775
10:55 ~ 11:15	**Probabilistic Risk Prediction for Aircraft Fatigue Life Management Using SHM Systems Considering the Effect of Inspection Correlation** M. Shiao[1], Y.-T. Wu[2], J. Chen[1], A. Ghoshal[1], J. Riddick[1] [1) U.S. Army Research Laboratory, USA; 2) CompRel Inc., USA]	783
11:15 ~ 11:35	**Selection and Identification of a Shape Function for Modeling Degradation as a Gamma Process** O. Saarela[1], B. H. Nystad[1], A. Taipale[2], O. Ventä[2] [1) Institutt for Energiteknikk, Norway; 2) VTT Technical Research Centre of Finland, Finland]	791
11:35 ~ 11:55	**Continuous Monitoring of an Aging PC Bridge by Using Fiber-Optic Strain Sensors Based on Time-Series Analysis in Considering Environmental Effects** J. Mizutani, M. Nishio, H. Katsuchi, H. Yamada [Yokohama National University, Japan]	799
11:55 ~ 12:15	**Fatigue Damage Prognosis of Single-Edged Notch Beam using Piezoelectric Transducers** S. I. Lim, Y. Liu, C. K. Soh [Nanyang Technological University, Singapore]	807

Advanced Monitoring for Loads/Environments - II

Chair: L. Wenk (Airbus, Germany) & **Co-chair**: V. Lopes (UNESP, Brazil)

Location: HC 200-203

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Verification of Joint Input-State Estimation by In Situ Measurements on a Footbridge** K. Maes[1], E. Lourens[1], K. Van Nimmen[1], P. Van den Broeck[2], P. Guillaume[3], G. De Roeck[1], G. Lombaert[1] [1) KU Leuven, Belgium; 2) KAHO Sint-Lieven, Belgium; 3) Vrije Universiteit Brussel, Belgium]	343
10:35 ~ 10:55	**Bayesian Regression Trees as Surrogate Models for the Health Monitoring of Civil Infrastructure** K. Worden, E. J.Cross [University of Sheffield, UK]	351
10:55 ~ 11:15	**Proton Radiation Sensitivity of Fiber Bragg Gratings for Particle Colliders** M. Frövel[1], D. Moya[2], I. Vila[2], E. Currás[2], A. L. Virto[2], J. G. Carrión[1], J.M. Pintado[1], J. García-López[3], M. C. Jiménez[3], Y. Morilla[3], F. R. Palomo[4] [1) Instituto Nacional de Técnica Aeroespacia, Spain; 2) Instituto de Física de Cantabria, Spain; 3) Centro Nacional de Aceleradore, Spain; 4) University of Sevilla, Spain]	361
11:15 ~ 11:35	**Vibration Data as a Tool for Continuous Monitoring of Cable Tensile Loads** C. Rainieri, G. Fabbrocino [University of Molise, Italy]	369

11:35 ~ 11:55	**Vibration Monitoring of Operational Wind Turbine** A. Jhinaoui[1], L. Mevel[2], J. Morlier[3] [1) Cornis, France; 2) Inria, France; 3) Université de Toulouse, France]	377
11:55 ~ 12:15	**An Imaging Method for Impact Localization Using Metal-Core Miezoelectric Fiber Rosettes** C. Zhang[1], J. Qiu[1], S. Shan[1], Y. Wu1, N. Hu[2] [1) Nanjing University of Aeronautics & Astronautics, China; 2) Chiba University, Japan]	385

SPECIAL SESSION

Sensing Strategy for Wave-based SHM - I

Chair: Z. Su (Hong Kong Polytechnic University, Hong Kong) & **Co-chair**: M. Meo (University of Bath, UK)

Location: HC 200-205

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Quantitative Detection of Shallow Corrosion Damage by Targeted Use of the Dispersive Behavior of Guided Wave Modes** P. Jäckel[12], F. Niese[2], C. Boller[1,2] [1) Saarland University, Germany; 2) Fraunhofer Institute for Nondestructive Testing, Germany]	2169
10:35 ~ 10:55	**Scattering Measurements and In Situ Imaging with Sparse Guided Wave Arrays** J. E. Michaels, X. Chen, T. E. Michaels [Georgia Institute of Technology, USA]	2177
10:55 ~ 11:15	**Damage Identification for Composite Structures using a Cross-Correlation Reverse-Time Migration Technique** J. He, F.-G. Yuan [North Carolina State University, USA]	2185
11:15 ~ 11:35	**Temperature Compensation Based on Hilbert Transform and Instantaneous Phase for Lamb Waves-Based SHM Systems of Aircraft Structures** L.Ambrozinski[1], P. Magda[1], K. Dragan[1,2], T. Stepinski[1], T. Uhl[1] [1) AGH-University of Science and Technology, Poland; 2)Air Force Institute of Technology, Poland]	1259
11:55 ~ 12:15	**Beamforming of Lamb Waves Using 2D Arrays a Comparative Study** T. Stepinski, L. Ambrozinski, T. Uhl [AGH University of Science and Technology, Poland]	2210

SPECIAL SESSION

Statistical Methods for SHM - I

Chair: D. Zonta (University of Trento, Italy) & **Co-chair**: J. Hwang (National Aerospace Laboratory NLR, The Netherlands)

Location: HC 200-303

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Understanding Environmental Effect on Building Vibration for Structural Health Monitoring Using Event Detection and Causal Analysis** Y. Zheng[1], L. Zhang[1], P. Zhang[2], H. Y. Noh[2] [1) Tsinghua University, China; 2) Carnegie Mellon University, USA]	2744
10:35 ~ 10:55	**Probabilistic Damage Detection in Beam Structures Based on the Neutral Axis** D. H. Sigurdardottir, B. Glisic [Princeton University, USA]	2678
10:55 ~ 11:15	**On the Impact of Prior Engineering Perception on Structural Health Diagnosis: Analysis of a Case Study** C. Cappello[1], F. Bruschetta[1], D. Zonta[1], S. Maestranzi[1], R. Zandonini[1], M. Pozzi[2], B. Glisic[3], D. Inaudi[4], D. Posenato[4] [1) University of Trento, Italy; 2) Carnegie Mellon University, USA; 3) Princeton University, USA; 4) Smartec SA, Switzerland]	2686
11:15 ~ 11:35	**Dynamic Bayesian Network for Operational Modal Identification** B. Li, A. D. Kiureghian [University of California, Berkeley, USA]	2696

11:35 ~ 11:55	**Nonlinear Model-Data Fusion for Post-Earthquake Assessment of Structures** E. M. Hernandez, K. Erazo [University of Vermont, USA]	2704
11:55 ~ 12:15	**Quantification of Pavement Condition by Tire/Road Noise Measurement** Y. Zhang, J. G. McDaniel, R. Birken, M. L. Wang [Northeastern University, USA]	2712

SPECIAL SESSION

Guided Waves in Structures for SHM - II

Chair: C. Lissenden (Penn State University, USA) & **Co-chair**: W. Ostachowicz (Polish Academy of Sciences, Poland)

Location: HC 200-305

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Ultrasonic Guided Wave Based SHM of a Steel Shell Structure Under Different Operating Conditions** C. J. Lissenden, A. Lesky, M. H. Soorgee [Pennsylvania State University, USA]	925
10:35 ~ 10:55	**Continuous Mode Conversion of Lamb Waves in Carbon Fiber Composite Plastics - Occurrence and Modelling** B. Hennings, M. N. Neumann, R. Lammering [Helmut-Schmidt-University/University of the FederalArmed Forces, Germany]	933
10:55 ~ 11:15	**Ultrasonic Guided Wave Propagation in Cellular Composite Plates** S. M. H. Hosseini, S. Duczek, U. Gabbert [Otto-von-Guericke-University Magdeburg, Germany	941
11:15 ~ 11:35	**Guided Waves in a Disbonded Honeycomb Composite Structure** F. Ricci[1], E. Monaco[1], H. Baid[2], A. Mal[3] [1) University of Naples Federico II, Italy; 2) AlphaStar Corporation, USA; 3) University of California, Los Angeles, USA]	910
11:35 ~ 11:55	**On the Structural Health Monitoring of Repaired Aerospace Structures** S. Pavlopoulou[1], K. Worden[2], C. Soutis[1] [1) University of Manchester, UK; 2) University of Sheffield, UK]	956
11:55 ~ 12:15	**Signal Processing System for Guided Wave-Based SHM Technique** P. Malinowski[1], T. Wandowski[1], W. Ostachowicz[1,2], T. Luba, G. Borowik[2], M. Rawski[2], P. Tomaszewski[2] [1) Institute of Fluid-Flow Machinery, Polish Academy of Sciences, Poland; 2) Warsaw University of Technology, Poland]	964

SPECIAL SESSION

SHM/NDE for Civil Infrastructure - I

Chair: S. Salamone (University of Buffalo, USA) & **Co-chair**: X. Yu (Case Western Reserve University, USA)

Location: ART 2

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**On the Use of Solitary Waves for the Prediction of Structural Buckling of Simple Structures** L. Cai, K. Li, P. Rizzo [University of Pittsburgh, USA]	2515
10:35 ~ 10:55	**Crack Pattern Quantification for Advanced Visual Inspection of Concrete Structures** A. Farhidzadeh, E. Dehghan-Niri, S. Salamone [University at Buffalo, USA]	2523
10:55 ~ 11:15	**Leakage of Guided Waves in Embedded Waveguides of Arbitrary Cross Section** M. Mazzotti[1], A. Marzani[2], I. Bartoli[1], E. Viola[2] [1) Drexel University, USA; 2) University of Bologna, Italy]	2531
11:15 ~ 11:35	**Bragg Grating and BOTDR Fiber Optic Principles Applied for Real-Time Structural Monitoring - The MONICO Project** M. Bimpas, K. Loupos, A. Amditis, G. Kanellos, O. Bursi, S. Frondistou, J. Meisner, D. Bairaktaris, B. Griffoni, A. Orfanoudakis [Institute of Communication and Computer Systems, Greece]	2538

11:35 ~ 11:55	**Structural Condition Assessment of Bridges: Past, Present, and Future - A Portuguese Perspective** E. Figueiredo [Catholic University of Portugal, Portugal]	2546
11:55 ~ 12:15	**The Role of SHM in Infrastructure Management** A. E. Del Grosso [University of Genoa, Italy]	2554

SPECIAL SESSION

Novel SHM/NDE Tech. for Material Damage Quantification - II

Chair: S. Banerjee (University of South Carolina, USA) & **Co-chair**: H. Sohn (KAIST, Korea)

Location: ART 4

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
10:15 ~ 10:35	**Characterization of Fatigue Damage in Adhesively Bonded Lap Joints Through Dynamic, Full-Spectral Interrogation of Fiber Bragg Grating Sensors** S. Webb[1], P. Shin1, K. Peters[1], M. Zikry[1], S. Schultz[2], R. Selfridge[2] [1) North Carolina State University, USA; 2) Brigham Young University, USA]	1953
10:35 ~ 10:55	**Non-collinear Inspection for the Detection of Damage Precursors** A. J. Croxford, J. N. Potter [University of Bristo, UKl]	1961
10:55 ~ 11:15	**A Hybrid Data Driven Technique for Long Term Monitoring of Structures** M. Malekzadeh, N. Catbas [University of Central Florida, USA]	1969
11:15 ~ 11:35	**Damage Inspection of Structures by Space-Wavenumber and Time-Frequency Analyses** P. F. Pai, H. Peng [University of Missouri, USA]	1977
11:35 ~ 11:55	**Non-Contact Nonlinear Ultrasound Scan of a CFRP Plate with Manufactured Damages** C. Hedberg[1], S. Andersson[2], K. Haller[2], S.-E. Hellbratt[3] [1) Blekinge Institute of Technology, SWEDEN; 2) Acoustic Agree AB, Sweden; 3) Kockums AB, Sweden]	1984
11:55 ~ 12:15	**Effect of Localized Plastic Deformation on Higher Harmonic Guided Wave Mode Generation in Plate** Y. Liu, G. Choi, C. J. Lissenden, J. L. Rose [Pennsylvania State University, USA]	1992

SPECIAL SESSION

SHM for Harsh Environments

Chair: D. G. Senesky (Stanford University, USA) & **Co-chair**: C. Roof (Lockheed Martin Corporation, USA)

Location: HC 200-002

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**Aluminum Nitride High Temperature Strain Sensors** F. T. Goericke, A. P. Pisano [UC Berkeley, USA]	2267
13:50 ~ 14:10	**MEMS Piezoelectric Energy Harvesters for Harsh Environment Sensing** Y.J. Lai[1], W.C. Li[1], C.M. Lin[1], V. V. Felmetsger[2], D. G. Senesky[3], A. P. Pisano[2] [1) UC Berkeley, USA; 2) OEM Group Incorporated, USA; 3) Stanford University, USA]	2275
14:10 ~ 14:30	**Optical MEMS Pressure Sensors for Geothermal Well Monitoring** W. Challener[1], S. Palit[1], R. Jones[2], L. Airey[2], R. Craddock[2], A. Knobloch[1] [1) General Electric Global Research, USA; 2) General Electric Measurement & Control, USA]	2283
14:30 ~ 14:50	**Development of High Performance BS-PT Based Piezoelectric Transducer for Structural Health Monitoring of High-Temperature Polymer-Matrix Composite Structures** Y.H. Li, S. J. Kim, R. Nardari, D. Oropeza, F. -K. Chang [Stanford University, USA]	2289

14:50 ~ 15:10	**Development and Verification of an Aerothermal Thermal Protection System Heat Shield Instrumentation Plug for Flight on Mars Science Laboratory** E. R. Martinez [NASA Ames Research Center, USA]	2297
15:10 ~ 15:30	**Characterization of Gallium Nitride Heterostructures for Strain Sensing at Elevated Temperatures** C. A. Chapin, H. C. Chiamori, M. Hou, D. G. Senesky [Stanford University,USA]	1621

SPECIAL SESSION

Aerospace Structures: Laboratory Demonstration - II

Chair: J. Michaels (Georgia Institute of Technology, USA) & **Co-chair**: A. Srivastava (Verizon, USA)

Location: HC 200-030

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**Reconfigurable Architecture Based on Programmable System on Chip and Versatile Interface for Multi Sensors Instrumentations Applied to SHM: Case of an ATR72 Wing Panels** H. Boukabache[1,2], S. Zedek[1,2], C. Escriba[1,2], J. Y. Fourniols[1,2] [1) CNRS / LAAS, France; 2) Université de Toulouse / UPS / INSA / INP / ISAE / LAAS, France]	454
13:50 ~ 14:10	**Structural Health Monitoring-Based Methodologies for Managing Uncertainty in Aircraft Structural Life Assessment** R. Bond[1], S. Underwood[2], D. E. Adams[1], J. J. Cummins[3] [1) Purdue University, USA; 2) GE Global Research, USA; 3) NAVAIR, USA]	461
14:10 ~ 14:30	**Assessment of Fibre Optic Sensor Architectures for Structural Health Monitoring** B. Rocha[1], D. Barazanchy[1], R. Sevenois[1], H. Guo[1], G. Xiao[1], N. Mrad[2] [1) National Research Council Canada, Canada; 2) DRDC, Canada]	470
14:30 ~ 14:50	**Simulation Studies of Spectral Subtraction Based Temperature Compensation of FBG Sensor for Structural Health Monitoring** P. Chelliah[1], A. Deniz[1], C. Keulen[2], G. Bektas[1], T. Boz[1], F. Melemez[1], C. Ozturk[1], A. Suleman[2], M. Yildiz[1] [1) Sabanci University, Turkey; 2) University of Victoria, Canada]	478
14:50 ~ 15:10	**Research on Spatial Filter Based Structural Imaging Method and the Evaluation Research on Complex Composite Structures** Q. Lei, Y. Shenfang, L. Bin, M. Hanfei [Nanjing University of Aeronautics and Astronautics, China]	486
15:10 ~ 15:30	**Application of the Triple Correlation Analysis to Damage Detection of Structures** A. Klepka[1], M. Strączkiewicz[1], W. J. Staszewski[1], F. Aymerich[2] [1) AGH University of Science and Technology, Poland; 2) Universityof Cagliari, Italy]	494

Civil Structures: Laboratory Demonstration - II

Chair: H. Y. Noh (Carnegie Mellon University, USA) & **Co-chair**: L. Cheng (Hong Kong Polytechnic University, Hong Kong)

Location: HC 200-034

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**Identifying Pipe Degradation In a Highly Dynamic Environment Using Singular Value Decomposition** C. Liu, J. B. Harley, D. W. Greve, M. Bergés, I. J. Oppenheim [Carnegie Mellon University, USA]	815
13:50 ~ 14:10	**A Proposal for Exteriori-Interiori Integrated Structural Health Monitoring Framework** S. Chen[1], H. Chung[2], Y. Park[1], D. M. Boyajian[3] [1) University of North Carolina at Charlotte, USA; 2) Acellent Technology, USA; 3) Taylor University, USA]	823
14:10 ~ 14:30	**Multi-sensing Strategy for SHM in Civil Engineering: Case Study of a Structural Element With Carbon Fiber Reinforcement** A. Belisario, C. Codreanu, S. Zedek, T. Camps, R.l Francois, C. Escriba, J. -Y. Fourniols [CNRS / LAAS, France]	831
14:30 ~ 14:50	**Development of Smart Pultruded Composite Materials with Embedded Fiber Bragg Gratings for In-situ Strain Monitoring** X. Chapeleau[1], M. Drissi-Habti[1], L. Quétel[2], T. Robin[3] [1) UNAM, France; 2) IDIL, France, 3) iXFiber, France]	839
14:50 ~ 15:10	**Multidisciplinary Health Monitoring of a Steel Bridge Deck Structure** L. Pahlavan, R. Pijpers, J. Paulissen, H. Hakkesteegt, R. Jansen [TNO, the Netherlands]	846

15:10 ~ 15:30	**Application of SHM using an Autonomous Sensor Network** R. Loendersloot[1], F. Schiphorst[1], T. Basten[2], T. Tinga[1] [1) University of Twente, the Netherlands; 2) TNO, the Netherlands]	854

SHM-based Structural Design/Intelligent Structures

Chair: O. Venta (VTT Technical Research Centre of Finland, Finland) & **Co-chair**: J. Yang (University of Washington, USA)

Location: HC 200-203

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**Optimizing Mode Tuning of Guided Waves and PWAS Electromechanical Impedance for Power Efficient SHM systems** A. Kamal, B. Lin, V. Giurgiutiu [University of South Carolina, USA]	1479
13:50 ~ 14:10	**Effect of Bonding Layer on Admittances of PWASs Bonded on Thin Slender Substrates: Correlation between Measurements and Simulation** H. Huang, M.M. Islam [University of Texas at Arlington, USA]	1487
14:10 ~ 14:30	**Analytical Modeling of Proof-Mass Piezoelectric Wafer Active Sensor for Symmetric Lamb Waves Tuning** T. Kamas, V. Giurgiutiu, B. Lin [University of South Carolina, USA]	1494
14:30 ~ 14:50	**Integration of Health Monitoring and Control of Building Structures Due to Earthquake** J. Shan[1], H. T.Y. Yang[2], W. Shi[1] [1) Tongji University, China; 2) University of California, Santa Barbara, USA]	1502
14:50 ~ 15:10	**FEM Model Calibration of Sports Arena Stand, Using Monitoring Data** A. Zhivaev[1], G.i Boldyrev[2] [1) Research and Production Company (NPP) Geotek Ltd., Russia; 2) Penza State University of Architecture and Construction, Russia]	1510
15:10 ~ 15:30	**Scenario Based Approach to Structural Damage Detection and its Value in a Risk and Reliability Perspective** M.K. Hovgaard[1], J.B. Hansen[2], R. Brincker[2] [1) Rambøll Denmark, Denmark; 2) Aarhus University, Denmark]	1517

SPECIAL SESSION

Sensing Strategy for Wave-based SHM - II

Chair: Z. Su (Hong Kong Polytechnic University, Hong Kong)

Location: HC 200-205

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**A Small, Light and Low-Power Passive Node Sensor for SHM of Composite Panels** L. De Marchi[1], A. Perelli[1], N. Testoni[1], A. Marzani[1], D. Brunelli[2], L. Benini[1] [1) University of Bologna, Italy; 2) Univeristy of Trento, Italy]	2218
13:50 ~ 14:10	**Embedded Inductively Coupled Sensors for Composite SHM** C. Zhong, A. J. Croxford, P. D. Wilcox [University of Bristol, United Kingdom]	2225
14:10 ~ 14:30	**Guided Wave Scattering for In Situ Health Monitoring of Slotted Fuel Flow Vents in Integral Stiffeners** C. Doherty, W.K. Chiu [Monash University, Australia]	2233
14:30 ~ 14:50	**Cognitive Structural Health Monitoring and Its Key Technology** L. Yu, J. Wang, Y. Zhang [Northwestern Polytechnical University, China]	2240
14:50 ~ 15:10	**Minimum Sensor Density for Quantitative Damage Imaging** C. H. Wang, L. R. F. Rose [RMIT University, Australia]	2248
15:10 ~ 15:30	**Monitoring Impact On Line with a Miniaturized Device for Composite Structures** S. Yuan, L. Qiu, W. Qian, H. Mei, P. Liu [Nanjing University of Aeronautics and Astronautics, China]	2256

SPECIAL SESSION

Statistical Methods for SHM - II

Chair: M. Pozzi (Carnegie Mellon University, USA) & **Co-chair**: F.-G. Yuan (North Carolina State University, USA)

Location: HC 200-303

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
13:30 ~ 13:50	**Probabilistic Learning and Planning for Optimal Management of Wind Farms** M. Memarzadeh, M. Pozzi, J. Z. Kolter [Carnegie Mellon University, USA]	2720
13:50 ~ 14:10	**Reliability-Oriented Optimization of Replacement Strategies for Monitored Composite Panels for Aircraft Structures** G. Cottone[1], D. Straub[1], S. Gollwitzer[2], U. Heckenberger[3] [(1) Universität München, Germany; 2) RCP gmbH, Germany; 3) EADS Innovation Works, Germany]	2728
14:10 ~ 14:30	**Reliability-Based Condition Assessment of Bridge Deck Using Long-Term Monitoring Data** Y.Q. Ni, K.C. Lin [The Hong Kong Polytechnic University, Hong Kong]	2736
14:30 ~ 14:50	**A Sequential Statistical Time Series Framework for Vibration Based Structural Health Monitoring** F. Kopsaftopoulos[1], S. D. Fassois[2] [(1) Stanford University, USA; 2) University of Patras, Greece]	2669
14:50 ~ 15:10	**An Approach to Fault Detection Using a Unified Linear Gaussian Framework** R. Fuentes, A. Halfpenny, E. Cross, R. Barthorpe, K. Worden [University of Sheffield, USA]	2752
15:10 ~ 15:30	**Automatic Damage Classification using Wavelet Classifier Based on Principal Component Analysis** F. Gharibnezhad, L.E. Mujica, J.Rodellar, C.P. Fritzen [Barcelona Tech., Spain]	2760

SPECIAL SESSION

Guided Waves in Structures for SHM - III

Chair: W. Ostachowicz (Polish Academy of Sciences, Poland) & **Co-chair**: R. Zemcik (University of West Bohemia, Czech Republic)

Location: HC 200-305

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
13:30 ~ 13:50	**Nonlinear Guided Waves for Thermal Stress Measurement in Constrained Solids** C. Nucera, F.L. di Scalea [University of California, San Diego, USA]	972
13:50 ~ 14:10	**Analysis of Wave Propagation in Rib-Stiffened and Isogrid Panels for Structural Health Monitoring** B. Cooper[1], D. Doyle[2], W. Reynolds[2] [(1) New Mexico Tech, USA; 2) Air Force Research Laboratory, USA]	980
14:10 ~ 14:30	**Progress in Structural Health Monitoring Technology and System for the Large Crane in China** K. -Q. Ding, N. Zhao, Z. -J. Wang [China Special Equipment Inspection and Research Institute, China]	988
14:30 ~ 14:50	**A Novel Time-Domain Technique for Damage Detection Applied to SHM Using Savitzky-Golay Filter** M. A. de Oliveira[1], J.V. Filho[2], V. Lopes Junior[2], D.J. Inman[3] [(1) Federal Institute of Education of Mato Grosso, Brazil; 2)Universidade Estadual Paulista, Brazil; 3) University of Michigan, USA]	996
14:50 ~ 15:10	**Quantitative Crack Monitoring Using Diffracted Lamb Waves** C. Du[1], Z. Wu[2], Y. Wang[1], X. Qing[1] [(1) Beijing Aeronautical Science and Technology Research Institute of COMAC, China; 2) Dalian University of Technology, China]	1004

SPECIAL SESSION

SHM/NDE for Civil Infrastructure - II

Chair: S. Salamone (University of Buffalo, USA) & **Co-chair**: N. Hoult (Queen's University, Canada)

Location: ART 2

TIME	THURSDAY, SEPTEMBER 12	PAGE NO.
13:30 ~ 13:50	**Combined MEMS Acoustic Emission and Strain Sensors for On Chip Data Fusion** H. Saboonchi, D. Ozevin [University of Illinois at Chicago, USA]	2562

13:50 ~ 14:10	**Non-Contact Ultrasonic Guided Wave Inspection of Rails** S. Mariani[1], T.V. Nguyen[1], R.R. Phillips[1], P. Kijanka[2], F.L. di Scalea[1], W.J. Staszewski[2] [1) University of California, San Diego, USA; 2) AGH University of Science and Technology, Poland]	2570
14:10 ~ 14:30	**Hyperbolic Signature Extraction of Deeper Rebar Layer in Concrete Bridge Decks using GPR** X. Wei, Y. Zhang [Georgia Institute of Technology, USA]	2578
14:30 ~ 14:50	**Air-coupled Ultrasonic NDT of Solids using a Focused Electrical Spark Source** X. Dai, J. Zhu, M. R. Haberman [The University of Texas at Austin, USA]	2592
14:50 ~ 15:10	**Multiple Cross Validated Sensing System for Damage Monitoring in Civil Structural Components** P. A. Vanniamparambil, F. Khan, R. Carmi, S. Rajaram, E. Schwartz, M. Bolhassani, A. Hamid, A. Kontsos, I. Bartoli [Drexel University, USA]	2600
15:10 ~ 15:30	**Feasibility for Energy Harvesting from Surface Bonded/Embedded Piezo-Patches in Addition to Structural Health Monitoring** N. Kaur, S. Bhalla [Indian Institute of Technology (IIT) Delhi, India]	2606

SPECIAL SESSION

Material State Awareness and Damage Precursors

Chair: V. Weiss (US Army, USA) & **Co-chair**: C. Larrosa (Exponent, USA)

Location: APT 4

TIME	*THURSDAY, SEPTEMBER 12*	*PAGE NO.*
13:30 ~ 13:50	**Characterization of CFRP Laminates: Linear and Nonlinear Acoustic Measurements of As-Fabricated Materials** D. Barnard[1], S. Chakrapani[2], A. Subramanian[2], L. Bond[1] [1) Center for Nondestructive Evaluation, USA; 2) Iowa State University, USA]	1763
13:50 ~ 14:10	**Uncertainty Quantification of Multiscale Composite Damage Initiation and Progression** J. Johnston, L. Borkowski, A. Chattopadhyay [Arizona State University, USA]	1770
14:10 ~ 14:30	**Damage Precursor Investigation of Fiber Reinforced Composite Materials Under Dynamic Cyclic Loads** A.J. Hall[1], R.E. Brennan IV[2], A. Ghoshal[1], M. Coatney[1], R. Haynes[1], N. Bradley[1], V. Weiss[1], J. Tzeng[2] [1) Vehicle Technology Directorate; 2) Weapons and Materials Research Directorate, U.S. Army Research Laboratory, USA]	1778
14:30 ~ 14:50	**Overview of the Use of Acoustic Emission and Electrical Resistivity for Damage Detection in Ceramic and Polymer Matrix Composites** G.N. Morscher, E. Maillet, C. Baker [University of Akron, USA]	1786
14:50 ~ 15:10	**Monitoring Transverse Matrix Cracking in Composite Laminates Using Ultrasonic Guided Waves** C. Larrosa, F. -K. Chang [Stanford University, USA]	1795
15:10 ~ 15:30	**Nonlinear Ultrasonic Time Reversal Imaging for Closed Crack Location in Metallic Structures** W. Zhang, W. Qu, L. Xiao [Wuhan University, China]	1805

Poster Session

Dohrmann Grove (Tuesday, September 10th) (Q&A Session: 12:30 ~ 13:45)

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11:45 ~ 13:45	**Detection of Impact Damage using a Nonlinear Ultrasound Approach** F. Ciampa, M. Meo [University of Bath, UK]	259
11:45 ~ 13:45	**Fiber-optic-based Quality Control of Aerospace CFRP Structures** K. Uhira, S. Minakuchi, N. Takeda [University of Tokyo, Japan]	501
11:45 ~ 13:45	**Auto-Association and Novelty Detection: Truths and Myths?** N. Dervilis, R.J. Barthorpe, K. Worden [University of Sheffield, UK]	243
11:45 ~ 13:45	**An Application of Near Infra-Red Fibre Bragg Grating as Dynamic Sensor in SHM of Thin Composite Laminates** M. H. Zohari[1,2], G. C. Kahandawa[1], J. A. Epaarachchi[1], K. T. Lau[1], K. Cook[3], J. Canning[3] [1) University of Southern Queensland, Australia; 2) UMP, Malaysia; 3) University of Sydney, Australia]	267
11:45 ~ 13:45	**Reconstruction of Impact on Textile Composite Plate using Piezoelectric Sensors** R. Zemčík, V. Laš, T. Kroupa, J. Bartošek [University of West Bohemia, Czech Republic]	393
11:45 ~ 13:45	**Optimization of Bio-inspired Piezoelectric Composite Hair Sensor; Mechanical Impedance Matching** J. Tao, X. Yu [Case Western Reserve University, USA]	2157
11:45 ~ 13:45	**Vibration Monitoring and Live Load Tests of Civil Infrastructure with Interferometric Radar** P. J. Bennett [Exponent Failure Analysis Associates, USA]	733
11:45 ~ 13:45	**Applications of New Sensing Technologies for Reinforced Concrete Related to Nuclear Facilities: Considerations and Potentials** D. B. Scott, A. Goodman, J. D. Smith, S.-E. Chen [Electric Power Research Institute, USA]	710
11:45 ~ 13:45	**SHM of a Masonry Chimney after a Lighting Accident** L. F. Ramos[1], M. G. Masciotta[1], P. B. Lourenço[1], M. Vasta[2] [1) University of Minho, Portugal; 2) University "G. d'Annunzio" of Chieti-Pescara, Italy]	740
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11:45 ~ 13:45	**Modeling of Lamb Waves in Composites Using A New Third-order Plate Theory** J. Zhao, J. Qiu, C. Zhang [Nanjing University of Aeronautics & Astronautics, China]	1160
11:45 ~ 13:45	**Finite Element Simulation of a Beam with Closed Crack and Breathing Crack Based on Subharmonic Detection Method** Z. WANG, W. QU, L. XIAO [Wuhan Unviersity, China]	1152
11:45 ~ 13:45	**Experiments on Structural Displacement Monitoring using ViSP (Visually Servoed Paired Structured Light System)** H. Jeon, W. Myeong, J.U. Shin, H. Myung [KAIST, Korea]	1903
11:45 ~ 13:45	**Influence of External Excitation on Electromechanical Impedance Signatures** Z. LI, W. QU, L. XIAO [Wuhan Unviersity, China]	1318
11:45 ~ 13:45	**Leakage Detection in Water Pipe Networks using Electromechanical Impedance (EMI) Based Technique** J. L. Pita, A. E. Turra, J. V. Filho [Univ Estadual Paulista, Brazil]	1524
11:45 ~ 13:45	**Health Monitoring of Composite Structures Using Carbon Nanotubes** C. Cheung[1], A. Kumar[1], D. C. Zhang[1], F. Li[1], I. Li[1], E. T. Thostenson[2], G. Gallo[2] [1) Acellent Technologies Inc., USA; 2) University of Delaware, USA]	2306
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11:45 ~ 13:45	**Damage Mode Analysis in Composite Structures Using Lamb Waves for SHM Purposes** L. zhao, X. P. Qing, C. Du [Beijing Aeronautical Science and Technology Research Institute of COMAC, China]	2097
11:45 ~ 13:45	**Highly Scalable Fiber Bragg Grating Interrogator System for Sensing in Harsh Environment Applications** B. Moslehi, R.J. Black, J.M. Costa, E. Edwards, F. Faridian, V. Sotoudeh [Intelligent Fiber Optic Systems Corporation, USA]	
11:45 ~ 13:45	**Design, Manufacture and Testing of a Fiber-optically Sensorized Composite Wing** J.M. Costa[1], R.J. Black[1], F. Faridian[1], B. Moslehi[1], L. Oblea[1], E. Abouzeida[2], V. Quinones[2], Y. Gowayed[2], P. Soobramaney[2], G. Flowers[2] [1) Intelligent Fiber Optic Systems Corporation, USA; 2) Auburn University, USA]	
11:45 ~ 13:45	**Fiber Optic Temperature Sensors for Thermal Protection Systems** R.J. Black[1], J.M. Costa[1], B. Moslehi[1], L. Zarnescu[1], D. Hackney[2], K. Peters[2] [1) Intelligent Fiber Optic Systems Corporation, USA; 2) North Carolina State University, USA]	
11:45 ~ 13:45	**Usability engineering: The surface becomes the screen to deliver breakthrough efficiency gains for surface inspection** E. Klaas[1], A. Chhabra[2], P. Böttcher[3] [1) 8tree, Germany; 2) 8tree, USA; 3) 8tree, UK]	
11:45 ~ 13:45	**Multi-modal and Self-sensing using Photoactive Thin Films and Light** D. Ryu, F. N. Meyers, K. J. Loh [UC Davis, USA]	
11:45 ~ 13:45	**Nano-engineered Multifunctional Materials for Sensing, Actuation, and Structural Health Monitoring** Y. Zhao, B. L.,F. N. Meyers, F. Azhari, I. Wong, K. J. Loh [UC Davis, USA]	
11:45 ~ 13:45	**Electromechanical Response of Carbon Nanotube-based Structural Coatings** B. Loyola, Y. Zhao, K. J. Loh [UC Davis, USA]	
11:45 ~ 13:45	**Robust and Accurate Image-Based 3D Scene Reconstruction in the Presence of Mismatched Features for Structural Health Monitoring** M. Jahanshahi, A. Ansar, C. Padgett [Jet Propulsion Laboratory, California Institute of Technology, USA]	
11:45 ~ 13:45	**Dual Mode Sensing on Grout Structures with Piezoelectric Sensors** Z. Tian, L. Yu, M. EL-Batanouny, P. Ziehl [University of South Carolina, USA]	
11:45 ~ 13:45	**The Need for Guidance on Integrating SHM within Military Aircraft Systems** M. Buderath[1], Jim McFeat[2], Hesham Azzam[3], P. Foote[4] [1) Cassidian, Germany; 2) BAE Systems, UK; 3) HAHN Spring Ltd, UK; 4) Cranfield University, UK]	

*Note: The above titles (without the page number) are for poster presentation only; they do not appear in the proceedings.

SHM-in-Action

Memorial Auditorium (Wednesday, September 11th (15:10 – 17:35))

One of our highlighted events showcasing how Structural Health Monitoring works in practical applications. The session features demonstrations on a variety of SHM applications from many leading SHM companies and educational institutions.

Session Chair: C. Boller (Fraunhofer IZFP, Germany) & B. Glisic (Princeton University, USA)

Mistras Group, Inc. (USA)
(15:15-15:20)

This single channel pulser/receiver node has a 4-channel multiplexer for four single or dual-crystal transducers, of two separated transducers used in a pitch-catch configuration. Wireless communication between the node and other software/hardware components is possible using Zigbee or Hart protocols. An SD memory card or data logger mode optimizes data acquisition and storage. this UT node is an ultra-low power with a two year battery life possible at one measurement per day. The 16116 is designed for intrinsically safe certification and use for Structural Health Monitoring in the oil&gas and petrochemical industries.

Advitam, Inc. (USA)
(15:22-15:27)

1. Scour Genius is a cluster box using a combination of sensors such as tiltmeters and accelerometers paired with proprietary software to characterize the response of the structure to scour events, rather than simply trying to quantify the amount of scour. 2. The EScan Void Detector uses the capacitance method to quickly and efficiently show in real time where air voids and white paste/soft grout are located; this is applicable to external Post tensioning ducts and is useful in determining areas of grout defects 3. The UScan Flaw Detector uses ultrasonic principles to measure wire defects (e.g. breaks) from the cable end and is applicable to post tensioning anchorage areas where the wire ends are accessible; the US pulse travels 1-2m up the wire before coming back, and depending on the reflection we can tell if the individual strand is broken.

Princeton University / IBM Research Division (USA)
(15:29-15:34)

Princeton University and IBM's Research Division have collaborated in creating a cloud based data management platform for large-scale SHM projects. The Streicker Bridge at Princeton University Campus has been equipped with 100+ fiber-optic long-gauge strain and temperature sensors. The bridge is used as a research and teaching tool and researchers from Princeton University created the algorithms for data processing and analysis. A real-time connection to the fiber optics sensor enables data transfer, storage, analysis and visualization of live and historic data in the cloud based on IBM's Measurement and Management Technology (MMT) platform. Demo presents the platform combining short film and / or live connection to the system.

Beijing Institute of Technology (China)

(15:36-15:41)

A twin-robot ultrasonic NDT system contains mechanical, electronic and software components. The basic mechanical parts of the system include the robot, base, work-piece-movement rail, water circulation system, and work-piece frame. The hardware part contains all the electronic hardware. The IPC, ultrasonic transducers, pulse transmitter/receiver card, high-speed data acquisition card. The software includes the parameters setup, scanned-image displays, signal processing, motion control, shape profile tracking, and system management. With fast detection speed, high precision, good flexibility, the system can be applied to composite structures with complex shapes and geometry.

Metis Design Corporation (USA)

(15:43-15:48)

The live demonstration will consist of a composite beam in a 4-point bend test fixture in stroke control. A single MD7 node will facilitate all testing. Guided wave methods will be used confirm no damage prior to testing and presence of damage after testing. Acoustic emission will be used to localize impact events. Real-time load, strain and temperature data will be streamed through the MD7 bus throughout the test in addition to state of heath via CNT network resistance. The system will be controlled, and data displayed, using a tablet.

BaySpec, Inc. (USA)

(15:50-15:55)

Live demo and overview of current applications will be presented covering recent applications used in aerospace, military/defense, nuclear, and other structural health monitoring systems.

Nanjing University of Aeronautics and Astronautics (China)

(15:57-16:02)

Video demonstration will be presented of a regional level aircraft structural SHM system including 4 subsystems and a regional manager. Subsystem 1 is an integrated multi-channel scanning system which is used to localize the structural damage and impact. Subsystem 2 is a miniaturized digital impact monitor which has very low weight and energy consumption. Subsystem 3 is a wireless strain monitoring system. This system is combined with Subsystem 4 which is a FBG based optic fiber monitoring system to form a strain distribution monitoring system to monitor the load distribution of the structure. The monitoring object is a carbon fiber wing structure in the demonstration.

Airbus (Germany)

(16:04-16:09)

The Online Maintenance Assistance System (OMA) was developed for Remote Support of Non Destructive Testing (NDT). It is Laptop/Tablet based and allows an encrypted two-channel Video/Screen conference over mobile networks with adaptation to NDT and SHM specific signals. OMA will be shown integrated into SHM Test Scenarios inside the SACL.

Acellent Technologies, Inc. (USA)

(16:11-16:16)

Acellent Technologies Inc. will showcase two of our latest technology developments for diverse market applications. Acellent light-weight, modular and scalable meter-long SMART Layer tape is designed to interface wirelessly with a remote controller for accurately monitoring of the integrity of rotating machinery in harsh environments encountered in the paper manufacturing industry. Using its latest ScanGenie series hardware and newly developed SmartPatch 3D software, Acellent SMART Layer sensor network will demonstrate the capability to detect changes in pressure and inception of cracks on a rotating shaft using its active sensing mode and display the results on a light-weight touchscreen remote controller.

The Hong Kong Polytechnic University (Hong Kong)

(16:18-16:23)

The "Mega-Structure Diagnostic and Prognostic System" for the Canton Tower of 600 m high is the first comprehensive long-term structural health monitoring (SHM) system implemented on skyscrapers. This system consists of over 700 sensors of 16 types and is composed of 5 modules: Module 1 - Sensory System, Module 2 -Data Acquisition and Transmission System, Module 3 - Data Processing and Control System, Module 4 - Data Management System, Module 5 - Structural Health Evaluation System, and Module 6 - Inspection and Maintenance System. This engineering paradigm realizes innovation in SHM in the following aspects: (i) modular system design for easy maintenance and upgrade, (ii) accomplishment of life-cycle SHM starting from 'birth' of the structure through integration of in-construction monitoring and in-service monitoring, (iii) imaginative practice of integrating on-line SHM with real-time feedback vibration control, (iv) hybrid tethered and wireless signal network primed for harsh operational conditions, (v) distributed sensing with over 200 FBG sensors and long-distance (500 to 1000 m) vision inspection, (vi) multi-level diagnosis and prognosis strategies, and (vii) all-round system protection customized for severe surrounding environment.

8tree, LLC (USA)

(16:25-16:30)

8tree will practically demonstrate the efficacy of its revolutionary approach to designing application-specific 3D optical scanners, in manufacturing and inspection environments. Furthermore, we will show that the integration of patent-pending augmented reality and gesture control techniques create an amazingly intuitive user-experience. This design makes the man-machine interface completely transparent thereby enhancing inspection efficiency by delivering actionable results in real-time.

VCE Innovation Services (Austria)

(16:32-16:37)

A real case performed recently in Europe will be presented. The integrity of a structure experiencing an impact from blasting had to be assessed within minutes. A video showing the impact, the related signals from monitoring as well as the answer of the decision support system will be presented.

4DSP, LLC (USA)

(16:39-16:44)

4DSP will be demonstrating the commercial use of a new fiber optic sensing platform which brings structural sensing and health monitoring into a new era. A collection of four short demonstrations will show the benefits of this FBG optical fiber based platform. A single, 12 inch fiber optic cable epoxied to the surface of a 6061 T6 aluminum beam provides a continuous mechanical and thermal strain profile. When bent beyond its yield strength and brought back to an unstressed state, the output profile allows engineers to qualify and quantify any induced damage. The second demo shows a possible installation to the skins of a commercial jetliner. When the wings are deflected to simulate lifting loads, the RTS150 displays a color-coded strain profile. The last two demos demonstrate the composite material embedment capabilities. Composites can become “smart materials” by simply laying fiber optics down during the layup process. This technology allows engineers to locate, quantify, and track various composite failure modes, each having their own unique strain profile.

Universite de Sherbrooke (Canada)

(16:46-16:51)

A correlation-based imaging technique called “Excitelet” is demonstrated to monitor crack growth on aluminum lap-joint, representative of an aircraft component. The principle is based on guided wave generation and sensing using a compact micro-machined piezoceramic array and measurement of reflections induced by potential damage. The method uses a propagation model to correlate measured signals with a bank of signals and imaging is performed using a round-robin procedure (Full-Matrix Capture). This method allows taking into account the transducer dynamics and finite dimensions, multi-modal and dispersive characteristics of the material and complex interaction between guided wave and damage.

Structures and Composites Laboratory, Stanford University (USA)

(16:53-16:58)

The Structures and Composites Laboratory (SACL) will demonstrate how a simple structure with a complex configuration can be transformed into an intelligent structure with self-state sensing capabilities by employing a stretchable network containing distributed temperature, strain, and piezoelectric sensors. An off-the-shelf programmable robotic arm, which is originally designed to perform a simple "pick and place" operation, will be outfitted with an e-skin with an embedded stretchable sensor network in order to be able to "sense" the change in the surrounding environment and react intelligently to accomplish its original targeted mission.

Tongji University (China)

(17:00-17:05)

The presented monitoring system is installed on the Shanghai Yangtze River Main Navagation Channel Bridge. The Shanghai Yangtze River Bridge, with a total length of approximately 8.5 km, is a part of the Chongming Cross River Passage Project connecting the Shanghai urban area and the Chongming Island. Its main navigation channel bridge is a double pylon double cable plane cable-stayed bridge with slotted box girder. According to the site and bridge mechanical characteristics, an operational monitoring system with 253 sensors, including environmental sensors, load sensors, and structural response sensors, is installed for continuous monitoring of bridge condition and performance. Since the formal opening to traffic, the bridge monitoring system has operated for almost four years.

Optilab (USA)

(17:07-17:12)

Optilab will demonstrate its 2nd Generation FBG Sensor Interrogator (FSI) with dynamic sensing gain control and >200 mW optical power. Optilab will also discuss the progress of a new compact interrogator with 1 KHz speed that consumes < 20 W, weighs <3 lbs, and is qualifiable for Aerospace applications.

High Performance Materials Institute, FSU (USA)

(17:14-17:19)

Research work at the High Performance Materials Institute (HPMI) of the Florida State University has led to the development of proprietary mechanoluminescent sensor technologies and a technology startup company (NPGroup, Inc.). Video demo will show real time damage monitoring in reinforced concrete members with the in-situ triboluminescent optical fiber (ITOF) sensor. The 3D tribo-photo voltaic sensor system for aerospace structures will also be highlighted.

Kinemetrics Open Systems & Services (USA)

(17:21-17:26)

As part of the Abu Dhabi Municipality's Seismic Hazard and Risk Assessment project, Kinemetrics Open Systems & Services was tasked to implement integrated, state-of-the-art SHM systems on several unique and prestigious structures in Abu Dhabi. Typical SHM systems are composed of up to 30 acceleration sensors within the building, a wind velocity/direction sensor at the roof, and a three-component downhole acceleration sensor near the building footprint. Data from these systems are all time-synchronized and recorded continuously at 200sps in real-time. A real-time data processing and analysis software package was developed to observe and display the dynamic characteristics (e.g., modal frequencies, damping ratios, and mode shapes) and responses (e.g., accelerations, velocities, displacements, and inter-story drifts) of the structures and their time variations. A demo will consist of a short presentation describing the system components and sensor location combined with a short recorded or live connection to the ADNEC Capital Gate "Leaning Tower" of Abu Dhabi SHM System.

Technical University of Madrid (Spain)

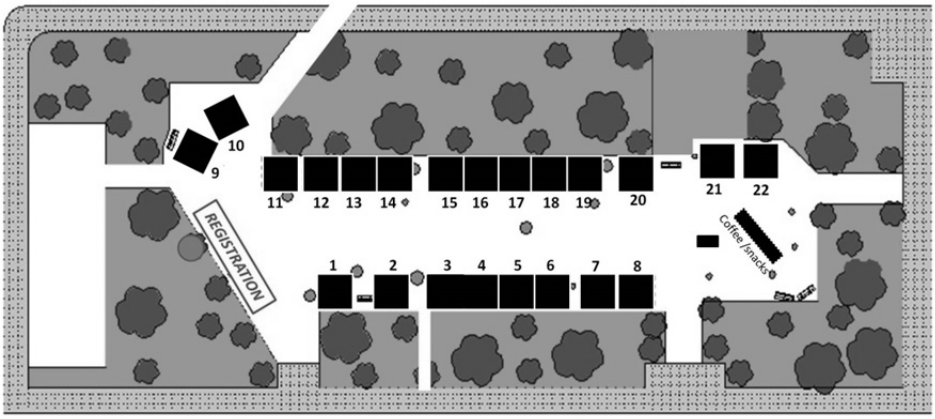
(17:28-17:33)

The performance of the last version of a single PAMELA SHM™ system will be presented. PAMELA SHM™ system consists of the embedded electronic "all in one" SHM miniaturized device, PAMELA III (Phased Array Monitoring for Enhanced Life Assessment, version III) installed directly on the integrated PhA transducer surface bonded onto an aluminum plate. The system is highly automated, easy to install and operate with capacity to perform quickly many different SHM tests in huge range of test configurations. The system can also be controlled wirelessly having only one cable for 12DC power supply. The system in its actual version is designed in order to have highly efficient, reliable and flexible development platform for SHM mapping algorithms and future high resolution SHM maps with easy interpretative information about any temporal or permanent changes of the host structure.

Company & Institution Exhibition

Dohrmann Grove (Tuesday – Thursday, September 10th – 12th (7:30 – 17:30))

The Company & Institution Exhibition highlights the state-of-the art Structural Health Monitoring technologies provided by leading companies and institutions working in the field



Exhibition Map – Dohrmann Grove, Stanford Universiy

4DSP, LLC (USA)
(Booth number 8)

BFG fiber optic strain, temperature and 3D sensing technology is a quantum leap forward in the aerospace, oil & gas, composites, and defense industries. We are changing the way companies examine and design materials. Our FPGA board level products and digitizers also stand out.

8tree, LLC (USA)
(Booth number 2)

8tree makes incredibly powerful, easy-to-use and affordable 3D scanners that solve chronic customer problems (e.g. surface deformation) across a variety of industries. These extremely fast and accurate systems integrate patent-pending augmented reality and gesture control to revolutionize the user experience and boost inspection efficiency by delivering actionable results in real-time.

Acellent Technologies, Inc. (USA)
(Booth number 3 & 4)

Acellent® Technologies Inc., provides state-of-the-art Structural Health Monitoring systems including SMART Layers®, diagnostic hardware, and software platforms. Acellent® systems can be used for active and/or passive monitoring of composite and metal structures. Our systems can either be on-board the structure or off-board. Acellent® products are currently used in several markets including aircraft, spacecraft, automobiles, and pipelines.

BaySpec, Inc. (USA)

(Booth number 11)

BaySpec's WaveCapture™ fiber bragg grating interrogation analyzers (FBGA) are revolutionizing the fiber sensing world offering, for the first time, excellent wavelength accuracy, ultra-low power consumption, small form factor, fast kHz response time, no moving parts, and lifetime calibration. Now offering multi-channel system level configurations.

Civionics, LLC (USA)

(Booth number 16)

Civionics was established in 2009 to provide customized wireless sensing and embedded control solutions to the structural health monitoring and cleantech communities. We strive to use our experience building intelligent wireless systems for civil, naval, aerospace, and wind energy applications to create a safer and more energy-efficient world.

XLab, Stanford University (USA)

(Booth number 10)

The EXtreme Environment Microsystems Laboratory (XLab) is a part of the Aero/Astro Department at Stanford University. We are focused on the development of micro- and nano-systems for operation within extreme harsh environments. Researchers in the XLab are investigating the synthesis of temperature tolerant, chemically resistant and radiation-hardened wide bandgap semiconductor thin films and nanostructures. These new material sets serve as a platform for the realization of sensor, actuator and electronic components that can operate and collect data under the most hostile conditions.

FiberSensing (Portugal)

(Booth number 1)

FiberSensing is a world leader in the development, production and installation of advanced monitoring systems based on optical fiber Bragg grating (FBG) sensor technology. The main markets are: Civil and Geotechnical Engineering; Power Generation and Distribution; Wind; Aerospace; Railway and Transportation.

High Performance Materials Institute, FSU (USA)

(Booth number 22)

Research work at the High Performance Materials Institute (HPMI) of the Florida State University has led to the development of proprietary mechanoluminescent sensor technologies and a technology startup company (NPGroup, Inc.). Video demo will show real time damage monitoring in reinforced concrete members with the in-situ mechanoluminescent optical fiber (ITOF) sensor. The 3D tribo-photo voltaic sensor system for aerospace structures will also be highlighted.

General Photonics Corporation (USA)

(Booth number 21)

General Photonics specializes in products for polarization control and measurement. We offer several technologies that can improve the performance of fiber sensors. Polarization scramblers and depolarizers minimize system polarization sensitivity by averaging over polarization states. Conversely, polarization stabilizers and switches can be used to optimize polarization states. A wavelength swept laser can be used for quick and accurate sensor interrogation. High-speed polarimeters enable monitoring of polarization variations in real time.

IFOS (USA)

(Booth number 5)

Intelligent Fiber Optic Systems Corporation (IFOS®) designs and manufactures innovative optical sensing systems, photonic modules, fiber optic sensors, and environment monitoring subsystems for aerospace and safety, energy and life science applications.

InPhenix Corporation (USA)

(Booth number 7)

InPhenix Corporation is a leading developer and manufacturer of Indium-Phosphide (InP) and Gallium Arsenide (GaAs) based active optoelectronic chips, devices and modules for the telecom, datacom, defense, biomedical and industrial markets. InPhenix's products include Semiconductor Optical Amplifiers (SOAs), Superluminescent Diodes (SLDs), Fabry-Perot Lasers and Swept Light Sources. InPhenix's world-class team of experts offer complete design and manufacturing capability as well as outstanding technical and product development support.

Kinemetrics Open Systems & Services (USA)

(Booth number 20)

Kinemetrics has been the world leader in the innovative design, quality manufacturing and timely supply of earthquake instruments for over 44 years. Kinemetrics provides seismologists and structural engineers with the highest-quality, most cost-effective seismic instruments on the market. Open Systems & Services (OSS) goes beyond instrumentation; we are a world-leading, multi-disciplinary team of geoscientists, earthquake engineers, and information technologists. We specialize in the design, integration and implementation of custom seismic and structural monitoring systems. Our complete array of comprehensive systems and services, including project consulting and documentation, are designed to protect human lives, capital assets, and critical infrastructure investments around the globe.

Metal Fatigue Solutions (USA)

(Booth number 12)

Metal Fatigue Solutions, Inc. offers crack inspection and monitoring technology that senses fatigue damage occurring cumulatively at microscopic levels in bridges. This helps owners make better bridge management decisions fixing only those areas that need to be fixed and then ensuring those repairs are indeed working before universal installation.

Metis Design Corporation (USA)

(Booth number 6)

Metis Design Corporation (MDC) has matured 2 unique SHM approaches. The MD7 system is a piezoelectric-based damage detection system capable of facilitating both guided wave interrogation and acoustic emission monitoring efficiently over large areas using a single digital bus. Similarly, MDC has demonstrated the use of conformably applied aligned carbon nanotube (CNT) layers to provide detailed mapping of strain and permanent damage.

Micron Optics (USA)

(Booth number 17)

The sm130 Optical Sensing Interrogator is a compact, field proven, industrial grade dynamic optical sensor interrogation module designed for reliable, long term field operation. The sm130 Optical Sensing Interrogator is built upon the x30 optical interrogator core, featuring a high power, high speed swept wavelength laser, realized with Micron Optics patented Fiber Fabry-Perot Tunable Filter technology.

Optilab (USA)

(Booth number 15)

Optilab provides a complete fiber sensing solution for SHM of Aerospace, Civil Structures, Oil, Electric, and Scientific Research. Optilab provides an FBG Sensor Interrogator (FSI) product for both high speed aerospace applications as well as a high channel solution for civil structures. In addition, Optilab has developed a very powerful software interface for the FSI; a LabView interface for R&D and OEM integration and C-based software for cloud computing. Furthermore, Optilab offers a full portfolio of customizable FBG sensors including temperature, strain, FBG chain, and more. Please visit optilab.com/fsi for more information.

Roctest, Inc. (USA)

(Booth number 19)

Sensors and Systems for Structural Health Monitoring for Civil and Geotechnical Engineering.

Structures and Composites Lab, Stanford University (USA)

(Booth number 9)

The Structures and Composites Laboratory at Stanford focuses on design and development of advanced structures with built-in intelligence to enhance performance, improve reliability, and reduce life-cycle cost for various structural applications including aerospace, automotive, civil infrastructures, and medical devices.

Technical University of Madrid (Spain)

(Booth number 13)

UPM will present the performance of the last version of PAMELA SHM™ system that consists of the electronic "all in one" SHM miniaturized device (PAMELA III) installed directly on the structure. The system is highly automated, easy to install and operate with capacity to perform quickly many different SHM tests in huge range of test configurations. The system can be controlled wirelessly having only one cable for 12DC power supply. The system has been designed in order to have highly efficient, reliable and flexible development platform for future SHM mapping algorithms and high resolution SHM maps with easy interpretative information about any temporal or permanent changes of the host structure.

University of South Carolina (USA)

(Booth number 18)

The McNAIR Center for Aerospace Innovation and Research at USC has been established to advance the economy of SC through research, education, outreach and economic development. The Laboratory for Active Materials and Smart Structures (LAMSS) is focused on Structural Health Monitoring, Adaptive Materials and Smart Structures, Aerospace Composites, and Mechatronics.

USCD / Los Alamos National Laboratory (USA)

(Booth number 14)

The Engineering Institute is a UC San Diego/Los Alamos National Laboratory research-driven, educational program performing fundamental and applied structural health monitoring and damage prognosis research through undergraduate and graduate training. We will display some recent innovations in laser-based ultrasonic scanning of complex composite structures for defect characterization/localization, a "glove" that realizes the haptic interface between human and machine for SHM pattern recognition, and various multi-use sensor nodes and platforms for which we have deployed SHM solutions.

Faculty/Student Panel

HC 200-002 (Thursday, September 12th (12:15 – 13:30))

Session Chair: C. Farrar (Los Alamos National Laboratory, USA)

The purpose of this session is to provide mentoring and guidance to students and early-career researchers and practitioners who are considering the further pursuit of a SHM-related career. The session is meant to be an open forum driven by the students and early-career participants' interests and concerns. A panel of senior researchers and practitioners will be present to provide their insight into questions raised by the participants. A moderator will attempt to promote wide participation while keeping the session focused on the students' and early-career participants' questions. Possible topics for discussion include: Emerging research topics in SHM, Starting a career in SHM, Entrepreneurial options for early career researchers, How do I find funding for SHM research? as well as any other topics of interest. In addition to providing mentoring and guidance, it is hoped that this session will promote more extensive technical exchanges and communication between workshop participants who are at different stages of their careers after the session has concluded.

*The panel is open for all participants of IWSHM 2013; students, early-career researchers and practitioners are particularly encouraged to attend and to actively discuss.

Lunch Box Mini Forum:

V&V/Standardization for Civil Infrastructure

Memorial Auditorium (Thursday, September 12th (12:15 – 13:30))

Session Chair: J. Lynch (University of Michigan, USA) & H. Wenzel (VCE, Austria)

The SHM community acknowledges the importance of codes and standards in accelerating the adoption of civil infrastructure SHM technologies. This Mini-Forum will focus on the review of existing standardization efforts and the discussion of current research trends towards SHM field deployment aiming to create a roadmap towards a globally harmonized approach to SHM code and standard development.

Panelists:

D. Powell	[NCSA]	Open Source Software for Asset and Maintenance Management
R. Veit-Egerer	[VCE]	Results of the CEN WS-63 on Aging of Structures
B. Frankenstein	[IZFP]	SHM Measurements at Hot Pipes in Thermal Power Plants
A. Krimotat	[SC Solutions]	Monitoring-based Performance Modeling of Long-Span Bridges
L. Mevel	[INRIA]	Current Practice in SHM in France
Y. Xia	[HK Polytechnic]	Experience of implementation of SHM in supertall buildings
J. Ou	[Dalian Inst. Of Tech]	Design Guideline of SHM for Bridges in China

Panel Discussion: SHM Roadmap

Memorial Auditorium (Thursday, September 12th (15:45 – 17:00))

Session Chair: C. Farrar (Los Alamos National Laboratory, USA)

SHM technology involves the use of sensor data to gain information on structural integrity for various applications. Maturing this technology for different market applications and filling in the gaps in the next few years remain issues to be addressed. What do we need to pursue as researchers, program managers, educators, and engineers to mature SHM?

A distinguished panel consisting of prominent researchers, educators, engineers, and program managers will share their views and exchange ideas with the audience in an effort to shape the roadmap of SHM for the next years. All workshop participants are welcome to attend the session.

Awards

SHM Lifetime Achievement Award

An individual in the SHM community who has championed SHM over their career by advancing the state-of-the-art through their meritorious accomplishments in research, applications, education or sponsorship of the discipline will be selected to receive the prestigious SHM Lifetime Achievement Award by a committee of researchers, educators and practicing scientists and engineers. **This award is sponsored by 'Boeing'.**

SHM Person of the Year Award

A structural health monitoring person of the year (SHM-POY) will be selected by the editors and associate editors of Structural Health Monitoring: An International Journal. The Person of the Year should have made an outstanding contribution to the field of SHM that will benefit society. This contribution can be in the form of theory, analysis, applications, education, or other ways that support the discipline of SHM and benefit society. The award is meant to recognize accomplishments within the past year or few years. **This award is sponsored by 'SAGE'.**

SHM Hans-Juergen-Schmidt Award

Individuals in the SHM community, recognized for their outstanding leadership in advancing technologies in industry and government, will be selected by an Award Committee representative of the world-wide SHM community to receive during every SHM workshop (International Workshop on Structural Health Monitoring [IWSHM], European Workshop on Structural Health Monitoring [EWSHM] and Asia-Pacific Workshop on Structural Health Monitoring [APWSHM]) the SHM Hans-Juergen Schmidt Award. **This award is sponsored by 'IWSHM'.**

The Achenbach Medal

The Achenbach Medal has been created to recognize an individual (within 10 years of PhD) who has made an outstanding contribution to the advancement of the field of Structural Health Monitoring. It is an international award and nominations from all over the world are encouraged. **This award is sponsored by 'Embraer'.**

Best Paper Award

The SHM Best Paper Award is presented to one or more individuals whose paper(s) are selected to have the highest quality and innovation from the Proceedings of the 2013 IWSHM. The Award Committee is formed by all the Session Chairmen for this Workshop. They may propose among the articles from the sessions of their specialty, one or two papers which may be candidates for the Award, justifying their proposal. **This award is sponsored by 'Boeing'.**

Student Best Paper Award

The IWSHM organizing committee is pleased to invite students to submit abstracts for the 2013 IWSHM Student Best Paper Award Competition. Papers will then be evaluated by a committee of experts from academia, industry, and the research community. **This award is sponsored by 'DEStech Publications'.**

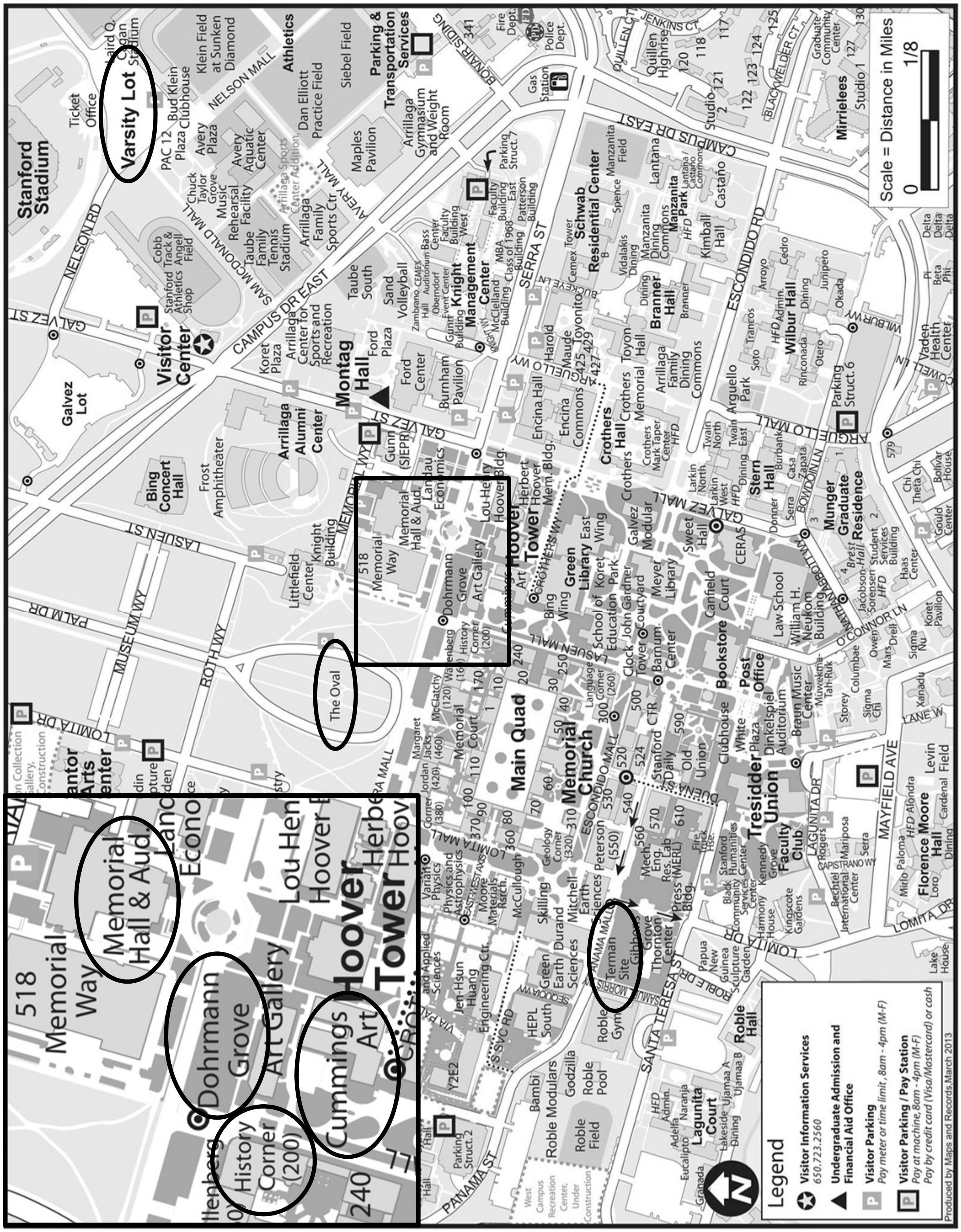
The Most Practical SHM Solutions for Aerospace Award

Airbus is proud to sponsor a prize for the "Most Practical SHM Solutions for Aerospace" to be demonstrated in SHM in Action. The session will be judged by a panel of representatives from industry and government. The prize will be awarded at the end of the session. **This award is sponsored by 'Airbus'.**

The Most Practical SHM Solutions for Civil/Mechanical Systems Award

Verizon will sponsor the Most Practical SHM Solution for Civil & Mechanical Systems to be demonstrated in the SHM in Action. The session will be judged by a panel of representatives from industry and government. The prize will be awarded at the end of the session. **This award is sponsored by 'Verizon'.**

Stanford Campus Map



Workshop Locations

Stanford University Campus

450 Serra Mall, Stanford, CA

Memorial Auditorium
History Corner (200)

Basement: HC 200-002, HC 200-030, HC 200-034
1st Floor: HC 200-107
2nd Floor: HC 200-203, HC 200-205
3rd Floor: HC 200-303, HC 200-305

Cummings (Nathan) Art Building

Basement: Annenberg Auditorium (ART 1), ART 2, ART 4

Dohrman Grove
Terman Park

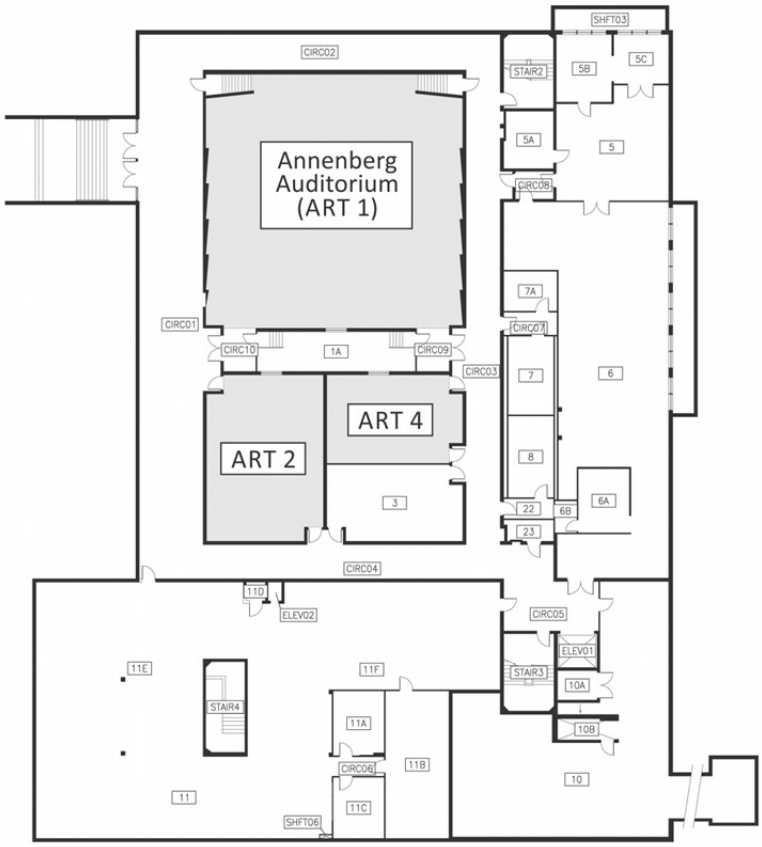
Crowne Plaza Hotel Cabana 4290 (Early Registration)

4290 El Camino Real, Palo Alto, CA

San Francisco Pier 3 (Banquet/Welcome Night)

Pier 3 on The Embarcadero, San Francisco, CA

Cummings (Nathan) Art Building: Basement



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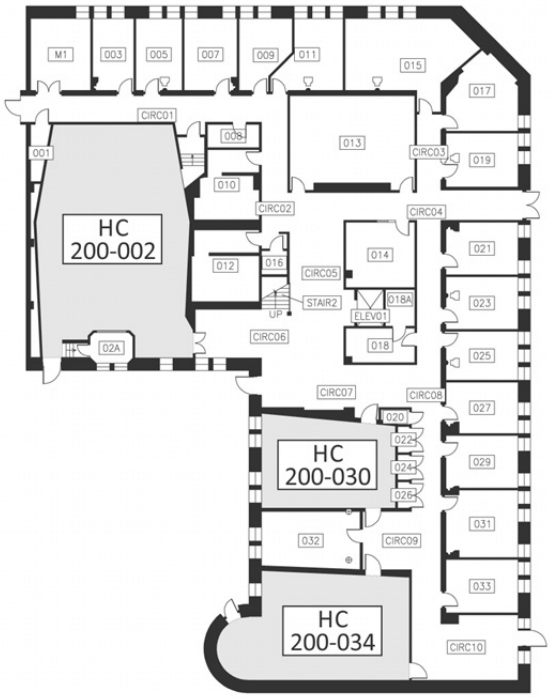
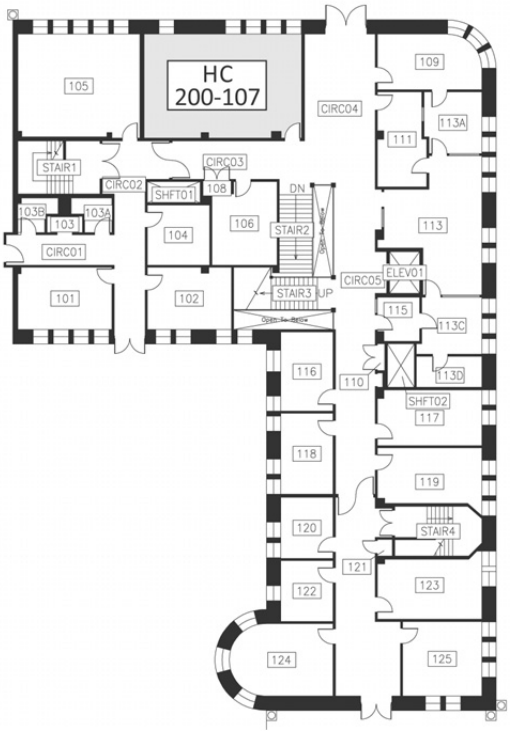


HISTORY CONER (200): 1st Floor



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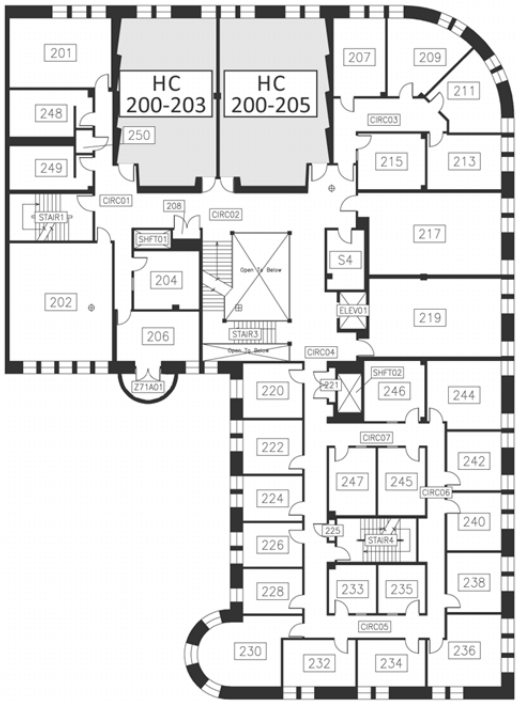
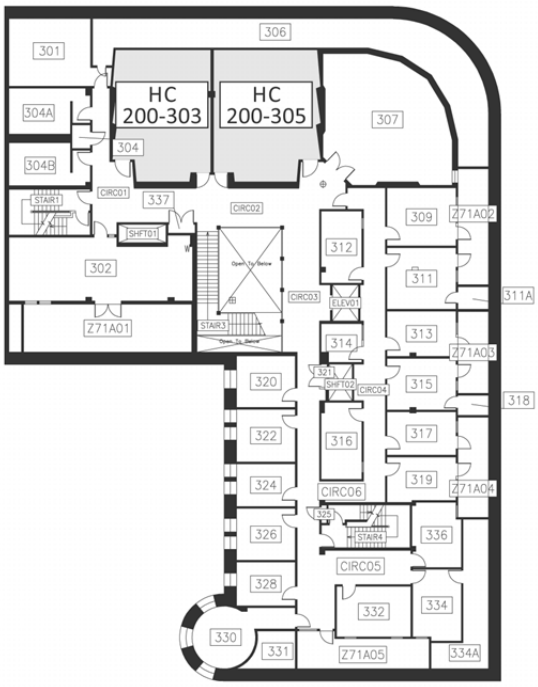


HISTORY CONER (200): 3rd Floor



Transportation

Driving Directions

From Highway 101 North & South

Exit onto Embarcadero Road and travel west, following the signs directing you to Stanford University. About three miles after you exit the freeway, Embarcadero Road becomes Galvez Street as you cross El Camino Real. Stay in the left lane and turn left onto Nelson Road (just past the stadium). Park at the Varsity Lot at the end of Nelson Road.

From Highway 280 North & South

Exit onto Sand Hill Road and follow the signs for Stanford University. Heading east, drive approximately 3 miles to the Stanford Shopping Center. Turn right onto Arboretum Road (Nordstrom is on your right). Stay on Arboretum until it ends, then turn right onto Galvez Street. Move to the left lane and turn left onto Nelson Road (just past the stadium). Park at the Varsity Lot at the end of Nelson Road.

From Crowne Plaza Cabana, Creekside Inn, Marriott Residence Inn

Take El Camino Real northeast and turn left at University Avenue. University Avenue enters Stanford Campus and becomes Palm Drive. Stay in the left lane and turn left to Arboretum Road. Make a right turn onto Galvez Street at the end of Arboretum Road. Move to the left lane and turn left onto Nelson Road (just past the stadium). Park at the Varsity Lot at the end of Nelson Road.

Parking Information

If you choose to drive to Stanford University campus, parking permits are available from the workshop registration table. As it is typical for a college campus, parking is limited and you are highly encouraged to take the workshop shuttle (see the following page).

For Sept. 10-12, parking will be available at the **VARSITY LOT**. An IWSHM window sticker is required to park there. It covers all days and can be purchased for $15 at the registration desk or directly at the parking lot (Tuesday only). Please note that only cash or checks can be accepted.

"A" permits will also be available for purchase for $15 per day. "A" parking spots are located all around campus and especially by the Oval (very close to Workshop's area). Parking permits will also be available at the Early Registration on Mon, Sept. 9 at the Crowne Plaza Hotel. Purchasing parking permits there is encouraged. Please note that only cash or checks are accepted. In addition to the conference registration table, parking permits can be purchased at the Parking & Transportation Services office at 340 Bonair Siding (open 7:30am-5:00pm). Moreover, there are parking permit machines in the Tresidder lot, in front of the Cantor Art Center, at 401 Quarry Road - Psychiatry, behind Memorial Auditorium, and at the Track House.

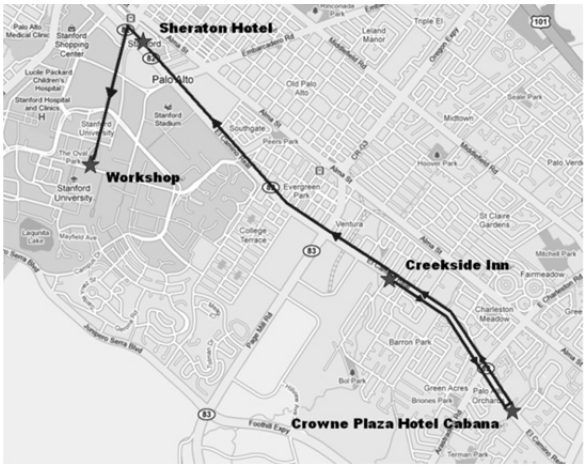
**More information about parking on Stanford University campus, including maps, is located on the Parking & Transportation website (http://transportation.stanford.edu/).

Shuttle Information

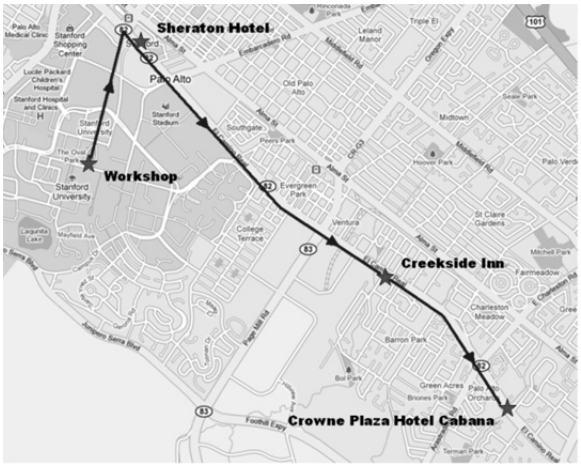
A complimentary shuttle service that connects all workshop locations is provided for all participants from Tuesday, September 10th to Thursday, September 12th. Please refer to the full shuttle schedule on the next page. The stops are as following:

- **Stanford University Campus (The Oval)**
- **The Westin (Please use the stop in front of Sheraton Hotel)**
- **Creekside Inn**
- **Crowne Plaza Hotel Cabana**

Shuttle Map (To Stanford University)



Shuttle Map (From Stanford University)



Charter Service the Dinner Cruise

Charters to San Francisco Pier 3 and back to the hotels for the dinner cruise on September 10th will be provided. Below is the charter schedule to the dinner cruise. The return charters from the cruise will arrive at the hotels around 10:30PM.

BUS	*STANFORD*	*CREEKSIDE*	*CROWNE*	*SHERATON*	*SF PIER 3*
Bus 1	4:30 PM	----------	4:50 PM	5:00 PM	5:45 PM
Bus 2	----------		5:00 PM	5:10 PM	5:55 PM
Bus 3	----------	4:45 PM	5:05 PM	5:15 PM	6:00 PM
Bus 4	----------	----------	5:10 PM	5:20 PM	6:05 PM
Bus 5	----------	----------	5:15 PM	5:25 PM	6:10 PM
Bus 6	5:00 PM	----------	5:20 PM	5:30 PM	6:15 PM
Bus 7	----------	----------	5:20 PM	5:30 PM	6:15 PM

*Note: The schedule is subject to change. Please refer to the latest schedule available at the registration.

Shuttle Schedule

Tuesday, September 10th

ROUTE	BUS	CREEKSIDE	CROWNE	SHERATON	WORKSHOP
Morning	IWSHM 1	6:25 AM	6:30 AM	6:40 AM	6:45 AM
	IWSHM 2	6:30 AM	6:35 AM	6:45 AM	6:50 AM
	IWSHM 3	6:40 AM	6:45 AM	6:55 AM	7:00 AM
	IWSHM 4	6:55 AM	7:00 AM	7:10 AM	7:15 AM
	IWSHM 1	7:00 AM	7:05 AM	7:15 AM	7:20 AM
	IWSHM 2	7:10 AM	7:15 AM	7:25 AM	7:30 AM
	IWSHM 3	7:15 AM	7:20 AM	7:30 AM	7:35 AM
	IWSHM 4	7:25 AM	7:30 AM	7:40 AM	7:45 AM
	IWSHM 1	7:30 AM	7:35 AM	7:45 AM	7:50 AM
	IWSHM 2	7:40 AM	7:45 AM	7:55 AM	8:00 AM
	IWSHM 3	7:45 AM	7:50 AM	8:00 AM	8:05 AM
	IWSHM 4	7:55 AM	8:00 AM	8:10 AM	8:15 AM
	IWSHM 1	8:00 AM	8:05 AM	8:15 AM	8:20 AM
	IWSHM 2	8:10 AM	8:15 AM	8:25 AM	8:30 AM
	IWSHM 3	8:15 AM	8:20 AM	8:30 AM	8:35 AM
	IWSHM 4	8:25 AM	8:30 AM	8:40 AM	8:45 AM
	IWSHM 1	8:45 AM	8:50 AM	9:00 AM	9:05 AM

ROUTE	BUS	WORKSHOP	CREEKSIDE	CROWNE	SHERATON
Afternoon	IWSHM 1	3:30 PM	3:40 PM	3:45 PM	3:55 PM
	IWSHM 2	3:45 PM	3:55 PM	4:00 PM	4:10 PM
	IWSHM 3	4:00 PM	4:10 PM	4:15 PM	4:25 PM
	IWSHM 1	4:05 PM	4:15 PM	4:20 PM	4:30 PM
	IWSHM 2	4:15 PM	4:25 PM	4:30 PM	4:40 PM
	IWSHM 3	4:30 PM	4:40 PM	4:45 PM	4:55 PM
	IWSHM 1	4:40 PM	4:50 PM	4:55 PM	5:05 PM
	IWSHM 2	4:50 PM	5:00 PM	5:05 PM	5:15 PM
	IWSHM 3	5:00 PM	5:10 PM	5:15 PM	5:25 PM
	IWSHM 1	5:10 PM	5:20 PM	5:25 PM	5:35 PM
	IWSHM 2	5:20 PM	5:30 PM	5:35 PM	
	IWSHM 1	5:50 PM	6:00 PM	6:05 PM	6:15 PM
	IWSHM 1	6:30 PM	6:40 PM	6:45 PM	6:55 PM

Wednesday, September 11th

ROUTE	BUS	CREEKSIDE INN	CROWNE PLAZA	SHERATON	WORKSHOP
Morning	IWSHM 1	6:25 AM	6:30 AM	6:40 AM	6:45 AM
	IWSHM 2	6:30 AM	6:35 AM	6:45 AM	6:50 AM
	IWSHM 3	6:40 AM	6:45 AM	6:55 AM	7:00 AM
	IWSHM 4	6:55 AM	7:00 AM	7:10 AM	7:15 AM
	IWSHM 1	7:00 AM	7:05 AM	7:15 AM	7:20 AM
	IWSHM 2	7:10 AM	7:15 AM	7:25 AM	7:30 AM
	IWSHM 3	7:15 AM	7:20 AM	7:30 AM	7:35 AM
	IWSHM 4	7:25 AM	7:30 AM	7:40 AM	7:45 AM
	IWSHM 1	7:30 AM	7:35 AM	7:45 AM	7:50 AM
	IWSHM 2	7:40 AM	7:45 AM	7:55 AM	8:00 AM
	IWSHM 3	7:45 AM	7:50 AM	8:00 AM	8:05 AM
	IWSHM 4	7:55 AM	8:00 AM	8:10 AM	8:15 AM
	IWSHM 1	8:00 AM	8:05 AM	8:15 AM	8:20 AM
	IWSHM 2	8:10 AM	8:15 AM		8:25 AM

ROUTE	BUS	WORKSHOP	CREEKSIDE INN	CROWNE PLAZA	SHERATON
Evening (Workshop)	IWSHM 1	5:00 PM	5:10 PM	5:15 PM	5:25 PM
	IWSHM 2	5:15 PM	5:25 PM	5:30 PM	5:40 PM
	IWSHM 3	5:35 PM	5:45 PM	5:50 PM	6:00 PM
	IWSHM 1	5:40 PM	5:50 PM	5:55 PM	6:05 PM
	IWSHM 2	5:45 PM	5:55 PM	6:00 PM	6:10 PM

ROUTE	BUS	CREEKSIDE INN	CROWNE PLAZA	SHERATON	AWARD NIGHT
Evening (Award Night)	IWSHM 3	6:10 PM	6:15 PM	6:25 PM	6:40 PM
	IWSHM 1	6:15 PM	6:20 PM	6:30 PM	6:45 PM
	IWSHM 2	6:20 PM	6:25 PM	6:35 PM	6:50 PM
	IWSHM 3	6:55 PM	7:00 PM		7:15 PM
	IWSHM 1	7:00 PM	7:05 PM	7:15 PM	7:30 PM

ROUTE	BUS	AWARD NIGHT	CREEKSIDE INN	CROWNE PLAZA	SHERATON
Night	IWSHM 4	9:30 PM	9:45 PM	9:50 PM	10:00 PM
	IWSHM 1	9:45 PM	10:00 PM	10:05 PM	
	IWSHM 2	10:05 PM	10:20 PM	10:25 PM	10:35 PM
	IWSHM 3	10:10 PM	10:25 PM	10:30 PM	
	IWSHM 4	10:15 PM	10:30 PM	10:35 PM	10:45 PM
	IWSHM 1	10:25 AM	10:40 PM	10:45 PM	
	IWSHM 2	10:45 PM	11:00 PM	11:05 PM	11:15 PM
	IWSHM 3	10:50 PM	11:05 PM	11:10 PM	

Thursday, September 12th

ROUTE	BUS	CREEKSIDE	CROWNE	SHERATON	WORKSHOP
Morning	IWSHM 1	6:30 AM	6:35 AM	6:45 AM	6:50 AM
	IWSHM 2	6:40 AM	6:45 AM	6:55 AM	7:00 AM
	IWSHM 3	6:55 AM	7:00 AM	7:10 AM	7:15 AM
	IWSHM 1	7:10 AM	7:15 AM	7:25 AM	7:30 AM
	IWSHM 2	7:15 AM	7:20 AM	7:30 AM	7:35 AM
	IWSHM 3	7:25 AM	7:30 AM	7:40 AM	7:45 AM
	IWSHM 1	7:40 AM	7:45 AM	7:55 AM	8:00 AM
	IWSHM 2	7:45 AM	7:50 AM	8:00 AM	8:05 AM
	IWSHM 3	7:55 AM	8:00 AM	8:10 AM	8:15 AM
	IWSHM 1	8:10 AM	8:15 AM		8:25 AM

ROUTE	BUS	WORKSHOP	CREEKSIDE	CROWNE	SHERATON
Evening	IWSHM 1	4:40 PM	4:50 PM	4:55 PM	5:05 PM
	IWSHM 2	4:55 PM	5:05 PM	5:10 PM	5:20 PM
	IWSHM 1	5:15 PM	5:25 PM	5:30 PM	5:40 PM
	IWSHM 2	5:30 PM	5:40 PM	5:45 PM	5:55 PM

Wireless Internet Access

Guest wireless access to the internet is available on Stanford Campus for IWSHM attendees. To access guest wireless service (SSID: Stanford)

1) Open your web browser and load any URL; a Stanford web login page will display
2) Click on “Register for Network Access” and select “Wireless Guest”
3) Click on “Stanford Guest Network Access” and log in with the following username and password:

Username: IWSHM2013
Password: welcome2013

Additional instructions for using wireless network on campus:

1. While using the guest network, you will be asked to authenticate every 4 hours. Just follow the login instructions above. You can log in the guest wireless network again.

2. In Dorhmann Grove, the nearest access points are located in the Art Gallery. If you have difficulty connecting to the network, staying closer to the building could help. Wireless access indoors, for example, in the History Corner, will have better reception.

3. Similar to Starbucks or McDonald's, guests don't have an SMTP server available to send email. Example: If your email client normally connects via Earthlink, your SMTP settings will tell the wireless network to use Earthlink to send mail. The Earthlink servers do not expect to see someone from a remote wireless system using their servers to send mail and will refuse the connection. The easiest way around this issue is to use Webmail services from your home ISP, if available.

**More information about Stanford wireless network:
https://itservices.stanford.edu/service/wirelessnet/access

Sponsors

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Notes

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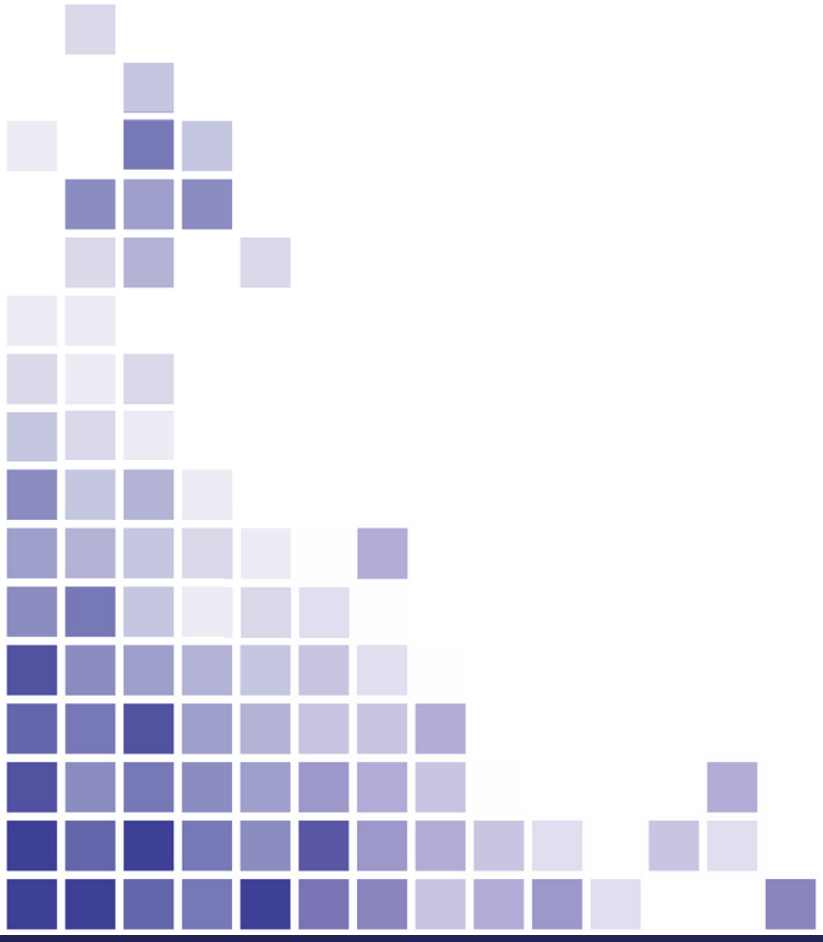
“A Roadmap to Intelligent Structures”



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