

**REVIEW OF PROGRESS IN QUANTITATIVE NDE**  
Colorado School of Mines  
Golden, Colorado

July 25-30, 2004

**PRELIMINARY PROGRAM**

Monday, July 26, 2004

**PLENARY SESSION 1**  
**OVERVIEW OF ARRAY TECHNOLOGY**

**9:00 AM**      ***Opening Remarks***

**9:15 AM**      **Sonar Arrays and Array Processing**

---**A. B. Baggeroer**, Massachusetts Institute of Technology, Ford Professor of Engineering, Secretary of the Navy/Chief of Naval Operations, Chair for Ocean Science, Departments of Ocean and Electrical Engineering, Room 5-204, Cambridge, MA 02139

**10:10 AM**      ***Coffee Break***

**PLENARY SESSION 2**  
**NEW NDE TECHNOLOGIES**

**10:30 AM**      **Wireless Nano- and Micro-Sensors, MEMS for Health Monitoring of Engineering Structures and Neurological Disorders in Humans: Can We Get Smarter?**

---**V. K. Varadan**, University Distinguished Professor of Engineering Science, Electrical Engineering and Neurosurgery, Penn State College of Engineering and Medicine, Director, Center for Engineering of Electronic and Acoustic Materials and Devices, Pennsylvania State University, University Park, PA 16802

**11:20 AM**      **Imaging with Terahertz Waves**

---**D. Mittleman**, Rice University, ECE Department, MS-366, 6100 Main Street, Houston, TX 77005

**12:10 PM**      ***Lunch***

**Please Note: The bolded authors throughout this program indicate the presenting author.**

### SESSION 3

#### ELASTIC AND THERMOELASTIC WAVES – PROPAGATION AND SCATTERING

- 1:30 PM**      **Application of a Modular Multi-Gaussian Beam Model to Some NDE Problems**  
---**H. Jeong** and M.-C. Park, Wonkwang University, Division of Mechanical and Automobile Engineering, 344-2 Sinyong-dong, Iksan, Jeonbuk 570-749, South Korea; L. W. Schmerr, Jr., Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 1:50 PM**      **Semi-Analytical Analysis of the High Frequency Near-Field Radiating by an Angle Beam Rectangular Ultrasonic Transducer into Elastic Half-Space**  
---**D. D. Zakharov** and L. J. Fradkin, FESBE, London South Bank University, London, United Kingdom
- 2:10 PM**      **Ultrasonic Modeling in the Near Field**  
---**L. Fradkin**, Faculty of Engineering, Science and Technology, London South Bank University, London, United Kingdom
- 2:30 PM**      **Simultaneous Calculation of Bulk and Surface Transient Waves Radiated by Water-Coupled Ultrasonic Transducers**  
---N. Leymarie, **A. Lhémy**, and P. Calmon, Commissariat a l'Energie Atomique, LIST, Gif-sur-Yvette, France; R. Coulette, SNECMA Moteurs, Evry, France
- 2:50 PM**      **Ultrasound Focusing by a Single Planar Fracture**  
---L. J. Pyrak-Nolte and **D. D. Nolte**, Physics Department, Purdue University, West Lafayette, IN 47907-2036
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Looking for Multiple Scattering Effects in Backscattered Ultrasonic Grain Noise from Jet-Engine Nickel Alloys**  
---**P. Haldipur**, F. J. Margetan, and R. B. Thompson, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 3:50 PM**      **Modelling Scatter from 2D Interfacial Cracks**  
---A. Gautesen, Department of Mathematics and Ames Laboratory, Iowa State University, Ames, IA 50011; **V. Kubzin** and L. Fradkin, Faculty of Engineering, Science, and Technology, London South Bank University, London, United Kingdom
- 4:10 PM**      **Nonlinear Scattering by a Partially Closed Surface-Breaking Crack**  
---**M. Poznic** and C. Pecorari, Marcus Wallenberg Laboratory, Royal Institute of Technology, Stockholm, Sweden
- 4:30 PM**      **Numerical Models of Ultrasonic Backscatter Response in Polycrystals**  
---**G. Ghoshal** and J. A. Turner, Department of Engineering Mechanics, University of Nebraska-Lincoln, Lincoln, NE 68588-0526
- 4:50 PM**      **Thermoelastic Waves in an Anisotropic Infinite Plate**  
---**H. M. Al-Qahtani** and S. K. Datta, Department of Mechanical Engineering, 427 UCB, University of Colorado, Boulder, CO 80309-0427

**SESSION 4**  
**COMPOSITES AND FABRICATED MATERIALS**

- 1:30 PM**      **Ultrasonic Field Computation into Multilayered Composite Materials Using a Homogenization Method Based on Ray Theory**  
---**S. Deydier**, N. Gengembre, and P. Calmon, CEA/LIST, CEA-Saclay, Bat. 611, 91191 Gif-sur-Yvette, France; V. Mengeling and O. Petillon, EADS/CCR, BP 76, 12 Rue Pasteur, 92152 Suresnes, Cedex, France
- 1:50 PM**      **Ultrasonic Ply-by-Ply Detection of Matrix Cracks in Composite Laminates**  
---**V. K. Kinra** and A. S. Ganpatye, Department of Aerospace Engineering, Texas A&M University, MS-3141, College Station, TX 77843-3141
- 2:10 PM**      **Experimental Assessment of Induced Damage for a Graphite-Epoxy Composite Using Ultrasonic Techniques**  
---**B. R. Nadler**, J. R. Wait, and C. R. Farrar, Weapon Response Group, Engineering Sciences and Applications, Los Alamos National Laboratory, MS T006, Los Alamos, NM 87545; T. N. Claytor, Applied Engineering Technologies Group, Los Alamos National Laboratory, Los Alamos, NM 87545
- 2:30 PM**      **Measurement of Angle-Dependent Ultrasonic Backscatter from Textile Composites**  
---**P. H. Johnston**, NASA Langley Research Center, 3 East Taylor Street, MS 231, Hampton, VA 23681
- 2:50 PM**      **Nondestructive Evaluation of Composites Using Micro-Focused X-Ray CT Scanner**  
---**S. Sugimoto**, T. Aoki, Y. Iwahori, and T. Ishikawa, Advanced Composite Evaluation Technology Center, Institute of Space Technology and Aeronautics, Japan Aerospace Exploration Agency, Mitaka, Tokyo, Japan
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Experimental Approach on the Behavior of Composite Laminated Shell Under Transverse Impact Loading**  
---**Y. N. Kim**<sup>1</sup>, **K. H. Im**<sup>2</sup>, **K. S. Lee**<sup>3</sup>, **Y. J. Cho**<sup>3</sup>, **S. H. Kim**<sup>3</sup>, and **I. Y. Yang**<sup>4</sup>, <sup>1</sup>Chosun University, Department of Mechanical Design Engineering, 375 Seosuk-dong, Dong-gu, Kwangju, 501-759, Korea; <sup>2</sup>Woosuk University, Department of Automotive Engineering, Wanju-gun, Chonbuk, 565-701, Korea; <sup>3</sup>Chosun University, Department of Mechanical Design Engineering, Graduate School, 375 Seosuk-dong, Dong-gu, Kwangju, 501-759, Korea; <sup>4</sup>Chosun University, Department of Mechanical Design Engineering, 375 Seosuk-dong, Dong-gu, Kwangju, 501-759, Korea
- 3:50 PM**      **Detection of Impact Damage on Space Shuttle Structures Using Acoustic Emission**  
---**E. I. Madaras** and W. H. Prosser, Nondestructive Evaluation Sciences Branch, NASA Langley Research Center, Hampton, VA 23681; M. R. Gorman, Digital Wave Corporation, 11234A Caley Avenue, Englewood, CA 80111
- 4:10 PM**      **Evaluation of Degradation of Ceramic Fiber Mat by Acoustic Emission**  
---**K. Ito** and M. Enoki, Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan; H. Takahashi, Ividen Co., Ltd., Ogaki, Gifu, Japan
- 4:30 PM**      **Iterative Simulation of Elastic Wave Scattering in Particle-Filled Materials**  
---**T. E. Doyle**, Department of Physics, Utah State University, SER Building 250, 4415 Old Main Hill, Logan, UT 84322-4415
- 4:50 PM**      **An Experimental Study of Lamb and Horizontal Shear Mode Sensitivity to Flaws in Multilayered Structures**  
---**M. J. Quarry**, Manufacturing and Materials Department, Lawrence Livermore National Laboratory, Livermore, CA 94550

**SESSION 5**  
**NDE FOR INFRASTRUCTURE AND ENVIRONMENT**

- 1:30 PM**      **Experimental Study of Elastic Waves in Concrete for NDE in Civil Engineering**  
---**B. Koehler** and F. Schubert, Branch Lab Dresden, Fraunhofer IZFP, Dresden, Germany; D. Algernon, A. Gardai, F. Milenz and M. Krause, Federal Institute for Materials Research and Testing, Berlin, Germany
- 1:50 PM**      **Towards Large-Scale, Nondestructive Inspection of Concrete Bridges**  
---A.-R. Mahmoud, A. H. Shah, and **N. Popplewell**, University of Manitoba, Mechanical and Industrial Engineering Department, Winnipeg, R3T 5V6, Canada
- 2:10 PM**      **The Use of Magnetoresistors for Imaging Steel Bars in Concrete**  
---**V. Torres**, P. Gaydecki, G. Miller, B. Fernandes, and M. Zaid, Department of Instrumentation and Analytical Science, UMIST, P. O. Box 88, Manchester M60 1QD, United Kingdom
- 2:30 PM**      **Elastic Wave Propagation in Concrete and Continuous Wavelet Transform**  
---**C.-H. Chiang**, Chaoyang University of Technology, Department of Construction Engineering, Gifeng E. Road, No. 168, Wufeng, Taichung 413, Taiwan, China
- 2:50 PM**      **Automatic Detection of Subsurface Defects in FRP Bridge Decks Using Infrared Thermography**  
---**G. M. Lonkar** and P. Klinkhachorn, Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26506-6103; U. B. Halabe and H. V. GangaRao, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506-6103
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Detecting Juvenile Wood in Southern Pine Lumber by Measuring Phase Shift**  
---**P. Steele**, J. Cooper, and B. Mitchell, Department of Forest Products, Forest and Wildlife Research Center, Mississippi State University, Box 9820, Mississippi State, MS 39762
- 3:50 PM**      **Detection of Wetwood in Lumber by Ultrasonic Measurement**  
---**M. F. Kabir**, Virginia Tech, Department of Wood Science and Forest Products, Blacksburg, VA 24060; T. D. Leininger, USDA Forest Service, Southern Research Station, Stonville, MS 38776; P. A. Araman, USDA Forest Service, Southern Research Station, Brooks Forest Products Center, 1650 Ramble Road, Blacksburg, VA 24061
- 4:10 PM**      **A Study on Ultrasonic Evaluation of Material Homogeneity in Wood**  
---**K.-H. Im**<sup>1</sup>, D. K. Hsu<sup>2</sup>, S.-K. Kim<sup>3</sup>, S.-J. Song<sup>4</sup>, H. Cho<sup>4</sup>, J.-W. Park<sup>5</sup>, J.-K. Sim<sup>5</sup>, and I.-Y. Yang<sup>5</sup>,  
<sup>1</sup>Woosuk University, Department of Automotive Engineering, Wanju-kun, Chonbuk, 565-701, Korea;  
<sup>2</sup>Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011; <sup>3</sup>Iksan National College, Department of Automobile Engineering, 194-5 Ma-dong, Iksan, Chonbuk, 570-752, Korea;  
<sup>4</sup>Sungkyunkwan University, School of Mechanical Engineering, Kyonggi-do, 440-746, Korea;  
<sup>5</sup>Chosun University, College of Engineering, 375 Seosuk-dong, Dong-gu, Kwangju 501-759, Korea
- 4:30 PM**      **Characterization of Unburned Carbon Content in Coal Fly Ash with Dielectric Constant Measurement**  
---**K. Chan**<sup>1</sup>, R. J. Weber<sup>1</sup>, and R. C. Brown<sup>2</sup>, <sup>1</sup>Department of Electrical and Computer Engineering, <sup>2</sup>Center for Sustainable Environmental Technologies, Iowa State University, Ames, IA 50011
- 4:50 PM**      **Acoustic Emission for Diagnosing the Incipient Generation of Flaws Within Solid Materials, The Natural Environment, and Manmade Structures**  
---S. Guarniere, A. Bottari, A. Marino, and A. Teramo, Osservatorio Sismologico, Di.C.T.A. Universita di Messina, via Osservatorio 4, 98121 Messina, Italy; G. P. Gregori and **G. Paparo**, Istituto di Acustica O. M. Corbino (CNR), via Fosso del Cavaliere 100, 00133, Roma, Italy

Monday, July 26, 2004

**SESSION 6**  
**SIGNAL PROCESSING**

- 1:30 PM**      **A Wavelet Characterization of Levy Noise for NDE**  
---**A. Flenner** and B. DeFacio, Physics and Astronomy, University of Missouri, Columbia, MO 65211
- 1:50 PM**      **Detection of Multiple Damages in Free-Free Beams Using Genetic Algorithms**  
---**S. Huo**<sup>1</sup> and X. Xue<sup>2</sup>, <sup>1</sup>Department of General Engineering, <sup>2</sup>Department of Mechanical & Industrial Engineering, University of Illinois at Urbana-Champaign, Urbana, IL 61801
- 2:10 PM**      **Maximum A Posteriori Defect Estimation and Detection Using Hidden Markov Models**  
---**A. Dogandzic** and N. Eua-anant, Iowa State University, Center for NDE, Ames, IA 50011
- 2:30 PM**      **A Data Fusion Approach to Blind Deconvolution of Multi-Frequency Eddy Current Data**  
---M. Kumar and **P. Ramuhalli**, Michigan State University, Nondestructive Evaluation Laboratory, Department of Electrical and Computer Engineering, 2120 Engineering Building, East Lansing, MI 48824
- 2:50 PM**      **Multiresolution Data Fusion Algorithms for Aerospace Applications**  
---M. Kumar and **P. Ramuhalli**, Michigan State University, Department of Electrical and Computer Engineering, 2120 Engineering Building, East Lansing, MI 48824
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Automated Algorithms for Eddy Current Array Probes for Steam Generator Inspection**  
---N. Zavaljevski, **S. Bakhtiari**, A. Miron, D. S. Kupperman, T. Y. Wei, and P. V. Marchertas, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439
- 3:50 PM**      **Automatic Guided Waveform Multi-Mode Sorting**  
---**M. K. Hinders**, J. Hou, and K. R. Leonard, Department of Applied Science, College of William & Mary, Williamsburg, VA 23187-8795
- 4:10 PM**      **Directional Filter Bank Technique for NDE Image Segmentation**  
---G. Swamy, **K. Balasubramaniam**, and C. V. Krishnamurthy, Centre for Nondestructive Evaluation and Department of Mechanical Engineering, Indian Institute of Technology Madras, Chennai 600 036, India
- 4:30 PM**      **Air-Coupled Ultrasound Scanning Sensors for Mobile Robots**  
---**M. K. Hinders** and W. Gao, College of William & Mary, Department of Applied Science, Williamsburg, VA 23187-8795
- 4:50 PM**      **Geometrical Recoveries and Positionings for Flaws of Infrastructures Using Electrical Potential Method**  
---F. Kojima and **Y. Hirabayashi**, Graduate School of Technology, Kobe University, Kobe, Hyogo, Japan; H. Fujiwara, Sumitomo Metal Industries, Ltd., Amagasaki, Hyogo, Japan; T. Kitamura, Sumitomo Metal Industries, Ltd., Sakai, Osaka, Japan

**SESSION 7**  
**NONLINEAR ACOUSTICS**  
J. H. Cantrell and W. T. Yost, Co-Chairpersons

- 8:30 AM**      **Substructural Organization and Acoustic Harmonic Generation in Fatigued Wavy Slip Metals**  
---J. H. Cantrell, 245 East Queens Drive, Williamsburg, VA 23185
- 8:50 AM**      **Investigation of Accumulated Fatigue Damage Using Nonlinear Acoustic Parameter Measurement in Nickel Base Super Alloy**  
---E. Burke, S. Sathish, and N. Ashbaugh, University of Dayton Research Institute, 300 College Park, Dayton, OH 45469-0127
- 9:10 AM**      **Simulations of Microdamage Depth Profiling Using Nonlinear Rayleigh Wave Propagation in Media with Stratified Hysteretic Nonlinearity**  
---K. Van Den Abeele and S. Vanaverbeke, Interdisciplinary Research Center, K. U. Leuven Campus Kortrijk (KULAK), Kortrijk, Belgium
- 9:30 AM**      **Experimental Detection of Structural Damage in Natural Building Stones Using Nonlinear Wave Modulation Spectroscopy**  
---N. Wilkie-Chancellor and K. Van Den Abeele, Interdisciplinary Research Center, K. U. Leuven Campus Kortrijk (KULAK), Kortrijk, Belgium
- 9:50 AM**      **Probing Granular Media Via Nonlinear Acoustic Effects**  
---V. Tournat<sup>1</sup>, V. Gusev<sup>1</sup>, V. Zaitsev<sup>2</sup>, V. Nazarov<sup>2</sup>, and B. Castagnede<sup>1</sup>, <sup>1</sup>Av. O. Messiaen, Université du Maine, Le Mans, Cedex 9, France; <sup>2</sup>Institute of Applied Physics, Russian Academy of Science, Russia
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Nonlinear Elastic Wave NDE I: Nonlinear Resonant Ultrasound Spectroscopy (NRUS) and Slow Dynamics Diagnostics (SDD)**  
---P. J. Johnson, Los Alamos National Laboratory, Los Alamos, NM 87545; A. Sutin, Stevens Institute of Technology, Hoboken, NJ and Artann Laboratories, NJ 07030
- 10:50 AM**      **Nonlinear Elastic Wave II: Nonlinear Wave Modulation Spectroscopy (NWMS) and Nonlinear Time Reversed Acoustics (NTRA)**  
---A. M. Sutin, Stevens Institute of Technology and Artann Laboratories, Hoboken, NJ 07030; P. J. Johnson, Los Alamos National Laboratory, NM 87545
- 11:10 AM**      **Nonlinear Modulated Angle Beam Ultrasonic Spectroscopy of Adhesive Bonds**  
---S. I. Rokhlin and L. Wang, The Ohio State University, Edison Joining Technology Center, 1248 Arthur E. Adams Drive, Columbus, OH 43221; B. Xie, V. A. Yakovlev, and L. Adler, Adler Consultants, 1275 Kinnear Road, Columbus, OH 43212
- 11:30 AM**      **The Nonlinear Response of Elasto-Plastic Interfaces: A Comparison Between Theory and Experiments**  
---C. Pecorari and M. Poznic, Marcus Wallenberg Laboratory, Royal Institute of Technology, Teknikringen 8, 100 44 Stockholm, Sweden
- 11:50 AM**      **Use of Capacitive Detection to Measure Harmonic Generation and the Nonlinearity Parameter in Liquids**  
---W. T. Yost, Structures and Materials Competency, NASA Langley Research Center, Hampton, VA 23681-2199
- 12:10 PM**      **Lunch**

**SESSION 8**  
**MATERIAL PROPERTIES I**

- 8:30 AM**      **Influence of Spatial Correlation Function on Ultrasonic Attenuation and Backscatter**  
---**J. A. Turner** and G. Ghoshal, University of Nebraska-Lincoln, Department of Engineering Mechanics, W317.4 NH, Lincoln, NE 68588-0526; P. Haldipur, F. J. Margetan, and R. B. Thompson, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 8:50 AM**      **Ultrasonic Attenuation in Zircaloy-4**  
---M. P. Gómez, Departamento de Ingeniería Eléctrica, FRBA, Universidad Tecnológica Nacional, Buenos Aires (1179), Argentina; D. Banchik, Grupo LMFAE, Centro Atómico Ezeiza, Comisión Nacional de Energía Atómica, Buenos Aires, Argentina; J. E. Ruzzante, Grupo de Ondas Elásticas, UA ENDE, Centro Atómico Constituyentes, San Martín Buenos Aires, Argentina; **M. I. López Pumarega**, Grupo de Ondas Elásticas – UA ENDE, Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, San Martín, Buenos Aires, Argentina
- 9:10 AM**      **Internal Friction in a Diffuse Field Used as a Measure to Characterize Material Properties**  
---**Pranaam Haldipur**<sup>1</sup>, Dan Barnard<sup>1</sup>, R. B. Thompson<sup>1</sup>, Paul Panetta<sup>2</sup>, <sup>1</sup>Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011; <sup>2</sup>Pacific Northwest National Laboratory, Richland, WA 99352
- 9:30 AM**      **A Formal Theory on the Backscattered Grain Noise Correlation**  
---**R. B. Thompson**, L. Yu, and F. J. Margetan, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 9:50 AM**      **Aberrations in Polycrystalline Materials**  
---**J. A. Hernandez**, M. Clark, S. D. Sharples, and M. G. Somekh, School of Electrical & Electronic Engineering, University of Nottingham, Nottingham, United Kingdom
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Nondestructive Characterization of Hydrogen Concentration in Zircalloy**  
---**C.-H. Yang**, M.-F. Huang, and Y.-A. Lai, Department of Mechanical Engineering, Chang Gung University, Taoyuan, Taiwan, Republic of China
- 10:50 AM**      **Profiles of Material Properties in Induction-Hardened Steel Determined Through Inversion of Resonant Acoustic Measurements**  
---**W. L. Johnson**, Materials Reliability Division, National Institute of Standards and Technology, Boulder, CO 80305; S. J. Norton, Geophex Ltd., 605 Mercury Street, Raleigh, NC 27603
- 11:10 AM**      **Defect Sensitive Magnetic Parameters Obtained from Minor Hysteresis Loops of Pure Iron and their Application in Nondestructive Evaluation of Steels**  
---**L. Zhang**, S. Takahashi, Y. Kamada, H. Kikuchi, and K. Ara, Nondestructive Evaluation and Science Research Center, Faculty of Engineering, Iwate University, 4-3-5 Ueda, Morioka, Iwate 020-8551, Japan
- 11:30 AM**      **Texture Asymmetry in Cubic Sheet Metals**  
---**M. D. G. Potter** and S. M. Dixon, Department of Physics, Warwick University, Coventry, United Kingdom; G. Kong and C. L. Davis, School of Metallurgy and Materials, The University of Birmingham, Birmingham, United Kingdom
- 11:50 AM**      **True-3D Strain Mapping for Assessment of Material Deformation by Synchrotron X-Ray Microtomography**  
---**J. Ahn**, H. Toda, M. Ninomi, and T. Kobayashi, Department of Production Systems Engineering, Toyohashi University of Technology, Toyohashi, Aichi, 441-8580, Japan
- 12:10 PM**      **Lunch**

**SESSION 9**  
**INVERSION, RECONSTRUCTION, AND CLASSIFICATION I**

- 8:30 AM**      **Numerical Modeling and Inverse Scattering in Nondestructive Testing: Recent Applications and Advances**  
---**R. Marklein**, K. J. Langenberg, and J. Miao, University of Kassel, Department of Electrical Engineering and Computer Science, Electromagnetic Theory, D-34109 Kassel, Germany; V. Schmitz, Institute for NDE (IZFP), University of Saarland, Building 37, D-66123 Saarbrücken, Germany
- 8:50 AM**      **Variable-Precision Arithmetic for Solving Inverse Problem of Electrical Impedance Tomography**  
---**H. Tian**, S. Yamada, and M. Iwahara, Division of Biological Measurement and Applications, Institute of Nature and Environmental Technology, Kanazawa University, Kodatsuno 2-40-20, Kanazawa 920-8667, Japan; H. Yang, The Key Laboratory of High Voltage and New Technology, Education of Ministry, Chongqing University, Chongqing 400044, China
- 9:10 AM**      **Lamb Wave Tomography with Frequency Compounding**  
---**M. K. Hinders** and K. R. Leonard, Applied Science Department, College of William & Mary, Williamsburg, VA 23187-8795
- 9:30 AM**      **Recent Developments in Thermal Tomography**  
---V. Bakirov and **R. Kline**, San Diego Center for Materials Research, San Diego State University, San Diego, CA 92182
- 9:50 AM**      **Flaw Imaging with Ultrasound: The Time Domain Topological Gradient Method**  
---**N. Dominguez** and J.-L. Arnaud, Quality-Non Destructive Investigations, AIRBUS France, Toulouse, France; V. Gibiat, Laboratoire d'Acoustique Métrologie et Instrumentation, Université Toulouse 3, Toulouse, France
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Defect Shape Reconstruction from an SH-Wave Array Ultrasonic Data Using Time Domain Linearized Inverse Scattering Method**  
---**K. Kimoto**, S. Hirose, and T. Matsue, Department of Mechanical and Environmental Informatics, Tokyo Institute of Technology, Room 301, West 8 Building, 2-12-1, Ookayama, Meguro-ku, Tokyo, 152-8552, Japan
- 10:50 AM**      **Simulating Angular Flaw Scattering Responses Using a Hierarchical Triangular Meshing Method**  
---**H.-J. Kim**<sup>1</sup> and Lester W. Schmerr Jr.<sup>1,2</sup>, <sup>1</sup>Center for NDE and the <sup>2</sup>Dept. of Aerospace Engineering, Iowa State University, Ames, IA 50011
- 11:10 AM**      **Characterization of Surface Cracks Using Rayleigh Waves**  
---**B. Masserey** and E. Mazza, Institute of Mechanical Systems, ETH Zurich, Ch-8092 Zurich, Switzerland
- 11:30 AM**      **Highly Accurate Defect Profiling for Stress Corrosion Cracks of SUS Sample Using Electromagnetic Inverse Problems**  
---**F. Kojima** and N. Kawai, Kobe University, Graduate School of Science and Technology, 1-1, Rokkodai, Nada-ku, Kobe 657-8501, Japan
- 11:50 AM**      **Application of TOFD Technique to Thin Sections Using ESIT and PSCT**  
---G. Baskaran and C. L. Rao, Department of Applied Mechanics, Indian Institute of Technology, Madras, Chennai, India; G. Swamy, **K. Balasubramaniam**, and C. V. Krishnamurthy, Center for Nondestructive Evaluation, Department of Mechanical Engineering, Indian Institute of Technology Madras, Chennai, India
- 12:10 PM**      **Lunch**

Tuesday, July 27, 2004

**SESSION 10**  
**NEW SENSORS AND PROBES**

- 8:30 AM**      **Fluid Characterization Using the Quasi-Scholte Mode**  
---**F. B. Cegla**, P. Cawley, and M. J. S. Lowe, Imperial College, RCNDE, Mechanical Engineering, Room 564, Exhibition Road, London SW7 2AZ, United Kingdom
- 8:50 AM**      **Transmission of Longitudinal and Transverse Ultrasonic Waves Using Dry-Coupled Transducer Modules**  
---**I. N. Komsky**, Center for Quality Engineering and Failure Prevention, Northwestern University, 2137 Tech Drive, Evanston, IL 60208
- 9:10 AM**      **Development of Ultrasonic Transducer for Nondestructive Evaluation of Whole Fruits**  
---**K.-B. Kim**, S. S. Lee, and M.-Y. Choi, Center for Environment & Safety Measurement, Korea Research Institute of Standards and Science, Daejeon, Korea; M. S. Kim, Department of Bio-Industrial Machinery Engineering, Chungnam National University, Daejeon, Korea
- 9:30 AM**      **A Dual-Function Inductive Sensor for Imaging Steel, Corrosion Products and Graphite Based Materials**  
---**G. Miller**, P. Gaydecki, M. Zaid, B. Fernandes, and V. Torres, Department of Instrumentation and Analytical Science, UMIST, P. O. Box 88, Manchester M60 1QD, United Kingdom
- 9:50 AM**      **Magnetic Study of Martensitic Transformation in Austenitic Stainless Steels by Low Field Hysteresis Loops Analysis**  
---**L. Zhang**, S. Takahashi, Y. Kamada, H. Kikucki, K. Mumtaz, K. Ara, and M. Sato, Nondestructive Evaluation and Science Research Center, Faculty of Engineering, Iwate University, Ueda 4-3-5, Morioka 020-8551, Japan
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **New Magnetostrictive Sensor Materials Based on Manganese-Doped Cobalt Ferrite for Nondestructive Evaluation Applications**  
---J. A. Paulsen, **C. C. H. Lo**, A. P. Ring, and D. C. Jiles, Center for NDE, Iowa State University, Ames, IA 50011; J. E. Snyder, Materials and Engineering Physics Program, Ames Laboratory, USDoE, Iowa State University, Ames, IA 50011
- 10:50 AM**      **PCB Conductor Dimension and Alignment Inspection with GMR Based ECT Probe**  
---**S. Yamada**, K. Chomsuwan, and M. Iwahara, Institute of Nature and Environmental Technology, Kanazawa University, 2-40-20 Kodatsuno, Kanazawa 920-8667, Japan; H. Wakiwaka, Shinshu University, 4-17-1 Wakasato, Nagano 380-8553, Japan; S. Shoji, TDK Corporation, 543 Otai, Saku-shi, Nagano 3805-8555, Japan
- 11:10 AM**      **Detection of Subsurface Flaws in Metals with GMR Sensors**  
---**J. K. Na** and M. A. Franklin, Systems Integration, General Dynamics, 2700 Indian Ripple Road, Dayton, OH 45440
- 11:30 AM**      **Laser Scanning Thermal Probe: A Novel Approach to NDE**  
---**J. T. Kephart**, J. Chen, and H. Zhang, Mechanical Engineering Department, Rowan University, Glassboro, NJ 08088
- 11:50 AM**      **Exo-MRI: Sensor for Quantitative Nondestructive Evaluation**  
---**S. Bobroff** and P. J. Prado, Quantum Magnetics, 15175 Innovation Drive, San Diego, CA 92128
- 12:10 PM**      **Lunch**

Tuesday, July 27, 2004

**SESSION 11**  
**STUDENT POSTER COMPETITION**

**NOTE:** Student posters are to be mounted Monday, July 26<sup>th</sup> from 4:00-6:00 PM for Monday evening judging only-*not public display*. During this period, no identification (author names, institutional names etc.) will be shown on the posters in order to preserve anonymity during judging. They will be open for public viewing with author and institutional titles during the regular Poster Session 11 on Tuesday, July 27<sup>th</sup> from 1:30-3:00 PM

**Resonance-EMAT Measurements on Aluminum Sheets With Monoclinic Texture**

**NPD, A Low Cost Ultrasonic Static Array System for Improved POD**

**Inversion Procedure for Eddy Current Profiling of the Near-Surface Residual Stress in Shot-Peened Metals**

**Determination of Microwave Dielectric Properties of Materials Using a Unique Application of Embedded Modulated Scatterer Technique**

**Differential Reassignment Algorithm for Lamb Wave Characterization**

**Characterization of the Microstructure of Cement-Based Materials Using Ultrasonic Attenuation**

**Empirical Modeling of Surface Crack Detection in Concrete Using an Open-Ended Rectangular Waveguide**

**Interpreting Complex Wave Propagation**

**Size Evaluation of Corrosion Precursor Pitting Using Near-Field Millimeter NDT Methods**

**Ultrasonic Attenuation to Predict the Damage State of a Polycrystalline Material**

**Development of the Dispersion Relationship of a Plate Using Permanently Mounted Piezoelectric Sensors**

**3:10 PM**

***Coffee Break***

## SESSION 11 – POSTERS

### UT, SIGNAL PROCESSING, ELECTROMAGNETIC METHODS, MATERIAL PROPERTIES

1:30 PM

UT

**The Effect of Material Inhomogeneity on Ultrasonic Phased Array Performance**

---L. Yu, J. H. Friedl, F. J. Margetan, and R. B. Thompson, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

**Investigation of Time Reversal Techniques to Enhance Flaw Detectability**

---H.-J. Kim, J. H. Friedl, and R. B. Thompson, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

**Ultrasonic Waves Reflected from Finite-Sized Shapes with Simple Curvatures**

---T. P. Lerch and G. Raman, Central Michigan University, Industrial and Engineering Technology Department, IT 100, Mt. Pleasant, MI 48859

**Generation of the Basis Sets for Multi-Gaussian Beam Models**

---H.-J. Kim<sup>1</sup> and L. W. Schmerr Jr.<sup>1,2</sup>, <sup>1</sup>Center for NDE and the <sup>2</sup>Department of Aerospace Engineering, Iowa State University, Ames, IA 50011

**Ultrasonic Generation and Optimization for EMAT**

---X. Jian, S. Dixon, and R. S. Edwards, Department of Physics, University of Warwick, Coventry CV4 7AL, United Kingdom

**Modal Wave Solved in Complex Wave Number**

---W.-J. Xu, F. Jenot, and M. Ourak, IEMN, Département OAE (UMR CNRS 8520), Université de Valenciennes et du Hainaut Cambrésis, 59313 Valenciennes Cedex 9, France

**Models of Standard Ultrasonic Reference Reflectors and Their Experimental Validation**

---A. Lopez-Sanchez\*, H.-J. Kim, and L. W. Schmerr, Jr.\*, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011; \*Department of Aerospace Engineering

**The Effect of Slowness Surfaces on the Beam Propagation in General Anisotropic Materials**

---R. Huang and L. W. Schmerr, Jr., Iowa State University, Center for NDE and Department of Aerospace Engineering, 1915 Scholl Road, Ames, IA 50011; A. Sedov, Lakehead University, Department of Mechanical Engineering, Thunder Bay, Ontario, P7B 5E1 Canada

**Simulation of Bulk Ultrasonic Waveform Excited for Two Layer Medium by Using Finite Element Method**

---G. Chen, X. R. Zhang, and J. C. Chen, State Key Laboratory of Modern Acoustics and Institute of Acoustics, Nanjing University, 210093 Nanjing, China

#### Signal Processing

**Index Size Determination with Varying Coil Diameters for Improved Automated Eddy Current Inspections on Aerospace Engine-Component**

---R. T. Ko, B. Frock, A. P. Berens, D. L. Petricola, and R. W. Martin, Structural Integrity Division, University of Dayton Research Institute, Dayton, OH 45469-0120; M. Rambo, Advanced Information Engineering Services, Inc., A General Dynamics Company, Dayton, OH 45469

**Decision Making of Aircraft Engine Blades Condition Based on Bispectral Analysis of the Vibroacoustical Signal**

---N. I. Bouraou, A. G. Protasov, O. V. Zazhistskiy, and Y. V. Sopilka, Department for Nondestructive Testing, National Technical University of Ukraine, Kiev Politechnical Institute, 37 Prospect Peremohy Street, Box 1760, Kiev 3056, Ukraine

## Electromagnetic Methods

### **Model Based Study of Three-Point Calibration Standard for Eddy Current Testing**

---**B. P. C. Rao** and N. Nakagawa, Iowa State University, Center for NDE, Ames, IA 50011

### **Comparison of ECT Signals and Calibration Procedures for Absolute and Differential Probes in Steam Generator Tubes**

---**Y.-K. Shin** and Y.-T. Lee, School of Electronic and Information Engineering, Kunsan National University, San 68, Miryong-dong, Kunsan, Chonbuk 573-701, Korea; M.-H. Song, Korea Institute of Nuclear Safety, 19 Kusong-Dong, Yousung-Ku, Taejon 305-338, Korea; T.-E. Chung, Korea Advanced Inspection Technology, P. O. Box 105, Yousung-Ku, Taejon, 305-600 Korea

### **Scheme for Characterization of Metal-Loss Defects Using MFL Signal from Pipeline Inspection**

---**V. P. Lunin**, Electrical Engineering and Introscopy Department, Moscow Power Engineering Institute (Technical University), 14 Krasnokazamennaja, 111250, Russia

### **Application of Near-Field Microwave and Millimeter Wave Nondestructive Testing for Evaluation of Fiber Breakage and Orientation in Carbon Composite Structures**

---**S. Kharkovsky** and R. Zoughi, Applied Microwave Nondestructive Testing Laboratory, Electrical and Computer Engineering Department, University of Missouri-Rolla, 228 Emerson Electric Co. Hall, 1870 Miner Circle, Rolla, MO 65409-0040

## Material Properties

### **Evaluating the Degree of Degradation of Resistance of Material in "Hot Spots" of Active Structures to Crack Propagation**

---**V. Makhnenko**, E. O. Paton Electric Welding Institute of the National Academy of Sciences of Ukraine, 11 Bozhenko Street, 03680, Kyiv, Ukraine

### **Computation of Grain-Noise Scattering Coefficients for Ultrasonic Pitch/Catch Inspections of Metals**

---**F. J. Margetan**, L. Yu, and R. B. Thompson, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

### **Nondestructive Testing of Aeronautical Bearing Ceramic Balls by Resonant Ultrasound Spectroscopy**

---S. Petit, M. Duquennoy, M. Ouafitou, and **F. Jenot**, IEMN, Département OAE (UMR CNRS 8520), Université de Valenciennes et du Hainaut Cambrésis, 59313 Valenciennes Cedex 9, France; S. Petit and J. Gualandri, SNRA, Al. No. 2 Batterie 900 Rouvignies, 59309 Valenciennes France

### **Hidden Corrosion Detection in Aircraft Metallic Structures Using Lamb Waves**

---C. Tity, F. Lepoutre, **N. Terrien**, and A. Déom, Department Mécanique du Solide et de l'Endommagement, Office National d'Etudes et de Recherches Aéropatiales, Châtillon, France

### **Two-Dimensional Thermoelastic Analysis of Diamond/Si Structures Heated by a Pulsed Gaussian Laser Beam**

---X. B. Mi and **S. Y. Zhang**, Laboratory of Modern Acoustics, Institute of Acoustics, Nanjing University, Nanjing 210093, China

### **Mean Grain Size Determination in Marbles by Ultrasonic Velocity Techniques**

---**I. H. Sarpun**, Physics Department, Afyon Kocatepe University, Afyon, Turkey; M. S. Kilickaya, Physics Department, Osmangazi University, Eskisehir, Turkey; S. Tuncel, Marmara Research Center, TUBITAK, Kocaeli, Turkey

### **Spectral Study of Ultrasonic Waves in a Beta-C Titanium Alloy**

---**B. L. Buitrago**, I. A. Irausquin, and J. A. Mendoza, Dpto. De Tecnologia Industrial, Universidad Simón Bolívar, Sede del Litoral, Caracas 1080, Venezuela

### **Materials Characterization for Prognostic Structural Diagnostic**

---**B. B. Djordjevic**, Johns Hopkins University, 810 Wyman Park Drive, Suite G010, Baltimore, MD 21211 and S. Kenderian, Jet Propulsion Laboratory, Pasadena, CA

**High Temperature Monitoring of Refractory Wall Recession Using Frequency-Modulated Continuous-Wave (FM-CW) Radar Techniques**

---B. Varghese, C. DeConick, G. Cartee, and **R. Zoughi**, Applied Microwave NDT Laboratory, Electrical and Computer Engineering Department, University of Missouri-Rolla, Rolla, MO 65409; M. Velez and R. Moore, Ceramic Engineering Department, University of Missouri-Rolla, Rolla, MO 65409

**Analysis of Microstructure Using Thermoelectric Diagnostics for Nondestructive Evaluation of Materials**

---**Y.-D. Park**, V. Kaydanov, B. Mishra, and D. L. Olson, Colorado School of Mines, Department of Metallurgical and Materials Engineering, Golden, CO 80401

**3:10 PM**

***Coffee Break***

**SESSION 12**  
**TERAHERTZ NDE**  
**H. Ringermacher, Chairperson**

- 3:30 PM**      **Technology and Applications of Terahertz Imaging Nondestructive Examination: Inspection of Space Shuttle Sprayed on Foam Insulation**  
---**D. Zimdars**, J. A. Valdmans, J. S. White, G. Stuk, and S. Williamson, Picometrix, Inc., 2925 Boardwalk Drive, Ann Arbor, MI 48108; W. P. Winfree and E. I. Madaras, Nondestructive Evaluation Sciences Branch, NASA Langley Research Center, Hampton, VA 23681
- 4:10 PM**      **Detection and Characterization of Flaws in Foam with Pulsed Terahertz Frequency Electromagnetic Waves**  
---**W. P. Winfree**, E. I. Madaras, and P. A. Howell, NASA Langley Research Center, MS 231, Hampton, VA 23681
- 4:30 PM**      **Characteristics of Terahertz Propagation in Porous Polymer and Ceramic Materials**  
---**C. Dodson** and J. Spicer, Johns Hopkins University, Center for NDE, 3400 N. Charles Street, Baltimore, MD 21218
- 4:50 PM**      **Noninvasive Study of Explosive Materials by THZ Time Domain Spectroscopy**  
---**F. Huang**, J. Federici, and D. Gary, Department of Physics, New Jersey Institute of Technology, Newark, NJ 07102; R. Barat, Otto York Department of Chemical Engineering, New Jersey Institute of Technology, Newark, NJ 07102; D. Zimdars, Picometrix, Inc., 2925 Boardwalk, Ann Arbor, MI 48104-6765

Tuesday, July 27, 2004

**SESSION 13**  
**MATERIAL PROPERTIES II**

- 3:30 PM**      **Identification of Material Property Changes Due to Impact Testing by Ultrasonic Harmonic Measurement**  
---**S. Lee**, K. Chang, B. Kim, and C. Shim, Korea Atomic Energy Research Institute, Daejeon, Korea
- 3:50 PM**      **Measurement of Elastic Moduli of a Fe-Si-B Amorphous Alloy Thin Film by EMAR and RUS**  
---**R. Tarumi**, A. Shibata, H. Ogi, and M. Hirao, Graduate School of Engineering Science, Osaka University, Toyonaka Osaka, Japan; K. Takashima and Y. Higo, Precision and Intelligence Laboratory, Tokyo Institute of Technology, Yokohama, Kanagawa, Japan
- 4:10 PM**      **Angular Dependence of Wave Attenuation in Textured Media**  
---**L. Yang** and J. A. Turner, Department of Engineering Mechanics, W317.4 Nebraska Hall, University of Nebraska, Lincoln, NE 68588-0526
- 4:30 PM**      **An Improved Model Description of the Stress Effects on Ferromagnetic Materials**  
---**L. Li**, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

Tuesday, July 27, 2004

**SESSION 14**  
**FILMS AND COATINGS**

- 3:30 PM**      **Ultrasonic Characterization of the Mechanical Properties of Nano-Structured Diamond-Like Carbon Thin Films**  
---**F. Zhang** and S. Krishnaswamy, Northwestern University, Center for Quality Engineering Failure Prevention, Room 331, Catalysis Building, 2137 Tech Drive, Evanston, IL 60208
- 3:50 PM**      **Acoustical Methods to Determine Thin-Film and Nanoscale Mechanical Properties**  
---**D. C. Hurley**, R. H. Geiss, M. Kopycinska-Mueller, J. Mueller, D. T. Read, and J. E. Wright, Materials Reliability Division, National Institute of Standards & Technology, Boulder, CO 80305-3328; N. M. Jennett and T. S. Maxwell, Materials Centre, National Physical Laboratory, Teddington, Middlesex, United Kingdom
- 4:10 PM**      **Brillouin Scattering and Laser-SAW Technique for Elastic Property Characterization of Micrometer DLC Films**  
---**P. V. Zinin**, SOEST, University of Hawaii, Honolulu, HI 96822-2219; S. Berezina, University of Zilina, Zilina, Slovak Republic; D. Fei and D. A. Rebinsky, Technical Center, Caterpillar Inc., Peoria, IL 61629
- 4:30 PM**      **Identification of AE Bursts by Classification of Physical and Statistical Parameters**  
---J. I. Mieza, M. E. Oliveto, **M. I. López Pumarega**, M. Armeite, and J. E. Ruzzante, Ensayos No Destructivos y Estructurales, Comisión Nacional de Energía Atómica, San Martín, Buenos Aires, Argentina; R. Piotrkowski, Escuela de Ciencia y Tecnología, Universidad Nacional General San Martín, San Martín, Buenos Aires, Argentina

Tuesday, July 27, 2004

**SESSION 15**  
**SENSORS AND TECHNIQUES**

- 3:30 PM**      **AC Modulated Magneto-Optic Sensor for Remote Investigation of Surface Deformation**  
---**S.-J. Lee**, S. Hoon, and D. C. Jiles, Iowa State University, Center for NDE, 258H Metals Development Building, Ames, IA 50011; H. Hauser, Vienna University of Technology, Vienna, Austria
- 3:50 PM**      **Design and Evaluation of Two-Dimensional Phased Array Ultrasonic Transducers**  
---**S. C. Mondal**, P. D. Wilcox, and B. W. Drinkwater, Mechanical Engineering, University of Bristol, Bristol, United Kingdom
- 4:10 PM**      **Sizing of Structures by Air-Solid Interface Wave Generated and Detected by Lasers**  
---**F. Jenot**, M. Ouafouh, M. Duquennoy, and M. Ourak, IEMN, Département OAE (UMR CNRS 8520), Université de Valenciennes et du Hainaut Cambrésis, 59313 Valenciennes Cedex 9, France
- 4:30 PM**      **Detecting Weld Zone Over Anticorrosion Painting by Rotating Uniform Eddy Current Probe**  
---**H. Hoshikawa**, K. Koyama, and Y. Naruse, Nihon University, Izumicho Narashino Chiba 275-8575, Japan
- 4:50 PM**      **Fourier Interpolation and Neural Network Analysis for Accurate 3D Reconstruction of Images Produced by an Inductive Scanner**  
---**M. Zaid**, P. Gaydecki, B. Fernandes, G. Miller, and V. Torres, UMIST, Department of Instrumentation and Analytical Science, P. O. Box 88, Manchester M60 1QD, United Kingdom

**SESSION 16**  
**GUIDED WAVES**

- 8:30 AM**      **Leaky Quasi-A0 Mode in Curved Plates**  
---**J. Fong** and M. J. S. Lowe, Imperial College, RCNDE, Department of Mechanical Engineering, Room 681, Exhibition Road, London SW7 2AZ, United Kingdom
- 8:50 AM**      **Guided Wave Scattering and Mixed Mode Conversions from 3-Dimensional Defects**  
---**W. Luo** and J. L. Rose, The Pennsylvania State University, Department of Engineering Science and Mechanics, 212 Earth and Engineering Science Building, University Park, PA 16802
- 9:10 AM**      **Simulation and Measurement of Ultrasonic Waves in Elastic Plates Using Laser Vibrometry**  
---**M. Ruzzene** and S. M. Jeong, School of Aerospace Engineering, Georgia Institute of Technology, 270 Ferst Drive, Atlanta, GA 30332-0150; T. E. Michaels, J. E. Michaels, and B. Mi, School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA 30332-0250
- 9:30 AM**      **Propagation of Lamb Waves on Rough Plates: Analysis of the Beam Section**  
---**D. Leduc**, B. Morvan, P. Pareige, and J.-L. Izbicki, Laboratoire d'Acoustique Ultrasonore et d'Electronique (LAUE), UMR CNRS 6068, le Havre, France; C. Potel and C. Depollier, Laboratoire d'Acoustique de l'Université du Maine (LAUM), UMR CNRS 6613, Le Mans, France; A.-C. Hladky, Institute d'Electronique, de Microélectronique et de Nanotechnologie (IEMN), UMR CNRS 8520, Lille, France
- 9:50 AM**      **Ultrasound in an Anisotropic Cladding with Wavy Interface**  
---**A. Bostrom**, T. Krasnova, and P.-A. Jansson, Department of Applied Mechanics, Chalmers University of Technology, Goteborg, SE-412-96 Sweden
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **The Role of Material Absorption in Guided Wave Propagation**  
---**F. Simonetti**, RCNDE, Department of Mechanical Engineering, Imperial College, London, United Kingdom
- 10:50 AM**      **Fe Modeling of Guided Waves Propagation and Diffraction in Structure with Weak Interfaces**  
---**B. Hosten** and M. Castaings, Laboratoire de Mécanique Physique, Université Bordeaux 1, UMR CNRS 5469, 351 Cours de la Libération, 33405-Talence, Cedex France
- 11:10 AM**      **Dispersion Behaviors of Wedge Waves Propagating Along the Apex Line of Wedges with Bilinear Cross Section**  
---C.-Z. Tsen and **C.-H. Yang**, Department of Mechanical Engineering, Chang Gung University, Taiwan, China
- 11:30 AM**      **Identification of Guided-Wave Mode in Pipe by Using Air-Coupled Transducer**  
---**H.-M. Kim**, I.-K. Park, K.-Y. Jhang, Y.-H. Cho, and Y.-K. Kim, Department of Precision Mechanical Engineering, Graduate School of Han Yang University, #17 HeangDang-Dong, SungDong-Gu, Seoul, Korea
- 11:50 AM**      **Optimization of Corrosion Monitoring Using Lamb Waves**  
---**N. Terrien** and M. Lepoutre, Office National d'Etudes et de Recherches Aérospatiales, Département de Mécanique du Solide et de l'Endommagement, Unité "Mécanique Expérimentale et Contrôle Santé", BP 72 – 29 avenue de la Division Leclerc, 92322 Châtillon Cedex, France; M. Royer, Laboratoire Ondes et Acoustique, ES)PCI, 10 rue Vauquelin, 75231 Paris Cedex 05, France
- 12:10 PM**      **Lunch**

## **SESSION 17**

### **NDE FOR RESIDUAL STRESS**

**P. B. Nagy and J. S. Knopp, Co-Chairpersons**

- 8:30 AM**      **The Role of Residual Stresses in Honeywell's Turbine Disk Life Prediction System**  
---**D. J. Greving** and M. Gorelik, Honeywell Engines Services and Systems, Materials Engineering Department, 111 S. 34<sup>th</sup> Street, P. O. Box 52181, MS 503-118, Phoenix, AZ 85072-2181
- 8:50 AM**      **Residual Stress Measurements to Assess Performance of Engineering Components Using X-Ray Diffraction Method**  
---**B. Raj** and T. Jayakumar, Metallurgy and Materials Group, Indira Gandhi Centre for Atomic Research, Kalpakkam, Tamil Nadu, India
- 9:10 AM**      **Residual Stress Measurements for Quantitative Evaluation of Fretting Fatigue Damage**  
---S. A. Martinez, **S. Sathish\***, and M. P. Blodgett, Air Force Research Laboratory, Wright-Patterson Air Force Base, OH 45433; S. Mall, Air Force Institute of Technology, Wright-Patterson Air Force Base, OH 45433; \*University of Dayton Research Institute, 300 College Park, Dayton, OH 45469
- 9:30 AM**      **Industrial Integration of Residual Stress Measuring NDT-Systems Based on Ultrasonics and Micromagnetics**  
---I. Altpeter, G. Dobmann, R. Kern, E. Schneider, B. Wolter, and **M. Spies**, Fraunhofer-Institut Zerstörungsfreie Prüfverfahren IZFP, University Building 37, Saarbrücken, Germany
- 9:50 AM**      **Eddy Current Nondestructive Residual Stress Assessment in Shot-Peened Nickel-Base Superalloys**  
---M. P. Blodgett, Ceramics and NDE Division, AFRL, Wright-Patterson Air Force Base, Dayton, OH 45432; F. Yu and **P. B. Nagy**, Department of Aerospace Engineering and Engineering Mechanics, University of Cincinnati, Cincinnati, OH 45221
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **High Resolution Residual Stress Imaging Using MWM-Arrays with Precomputed Response Databases**  
---**N. Goldfine**, V. Zilberstein, D. Schlicker, I. Shay, A. Washabaugh, D. Grundy, and R. Lyons, JENTEK Sensors, Inc., Waltham, MA 02453-7013
- 10:50 AM**      **Application of Various Magnetic Measurement Techniques to the Evaluation of Residual Stress**  
---D. C. Jiles and **C. C. H. Lo**, Iowa State University, Center for NDE, Ames, IA 50011
- 11:10 AM**      **Characterization of Plastically Deformed Steels Utilizing Ultrasonic Velocity Measurements**  
---**P. D. Panetta**<sup>1</sup>, B. Francini<sup>1</sup>, S. Ahmed<sup>1</sup>, M. Morra<sup>1</sup>, G. A. Alers<sup>2</sup>, K. Johnson<sup>1</sup>, and R. B. Thompson<sup>3</sup>, <sup>1</sup>Pacific Northwest National Laboratory, Richland, WA 99352; <sup>2</sup>EMAT Consulting, San Luis Obispo, CA 93401; <sup>3</sup>Iowa State University, Center for NDE, Ames, IA 50011
- 11:30 AM**      **A Study of Correlation Between Conductivity Measurement and Surface Residual Stress**  
---**N. Nakagawa**, Iowa State University, Center for NDE, Ames, IA 50011; A. M. Frishman, Iowa State University, Department of Physics, Ames, IA 50011
- 11:50 AM**      **Limitations of Nondestructive Subsurface Residual Stress Measurements by X-Ray Diffraction**  
---**D. J. Hornbach** and P. S. Prevéy, Lambda Research, 5521 Fair Lane, Cincinnati, OH 45273
- 12:10 PM**      **Lunch**

**SESSION 18**  
**EDDY CURRENT MODELING AND PROBES**

- 8:30 AM**      **The Truncated Region Eigenvalue Expansion Method for the Solution of Boundary Value Problems in Eddy Current Nondestructive Evaluation**  
---**T. P. Theodoulidis**<sup>1</sup> and J. R. Bowler<sup>2</sup>, <sup>1</sup>University of West Macedonia, Department of Engineering and Management of Energy Resources, Kastorias & Fleming, 50100 Kozani, Greece; <sup>2</sup>Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 8:50 AM**      **Modeling the Perturbation Flux Density of Current Flowing Around a Small Surface Crack as Detected by a GMR Probe**  
---**M. J. Sablik**, G. L. Burkhardt, and G. M. Light, Southwest Research Institute, San Antonio, TX 78228-0510
- 9:10 AM**      **Studies of Eddy Current NDE for Small Crack Detection Around Fasteners in Multi-Layer Structures**  
---**J. S. Knopp**, Materials and Manufacturing Directorate, Air Force Research Laboratory, 2230 Tenth Street, Suite 1, Wright-Patterson Air Force Base, OH 45433-7817; J. C. Aldrin, Computational Tools, Gurnee, IL
- 9:30 AM**      **Studies into the Effects of Surface Roughness on Spatial Eddy-Current Data from Titanium and Nickel-Based Engine Alloys**  
---**M. J. Johnson**, N. Nakagawa, S. Wendt, S. Hentscher, and D. C. Raithel, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 9:50 AM**      **A Study of Boundary Element Eddy Current Model Validation**  
---**N. Nakagawa** and B. P. C. Rao, Iowa State University, Center for NDE, Ames, IA 50011
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Code Validation for Eddy Current Modeling: Tube Inspection with Reflection-Differential Probes**  
---**A. Schumm**, Electricité de France, R&D Division, Clamart, France; N. Nakagawa, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 10:50 AM**      **Eddy Currents Induced by an Encircling Coil in a Finite Length Layered Rod**  
---**H. Sun** and J. Bowler, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 11:10 AM**      **Subsurface Defect Detection in Metals with Pulsed Eddy Current**  
---**Y. A. Plotnikov** and W. J. Bantz\*, GE Global Research Center, Research Circle, Niskayuna, NY 12309-1135; \*GE Aircraft Engines M&QTD, 10270 St. Rita Lane, Cincinnati, OH 45215
- 11:30 AM**      **EC Modeling of Ferrite-Core Probes**  
---**F. Buvat**, **G. Pichenot**, and D. Premel, CEA SACLAY, Batiment 611, 91191 Gif-sur-Yvette, France; **H. Voillaume**, EADS, Suresnes, France
- 11:50 AM**      **An Approach for Characterization of Eddy Current Probes**  
---**B. P. C. Rao** and N. Nakagawa, Iowa State University, 1915 Scholl Road, Ames, IA 50011
- 12:10 PM**      **Lunch**

**SESSION 19**  
**STRUCTURAL HEALTH MONITORING APPLICATIONS I**

- 8:30 AM**      **A Wireless Sensor Network of Permanently Installed Structural Integrity Monitors**  
---**G. Benny**, K. Steel, A. McNab, and G. Hayward, United Kingdom Research Centre for Non-Destructive Evaluation (UK RCNDE), Centre for Ultrasonic Engineering, University of Strathclyde, 204 George Street, Glasgow G1 1XW, Scotland, United Kingdom
- 8:50 AM**      **Guided Wave Tomography on an Aircraft Wing with Leave in Place Sensors**  
---**H. Gao**, Y. Shi, and J. L. Rose, Department of Engineering Science and Mechanics, The Pennsylvania State University, State College, PA 16802
- 9:10 AM**      **Permanently Attached Single PZT Guided Wave Encoded Sensor for Flood Detection of Oil Rigs Cross Beams**  
---R. Mijarez and **P. Gaydecki**, Department of Instrumentation and Analytical Science, UMIST, P. O. Box 88, Manchester M60 1QD, United Kingdom; M. Burdekin, The Fatigue Monitoring Bureau, Macclesfield, SK 10 5LX, United Kingdom
- 9:30 AM**      **Plate Waves Structural Health Monitoring of Composite Structures**  
---R. Jagannathan, B. Somashekar, **K. Balasubramaniam**, and C. V. Krishnamurthy, Centre for Nondestructive Evaluation and Department of Mechanical Engineering, Indian Institute of Technology Madras, Chennai 600 036, India
- 9:50 AM**      **An Intelligent Sensor System for Monitoring Fatigue Damage in Welded Steel Components**  
---**B. Fernandes** and P. Gaydecki, Department of Instrumentation and Analytical Science, UMIST, P. O. Box 88, Manchester M60 1QD, United Kingdom; M. Burdekin, The Fatigue Monitoring Bureau, Macclesfield, SK10 5LX, United Kingdom
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Self-Calibrating Ultrasonic Techniques for In-Situ Monitoring of Fatigue Crack Progression**  
---**J. E. Michaels**, T. E. Michaels, B. Mi, and A. C. Cobb, School of Electrical and Computer Engineering, Georgia Institute of Technology, 777 Atlantic Drive NW, Atlanta, GA 30332-0250
- 10:50 AM**      **Visualization and Modeling of Short Wave Propagation by Using Genetic Algorithm and S-Transformation**  
---X. Wang, **I. N. Tansel**, P. Chen, and N. Reen, Florida International University, Miami, FL 33174
- 11:10 AM**      **An Intelligent Sensing System for Detection and Evaluation of Particle Impact Damage**  
---**A. Scott**, A. Batten, G. Edwards, T. Farmer, M. Hedley, N. Hoschke, P. Isaacs, M. Johnson, C. Lewis, A. Murdoch, D. Price, M. Prokopenko, P. Valencia, and P. Wang, CSIRO Industrial Physics, P. O. Box 218, Lindfield, NSW, 2070, Australia
- 11:30 AM**      **Sensors in Corrosion**  
---**V. S. Agarwala**, Naval Air Systems Command, Research & Engineering Group, Building 2187, Suite 2373, 48110 Shaw Road, Patuxent River, MD 20670-2906
- 11:50 AM**      **Tracking Fabry-Perot Transmission Line Through Multiple Free Spectral Ranges**  
---**J. A. Smith**, Advanced Engineering, Corning Incorporated, SP-AR-02-04, Corning, NY 14831
- 12:10 PM**      **Lunch**

**SESSION 20**  
**UT PHASED ARRAYS**  
R. C. Addison, Chairperson

- 1:30 PM**      **Simulation of Phased Array Techniques and Modeling-Based Data Reconstruction**  
---J. Porré, S. Mahaut, S. Chatillon, and P. Calmon, CEA/LIST, CEA Saclay, 91191 Gif-sur-Yvette, France
- 1:50 PM**      **An Evaluation of Phased Array Transducer Configurations Using Conventional and Finite Element Beam Simulation Models**  
---A. Gachagan and A. McNab, Centre for Ultrasonic Engineering, University of Strathclyde, Glasgow, United Kingdom; D. Reilly, NDTSoft, Cumbernauld, United Kingdom; P. Reynolds, Weidlinger Associates, Los Altos, CA 94022
- 2:10 PM**      **Application of Tandem Techniques with Contact Monoelement or Phased Array Probes: Simulations and Experiments**  
---S. Mahaut, R. Raillon, and E. Kerbrat, CEA/LIST, CEA Saclay, 91191 Gif-sur-Yvette, France; R. Spencer and M. Lozev, Edison Welding Institute, Columbus, OH 43218-2426
- 2:30 PM**      **Signal Processing of Ultrasonic Array Data**  
---C. Holmes, B. W. Drinkwater, and P. D. Wilcox, Department of Mechanical Engineering, University of Bristol, United Kingdom
- 2:50 PM**      **Application of Piezocomposite Twin, Side by Side, Phased Array UT Probes for the Inspection of Stainless Steel**  
---M. Delaide<sup>1</sup> and P. Dumas<sup>2</sup>, <sup>1</sup>AVI International, Vilvoorde, Belgium, <sup>2</sup>Imasonic SA, Besancon, France
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Phased Array Inspection of Titanium Disk Forgings Targeting #1/2 FBH Sensitivity**  
---R. A. Roberts and J. H. Friedl, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, Ia 50011
- 3:50 PM**      **Algorithms for Ultrasonic Spacecraft Leak Location Using Structure Borne Noise**  
---S. D. Holland, R. Roberts, M. Strei, and D. E. Chimenti, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

Wednesday, July 28, 2004

## **SESSION 21**

### **3D-POD**

**W. D. Rummel, Chairperson**

- 1:30 PM**      **3-D POD Probability of Detection for Subsurface Defects**  
---**W. D. Rummel**, D&W Enterprises, Ltd., 8776 W. Mountainview Lane, Littleton, CO 80125
- 1:50 PM**      **Summary of a Workshop on Computational NDE for Modeling POD**  
---**G. A. Matzkanin** and H. T. Yolken, Nondestructive Testing Information Analysis Center (NTIAC),  
415 Crystal Creek Drive, Austin, TX 78746
- 2:10 PM**      **Probability of Detection for Embedded Defects: Needs for Ultrasonic Inspection of  
Aerospace Turbine Engine Components**  
---**D. A. Stubbs**, University of Dayton Research Institute, 300 College Park, Dayton, OH 45469-  
0120
- 2:30 PM**      **Design and Fabrication of Ultrasonic POD Test Specimens – Phase I**  
---**J. L. Bartos**, Cincinnati Aerotech Consulting, 8325 Old Stable Road, Cincinnati, OH 45243; **M.**  
**F. Gigliotti**, General Electric Global Research Center, Schenectady, NY; **A. Gunderson**, University  
of Dayton Research Institute, Dayton, OH 45469-0120
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Uses of Physics-Based Models in the Determination of POD: Current Status**  
---**R. B. Thompson**, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 3:50 PM**      **3-D POD Probability of Detection for Subsurface Defects (Path Forward/Summary)**  
---**W. D. Rummel**, D&W Enterprises, Ltd., 8776 W. Mountainview Lane, Littleton, CO 80125

**SESSION 22**  
**COMPOSITE APPLICATIONS**  
D. K. Hsu, Chairperson

- 1:30 PM**      **Percolative Conductivity and Impedance Spectroscopy of SWNT Polymer Composites**  
---**D. S. McLachlan**<sup>1</sup>, C. Chiteme<sup>1</sup>, C. Park<sup>2</sup>, K. E. Wise<sup>2</sup>, Z. Ounaies<sup>3</sup>, S. E. Lowther<sup>4</sup>, P. Lillehei<sup>4</sup>, E. J. Siochi<sup>4</sup>, and J. S. Harrison<sup>4</sup>, <sup>1</sup>School of Physics, University of the Witwatersrand, Johannesburg, South Africa, <sup>2</sup>National Institute of Aerospace (NIA), <sup>3</sup>Virginia Commonwealth University, <sup>4</sup>Advanced Materials & Processing Branch, NASA Langley Research Center, Hampton, VA 23681-2199
- 1:50 PM**      **Signal Processing Variables for Optimization of Flaw Detection in Composites Using Ultrasonic Guided Wave Scanning**  
---**D. J. Roth**, MS 6-1, NASA Glenn Research Center, 21000 Brookpark Road, Brookpark, OH 44135; L. M. Cosgriff and R. E. Martin, Cleveland State University; 2100 Brookpark Road, Brookpark, OH 44135; L. Teemer, Florida A&M University
- 2:10 PM**      **Thermal Imaging Characterization of Material Properties for Ceramic Matrix Composites**  
---**J. Sun**, ET/212, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439
- 2:30 PM**      **FT-IR Photoacoustic Spectroscopy Applied to the Curing and Aging of Composites**  
---**R. W. Jones**, A. J. Wagner, and J. F. McClelland, Ames Laboratory, Iowa State University, 109 Spedding Hall, Ames, IA 50011; J. J. Sweterlitsch, Department of Chemical Engineering, Iowa State University; D. K. Hsu, Center for NDE, Iowa State University, Ames, IA 50011; D. L. Polis, Swales Aerospace, NASA/GSFC, Greenbelt, MD 20771-0001
- 2:50 PM**      **Applications of the Zero-Group-Velocity Lamb Mode for Air-Coupled Ultrasonic Imaging**  
---**S. D. Holland**, V. L. Evan, and D. E. Chimenti, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Experience with Air-Coupled Ultrasonic Inspection of Aerospace Composites**  
----**D. K. Hsu**, J. J. Peters, D. J. Barnard, V. Kommareddy<sup>1</sup>, and V. Dayal, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

**SESSION 23**  
**NDE FOR WELDS, PROPERTIES, AND TECHNIQUES**

- 1:30 PM**      **Utilization of Non-Destructive Thermoelectric Power Measurements for Determination of Interstitial Nitrogen Content in Nitrogen-Strengthened Austenitic Stainless Steel Weldments**  
---A. Lasseigne, **D. Olson**, V. Kaydanov, Department of Metallurgical and Materials Engineering, Colorado School of Mines, Golden, CO 80401; T. Boellinghaus, Federal Institute of Materials Research and Testing, Berlin, Germany
- 1:50 PM**      **Weld Depth Penetration Evaluation Using an Electrical Potential Probe**  
---**E. Fraizier**, Laboratoire de Contrôle Non Destructif, CEA Centre de Valduc, 21120 Is-sur-tille, France
- 2:10 PM**      **Ultrasonic Evaluation of Weld Strength for Aluminum Ultrasonic Spot Welds**  
---**B. Ghaffari**, E. T. Hetrick, and G. Mozurkewich, Ford Motor Company, Research and Advanced Engineering, MD 3083/SRL, P. O. Box 2053, Dearborn, MI 48121-2053
- 2:30 PM**      **Finite Element Analysis for the Verification of Post Weld Heat Treatment of Cr-Mo Welds**  
---**W. Cheng**, M. Shiwa, and I. Komura, NDE Center, Japan Power Engineering and Inspection Corporation, Kanagawa 230-0044, Japan; Y. Gotoh, Department of Electrical and Electronic Engineering, Kurume National College of Technology, Fukuoka 830-8555, Japan; N. Takahashi, Department of Electrical and Electronic Engineering, Okayama University, Okayama 700-8530, Japan
- 2:50 PM**      **Inspection of Resistance Spot Welds Using a Portable Ultrasonic Phased-Array System**  
---**F. Reverdy**, Lawrence Berkeley National Laboratory, One Cyclotron Road, MS 46A-1123, Berkeley, CA 94720
- 3:10 PM**      **Coffee Break**
- 3:30 PM**      **Simulation of NDE Methods for Weld Inspection**  
---**R. N. Yancey**, M. Lozev, and E. Todorov, EWI, 1250 Arthur E. Adams Dr., Columbus, OH 43221

Wednesday, July 28, 2004

***SPECIAL EVENING SESSION***

**J. Malas, Chairperson**

**8:00 PM      Structural Health Monitoring/Prognostics**

**SESSION 24**  
**THERMAL TECHNIQUES**  
X. Han, Chairperson

- 8:30 AM**      **Coating Thickness and Thermal Conductivity Evaluation Using Flash IR Imaging**  
---**H. I. Ringermacher**, GE Global Research Center, P. O. Box 8, Schenectady, NY 12301; E. R. Rozier, GE Energy, 1 River Road, Schenectady, NY 12345
- 8:50 AM**      **Flash Duration Effect in One-Sided Thermal Imaging**  
---**J. Sun**, ET/212, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439
- 9:10 AM**      **Characterizing the Effects of Sonic IR Variables on Turbine Disk Inspection Using a Design of Experiments Approach**  
---**D. J. Mayton** and C. Alvarez, SAIC, 16701 West Bernardo Drive, San Diego, CA 92127; F. W. Spencer, Sandia National Laboratories, P. O. Box 5800, MS 0829, Albuquerque, NM 87185-0829
- 9:30 AM**      **Study the Effect of Geometry in Sonic IR Imaging**  
---**X. Han**, W. Li, and Z. Zeng, Electrical and Computer Engineering, Wayne State University, Detroit, MI 48202; L. Favro and G. Newaz, Institute of Manufacturing Research, Wayne State University, Detroit, MI 48202; R. L. Thomas, College of Science, Wayne State University, Detroit, MI 48202
- 9:50 AM**      **Developing Sonic IR Imaging NDE for Aircraft Structures**  
---**X. Han**, S. Islam, J. Lu, W. Li, Z. Zeng, and N. Kashyap, Electrical and Computer Engineering, Wayne State University, Detroit, MI 48202; L. D. Favro and G. M. Newaz, Institute of Manufacturing Research, Wayne State University, Detroit, MI 48202; R. L. Thomas, College of Science, Wayne State University, Detroit, MI 48202
- 10:10 PM**      **Coffee Break**
- 10:30 PM**      **Derivative Contrast in Thermographic NDT**  
---**S. M. Shepard**, Y. Hou, and J. R. Lhota, Thermal Wave Imaging, Inc., 845 Livernois, Ferndale, MI 48220
- 10:50 PM**      **Improved Thermographic Damage Detection with Principle Component Analysis**  
---**W. P. Winfree**, K. E. Cramer, and J. N. Zalameda, NASA Langley Research Center, MS 231, Hampton, VA 23681; A. R. Roberts, Swales Aerospace, K. L. Hodges, Lockheed Martin
- 11:10 PM**      **Acoustic Thermography: Vibrational Modes of Cracks and the Mechanism of Heat Generation**  
---**M. Rothenfusser** and C. Homma, Corporate Technology, Siemens AG, Munich 81730, Germany
- 11:30 PM**      **Vibro Acoustic Modulation NDE Technique. Part 1: Theoretical Study**  
---**P. Duffour**, P. Cawley, and M. Morbidini, RCNDE, Department of Mechanical Engineering, Imperial College, London, United Kingdom
- 11:50 PM**      **Vibro Acoustic Modulation NDE Technique. Part II: Experimental Study**  
---**M. Morbidini**, P. Duffour, and P. Cawley, RCNDE, Department of Mechanical Engineering, Imperial College, London, United Kingdom
- 12:10 PM**      **Vibro-Thermography Crack Tip Temperature Measurements**  
---**D. L. Simon**, General Motors Corporation, Detroit, MI 48207

**SESSION 25**  
**INVERSION, RECONSTRUCTION, AND CLASSIFICATION II**

- 8:30 AM**      **Residual Crack Depth Estimation in Plates Via Frequency Gradient Measurement of EC Impedance**  
---**N. Nakagawa** and B.P.C. Rao, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 8:50 AM**      **Evaluation of Case Hardened Steel Rods Using Model-Based Inversion of Electromagnetic Data**  
---**Y. Huang** and N. Bowler, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 9:10 AM**      **Reconstruction of Flaw Profiles Using Neural Networks and Multi-Frequency Eddy Current System**  
---**T. Chady** and M. Caryk, Faculty of Electrical Engineering, Technical University of Szczecin, Szczecin, Poland
- 9:30 AM**      **Improving Ultrasonic C-Scan Resolution Using the Hilbert-Huang Transform**  
---**G. G. Leisk**, E. S. Miller, and D. J. Murphy, Tufts Mechanical Engineering
- 9:50 AM**      **Quantitative Evaluation of Local Young's Modulus of Small-Scale Solids by Isolated Langasite Oscillator: Resonant-Ultrasound Microscopy**  
---**H. Ogi**, J. Tian, T. Tada, and M. Hirao, Graduate School of Engineering Science, Osaka University, Machikaneyama 1-3, Toyonaka, Osaka 560-8531, Japan
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Analytical Approach to Simulation of Magnetic Particle Inspection of Defects with Various Shapes and Sizes**  
---**Y. Melikhov**<sup>1</sup>, S.-J. Lee<sup>1</sup>, D. C. Jiles<sup>1</sup>, M. Garton<sup>2</sup>, R. Lopez<sup>2</sup>, and L. Brasche<sup>2</sup>, Center for Aviation Systems Reliability, Iowa State University, <sup>1</sup>2581 Metals Development, <sup>2</sup>Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 10:50 AM**      **Application of Memory-Saved Time Domain BIE Method for Visualization of Scattered Wave Fields**  
---**K. Nakahata**, Department of Civil and Environmental Engineering, Ehime University, Matsuyama, Ehime, Japan; S. Hirose, Department of Mechanical and Environmental Informatics, Tokyo Institute of Technology, Meguro, Tokyo, Japan
- 11:10 AM**      **Multi-Sensor NDE Data Intregation and Visualization for Gas Transmission Pipelines**  
---J. Oagaro, S. Papsen, J. Bram, P. J. Kulick, R. Polikar, J. Chen, J. Schmalzel, and **S. Mandayam**, College of Engineering, Rowan University, Glassboro, NJ 08028
- 11:30 AM**      **Detection and Sizing of Cracks in Structural Components of a Nuclear Power Plant by ECT**  
---**Z. Chen** and K. Miya, International Institute of Universality, Imon Ikenohata Bldg. 7F, 2-7-17 Ikenohata, Taito-ku, Tokyo, 110-0008, Japan
- 11:50 AM**      **Lamb Waves Converted and Diffracted by an Artificial Bonding Defect of Two Composite Plates**  
---H. Dufflo, B. Morvan, and J.-L. Izbicki, Laboratoire d'Acoustique Ultrasonore et d'Electronique, UMR CNRS 6068, Place Robert Schuman, 76600 Le Havre, France; Presenter: **D. Leduc**
- 12:10 PM**      **Lunch**

**SESSION 26**  
**NDE DESIGN, PROCESS CONTROL, AND LIFE PREDICTION**

- 8:30 AM**      **Strategy and Software Framework for Integration of QNDE and Product Life Management Design**  
---**E. A. Medina** and M. Altynova, Austral Engineering and Software, Inc., P. O. Box 340646, Dayton, OH 45434; J. C. Aldrin, Computational Tools, Gurnee, IL; J. Knopp and C. Kropas-Hughes, NDE Branch, Materials and Manufacturing Directorate, U.S. Air Force Research Laboratory, Wright-Patterson AFB, OH 45449
- 8:50 AM**      **In-Process Measurement of Particle Size for Explosive Slurries**  
---**W. N. Cobb**, University of Denver Research Institute, 2050 E. Liff Avenue, Denver, CO 80208
- 9:10 AM**      **Measurement of the Viscosity-Density Product Using a Quartz Wedge**  
---**M. S. Greenwood**, J. D. Adamson, and L. J. Bond, NDE Measurement Systems, Pacific Northwest National Laboratory, Battelle Blvd., Mailstop K5-26, Richland, WA 99352
- 9:30 AM**      **Ultrasonic Characterization of Solid-Liquid Suspensions**  
---**P. D. Panetta**, B. Tucker, and S. Ahmed, Pacific Northwest National Laboratory, 903 Battelle Boulevard, P. O. Box 999, MSIN K5-26, Richland, WA 99352
- 9:50 AM**      **Observing Effects of Particle Size for a Slurry Using Ultrasonic Diffraction Grating Spectroscopy**  
---**M. S. Greenwood** and L. J. Bond, NDE Measurement Systems, Pacific Northwest National Laboratory, P. O. Box 999, Mailstop K5-26, Richland, WA 99352; A. Brodsky and L. Burgess, Center for Process Analytical Chemistry, University of Washington, Seattle, WA 98195
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Laser Ultrasonic Measurement of Elastic Properties of Moving Paper**  
---**P. L. Ridgway** and R. E. Russo, Lawrence Berkeley National Laboratory, Berkeley, CA 94720; E. F. Lafond and T. G. Jackson, Institute of Paper Science and Technology at Georgia Tech
- 10:50 AM**      **Application of Laser AE Technique to Monitoring of Sintering in Structural Ceramics**  
---**S. Nishinoiri** and M. Enoki, Department of Engineering, Graduate School of Engineering, The University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo, Japan
- 11:10 AM**      **Characterization of Magnetron Sputtered Coatings by Pulsed Eddy Current Techniques**  
---**C. P. Mulligan**, Benet Laboratories, US Army, AMSRD-AAR-AEW-T (B), Watervliet Arsenal, NY 12189; C. Lee and Y. Danon, Department of Mechanical, Aerospace and Nuclear Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180
- 11:30 AM**      **Quality Control of the Continuous Casting Process Using Electromagnetic Transducers (EMAT) Sensors**  
---**I. S. Kim**, C. E. Park, J. S. Son, and B. A. Chin, Department of Mechanical Engineering, Mokpo National University, 61, Dorim-ri-Chunhke-myun, Muan-gun, Chonnam, 534-729, Korea
- 11:50 AM**      **Machine Condition and Remaining Service Life Prediction**  
---**L. Burstein** and L. Segal, Quality Assurance and Reliability Department, Technion – Israel Institute of Technology, Technion City, Haifa, Israel
- 12:10 PM**      **Lunch**

Thursday, July 29, 2004

**SESSION 27**  
**NEW TECHNIQUES AND APPLICATIONS**

- 8:30 AM**      **Natural Focusing Inspection for Pipes by Frequency Tuning**  
---**L. Zhang**, J. L. Rose, and B. J. Gavigan, The Pennsylvania State University, Department of Engineering Science and Mechanics, 212 Earth and Engineering Science Building, University Park, PA 16802
- 8:50 AM**      **Non-Contact Ultrasonic Characterization of Defects Using EMATs**  
---**R. S. Edwards**, S. Dixon, and X. Jian, Department of Physics, University of Warwick, Coventry, United Kingdom
- 9:10 AM**      **Comparison of Damage and Ultrasonic Signals, Induced by Laser at Different Wavelengths, for Al and Alumina Samples**  
---**Y. Perchenok**, G. Hurvitz, and A. Azoulay, Department of Electro-Optics, Soreq NRC, Yavne 81800, Israel
- 9:30 AM**      **NDE Characterization of Residual Stress on Shrink-fit Specimens of Ti-6Al-4V**  
---S. Sathish and M. P. Blodgett, Metals, Ceramics and NDE Division, Air Force Research Laboratory, Wright Patterson Air Force Base, Dayton, OH 45469-0127; **R. W. Martin**, R. T. Ko, and R. Reibel, Structural Integrity Division, University of Dayton Research Institute, 300 College Park, Dayton, OH 45469-0127
- 9:50 AM**      **Development of New Surface Crack Inspection Technique Using Electronic Speckle Pattern Interferometry**  
---**A. Baba**, M. Nakamura, and T. Matsui, Power & Industrial Systems R & D Laboratory, Hitachi, Ltd., Japan
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Critical Timing Issues in Flash Thermography**  
---**S. M. Shepard** and J. R. Lhota, Thermal Wave Imaging, Inc., Ferndale, MI 48220
- 10:50 AM**      **Acoustic Emission – A Precision Indicator of Phase Transition in Soft PZT Ceramics Under an Applied Electric Field**  
---**S. P. Mallikarjun Rao** and K. Prabakar, Acoustic Emission Laboratory, Physics Department, University College of Science, Osmania University, Hyderabad – 500 007, India
- 11:10 AM**      **Combining X-Ray, Eddy Current, and Electric Field Measurement Techniques for Automating Particle Fuel Characterization**  
---**R. Hockey**, R. Mathews, and L. Bond, Pacific Northwest National Laboratory, P. O. Box 999, MS K5-26, Richland, WA 99352; J. Gray, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 11:30 AM**      **Ultrasonographic Periodontal Probing Based on the Dynamic Wavelet Fingerprint**  
---**M. K. Hinders** and J. Hou, College of William and Mary, Department of Applied Science, Williamsburg, VA 23187-8795
- 11:50 AM**      **Ultrasonic Estimation of Mechanical Properties of Pulmonary Artery Wall Under Normotensive and Hypertensive Conditions**  
---**K. R. Waters**, National Institute of Standards and Technology, Materials Reliability Division, Mail Stop 853.00, 325 Broadway, Boulder, CO 80305-3328; O. M. Mukdadi, The Children's Hospital, University of Colorado Health Sciences Center, Denver, CO 80305
- 12:10 PM**      **Lunch**

## **SESSION 28 - POSTERS**

### **LASER ULTRASOUND, GUIDED WAVES, CHARACTERIZATION AND CLASSIFICATION, SENSORS AND PROBES, NEW APPLICATIONS, NEW TECHNIQUES, INSTRUMENTS AND SYSTEMS, COMPOSITE MATERIALS, INFRASTRUCTURE, DESIGN MANUFACTURING, AND RELIABILITY**

1:30 PM

#### **Laser Ultrasound**

##### **Simulation of Ultrasonic Waveform Excited by Laser Source by Using Finite Element Method**

---J. He, G. Chen, **X. R. Zhang**, and J. C. Chen, State Key Laboratory of Modern Acoustics and Institute of Acoustics, Nanjing University, 210093 Nanjing, China; M. Zhou, College of Material Science and Engineering, Jiangsu University, 212013, Zhenjiang, China

##### **Defects Detection on Silicon Nitride Balls by Laser-Ultrasonics**

---M. Lemarie, M. Duquennoy, **F. Jenot**, M. Ouafouh, and M. Ourak, IEMN, Département OAE (UMR CNRS 8520), Université de Valenciennes et du Hainaut Cambrésis, 59313 Valenciennes Cedex 9, France

#### **Guided Waves**

##### **Analysis of Ultrasonic Guided Wave Dispersion in Pipes Using 3-D FEM and 2-D FFT**

---J.-S. Park, H.-J. Yu, **S.-J. Song**, and Y. H. Kim, Sungkyunkwan University, School of Mechanical Engineering, 300 Chonchon-dong, Jangan-gu, Suwon, Kyonggi-do, 440-746; Jangan-gu, Suwon, Kyonggido, Korea; Y.-M. Cheong and H.-K. Jung, Korea Atomic Energy Research Institute, Daejeon, Korea

##### **Generation of the Ultrasonic Guided Waves in a Steamless Stainless Steel Pipe Using an Array Transducer**

---**S.-J. Song**, Y. H. Kim, J.-S. Park, and J.-S. Heo, School of Mechanical Engineering, Sungkyunkwan University, 300 Chonchon-dong, Jangan-gu, Suwon, Kyonggi-do, 440-746, Korea; J.-H. Kim and H.-S. Eom, Korea Atomic Energy Research Institute, Daejeon, Korea; K.-H. Im, Woosuk University, Department of Automotive Engineering, Wanju-Kun, Chonbuk, Korea

##### **Theoretical Aspects of Laser-Generated Guided Waves in Bonded Plates by Expansion of the Two-Layer Normal Mode Method**

---J. Du and **J. Cheng**, State Key Laboratory of Modern Acoustics, Nanjing University, No. 22 Hankou Road, Nanjing 210093, China; M. Li, Institute of Acoustics, Chinese Science Academy, Beijing 100080, P. R. China

#### **Characterization and Classification**

##### **Modeling and Simulation of the Effects of AC and DC Excitation Currents on Magnetic Particles Inspection Using an Extended 3D Finite Element Model**

---**S.-J. Lee**, Y. Melikhov, D. C. Jiles, M. Garton, R. Lopez, and L. Brasche, Iowa State University, Center for Aviation Systems Reliability, Ames, IA 50011

##### **Evaluation of Adhesive Bonded Properties by Using Wavelet Transform and Neural Networks from Laser-Generated Ultrasonic Guided Wave**

---L. Cui, J. Yang, and **J. Cheng**, State Key Laboratory of Modern Acoustics, Nanjing University, Nanjing 210093, P. R. China; M. Li, Institute of Acoustics, Chinese Science Academy, Beijing 100080, P. R. China

### **System and Method for Ultrasonic Image Reconstruction Using Mode-Converted Rayleigh Wave Technique**

---**D.-M. Suh**, Raynar/Kunjang College, HTVC 5114, Kaist, Yusong, Daejeon, Korea; J.-J. Sung, Sae-An Engineering Company, Korea; J.-G. Chung, Chonbuk National University, Chonju, Korea

## **Sensors and Probes**

### **Detection of Laser Excited Lamb-Wave Using Air-Coupled Transducer and Wave Mode Identification Using Wavelet Transform**

---**H. K. Ann**, N. G. Kwag, and C. M. Lee, Sae-An Engineering Corporation, #910 ByukSan Digital Vally, 481-10, Gasan-dong, KeumChun-Gu, Seoul, Korea; H. M. Kim and K. Y. Jhang, Graduate School of Hanyang University, Seoul, Korea

### **Modeling and Analysis of the Membrane-Behavior in Capacitive Micromachined Ultrasonic Transducer**

---S. S. Lee, **K.-B. Kim**, and B. Ahn, Center for Environment & Safety Measurement, Korea Research Institute of Standards and Science, Daejeon, Korea

### **Choice of the Distance Between the Pole-Pieces of the Electromagnet Yoke in a Magnetic Method of Material Testing**

---M. Komorowski, S. Gratkowski, and **T. Chady**, Faculty of Electrical Engineering, Technical University of Szczecin, Szczecin, Poland

### **An Interrogating Electric Field Simulation for Probes with Short Coplanar Electrodes**

---**Y. Bulbik**<sup>1,2</sup> and I. Chernykh<sup>2</sup>, <sup>1</sup>UNESCO Chair "New Materials and Technologies" at Krasnoyarsk State Technical University, Krasnoyarsk, Russia; <sup>2</sup>Siberian Aerospace University, Krasnoyarsk, Russia

### **Eddy Current and Magnetic Testing of Magnetic Material by Uniform Eddy Current Probe**

---**H. Hoshikawa**, K. Koyama, and S. Mitsuhashi, Nihon University, Izumicho Narashino Chiba 275-8575, Japan

### **Mode Extraction and Defect Detection Using a Multi-Channel Array with Magnetostrictive Transducer and Mode Extraction**

---**M. Murase**, T. Hayashi, M. Nagao, and Y. Okuda, Faculty of Engineering, Nagoya Institute of Technology, Nagoya, Aichi, Japan

## **New Applications**

### **Thermoelastic Generation of Resonant Ultrasonic Waves by a Pulsed Laser**

---K. E. Claytor, J. A. Tencate, and **T. N. Claytor**, Los Alamos National Laboratory, MS C914, Los Alamos, NM 87544

### **Analysis of Dispersion Characteristics of Circumferential Guided Waves and Detection of Feeder Cracking in Pressurized Heavy Water Reactor**

---Y.-M. Cheong, S.-S. Kim, D.-H. Lee, and **H. K. Jung**, Division Nuclear Materials Technology, Korea Atomic Energy Research Institute, Yusong P. O. Box 105, Daejeon, 305-600, Korea

### **Applications of the Helmholtz Coil for Eddy Current Testing of Ferromagnetic Materials**

---**J. Sung**, K. Jang, and S. Ku, Research and Development Center, Sae-an Engineering Corporation, Seoul, Korea; D. Suh, Kunjang College, Kunsan, Korea; M. Lee, Raynar Corporation, Daejeon, Korea

### **Remote Field Eddy Current Signal Modeling for the Gap Measurement of Neighboring Tubes**

---**H. K. Jung**, D. H. Lee, and Y. S. Lee, Nuclear Robot Laboratory, Korea Atomic Energy Research Institute, Yusong P. O. Box 105, Daejeon, 305-600, Korea

### **Advanced Ultrasonic Simulations in Complex Geometries**

---**M. Garton**, T. Gray, L. W. Schmerr, Jr., H.-J. Kim, and R. Huang, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

## **New Techniques, Instruments, and Systems**

### **Damage Detection in Plate Structures Using Laser Vibrometry and Sparse Ultrasonic Transducer Arrays**

---T. E. Michaels, J. E. Michaels, and B. Mi, School of Electrical and Computer Eng., Georgia Institute of Technology, 777 Atlantic Dr., NW, Atlanta, GA 30332-0250; M. Ruzzene and S. M. Jeong, School of Aero. Eng. Georgia Institute of Technology, Atlanta, GA 30332-0250

### **Using Ultrasound for Non-Invasive Slurry Characterization**

---J. A. Bamberger and M. S. Greenwood, Battelle Pacific Northwest National Laboratory, Richland, WA 99352

### **Air-Coupled Ultrasound Images of Spot Welds Having Sub-Wavelength Resolution**

---T. J. Potter, B. Ghaffari, and G. Mozurkewich, Ford Motor Company, Research and Advanced Engineering, MD 3083/SRL, P. O. Box 2053, Dearborn, MI 48121-2053

### **Lift-Off Point of Intercept (LOI) Behavior**

---J. H. V. Lefebvre, Defense Research and Development Canada, Ottawa, Ontario, Canada; J. M. S. Dubois, Royal Military College of Canada, Kingston, Ontario, Canada

### **Resonant Transmission of Air-Coupled Ultrasound Through Metallic Inserts in Honeycomb Sandwich**

---J. J. Peters, V. Dayal, D. J. Barnard, and D. K. Hsu, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

### **Acoustic Leak Location in Spacecraft Structures Using Dispersed Multimode Signals**

---R. A. Roberts, S. D. Holland, M. Strei, J. Song, and D. E. Chimenti, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011

### **Towards a Generic Manual Scanner for Nondestructive Inspection**

---D. J. Barnard, J. J. Peters, and D. K. Hsu, Iowa State University, Center for NDE, Ames, IA 50011

### **New NDT Equipment Concepts**

---V. Mengeling, D. Simonet, and S. Rolet, EADS Corporate Research Centre, 12 rue Pasteur, BP76, F-92152 SURESNES Cedex, France

## **Composite Materials**

### **Subsurface Defect Detection in FRP Composites Using Infrared Thermography**

---U. B. Halabe, A. Vasudevan, H. V. S. GangaRao, West Virginia University, Department of Civil and Environmental Engineering, Constructed Facilities Center, Morgantown, WV 26506-6103;

## **Infrastructure**

### **Evaluation of a Fiber Optic Strain Measurement System for Monitoring FRP Bridge Decks**

---P. Klinkhachom and G. M. Lonkar, Lane Dept. of Computer Science and Electrical Eng., West Virginia University, Morgantown, WV 26506-6103; U. B. Halabe and H. V. GanagaRao, Dept. Civil and Environmental Eng., West Virginia University, Morgantown, WV 26506-6103

### **Ultrasonic Study on Modulus of Elasticity and Nonlinearity Parameter (B/A) in Norway Spruce as a Function of Year Ring**

---T. Koponen, E. O. Haeggström, T. Karppinen, and R. Serimaa, University of Helsinki, Department of Physical Sciences, Gustav Hällströms gata 2, FIN-00014, Finland; P. Saranpää Finnish Forest Research Institute, Vantaa Research Centre, P. O. Box 18 FIN-01301, Finland

### **Study on Attenuation and Nonlinearity in ThermoWood Using Ultrasound**

---E. O. Haeggström, University of Helsinki, Department of Physical Sciences, Gustav Hällströms gata 2, FIN-00014, Finland

### **The Potential of Ultrasonic Surface Waves for Rail Inspection**

---D. Hesse and P. Cawley, RCNDE, Department of Mechanical Engineering, Imperial College London, United Kingdom

## **Design Manufacturing and Reliability**

### **Contribution of Modelling Tools to Aeronautic NDT**

---**V. Mengeling**, O. Petillon, and H. Voillaume, EADS Corporate Research Centre, 12 rue Pasteur, BP76, F-92152 Suresnes Cedex, France

### **NDE Procedure Validation and Use in NDE System Calibration for NDE Applications**

---**Ward D. Rummel**, D&W Enterprises, Ltd., 8776 W. Mountainview Lane, Littleton, CO 80125

### **On-Line, Real-Time NDE and Quality Assessment in the Precision Small Lot Manufacturing Environment**

---V. R. Dave, **D. A. Hartman**, M. J. Cola, W. H. King, Los Alamos National Laboratory, Nuclear Materials Technology, NMT-10: Manufacturing Process Science and Technology, P. O. Box 1663, MS E506, Los Alamos, NM 87545

### **Monitoring of Detection Probability in QNDE Devices for Storage Tanks**

---**Y. H. Michlin**, Quality Assurance and Reliability, Technion – Israel Institute of Technology, Technion City, Haifa 32000

### **Observing Effects of Particle Size for a Slurry Using Ultrasonic Diffraction Grating Spectroscopy**

---**M. S. Greenwood** and L. J. Bond, Pacific Northwest National Laboratory, Richland, WA 99352; A. Brodsky and L. Burgess, University of WA, Seattle, WA

**SESSION 29**  
**LAYERED MATERIALS AND INTERFACES**

- 3:30 PM**      **Ultrasonic Inspection of Thin Multilayers**  
---**M. K. Hinders**, Department of Applied Science, College of William & Mary, Williamsburg, VA 23187-8795; J. Hou and J. C. P. McKeon, Sonix, Inc., 8700 Morrisette Drive, Springfield, VA 22152
- 3:50 PM**      **Elastic Constants of Co/Pt Nano-Multilayers by Resonance Ultrasound Spectroscopy**  
---**N. Nakamura**, H. Ogi, and M. Hirao, Graduate School of Engineering Science, Osaka University, Machikaneyamacho 1-3, Toyonaka, Osaka 560-8531, Japan
- 4:10 PM**      **Application of SAFT to Layered, Anisotropic Media**  
---C. Engstrand and **R. Kline**, San Diego Center for Materials Research, San Diego State University, San Diego, CA 92182
- 4:30 PM**      **Characterization of Interfacial Properties of Solids in Elasto-Plastic Contact by an Ultrasonic Method**  
---A. Baltazar, J.-Y. Kim, and **S. I. Rokhlin**, The Ohio State University, Nondestructive Evaluation Program, Edison Joining Technology Center, 1248 Arthur E. Adams Drive, Columbus, OH 43221

**SESSION 30**  
**STRUCTURAL HEALTH MONITORING II**

- 3:30 PM**      **Study of Plate Waves Fields Generated by Piezo-Arrays and Their Application to Structural Health Monitoring**  
---**B. Koehler**, F. Schubert, and N. Meyendorf, Fraunhofer IZFP Dresden, Kruegerstrasse 22, D01326 Dresden, Germany; J. L. Blackshire, Air Force Research Laboratory, Nondestructive Evaluation Branch, Wright-Patterson AFB, OH 45449
- 3:50 PM**      **Experimental Study of Plate Waves in Isotropic and Anisotropic Materials for Structural Health Monitoring**  
---**B. Koehler**, Branch Lab EADQ, Fraunhofer IZFP, Kruegerstrasse 22, 01326 Dresden, Germany
- 4:10 PM**      **A Guided Ultrasonic Waves Array for Structural Integrity Monitoring**  
---**P. Fromme**, Department of Mechanical Engineering, University College London, London, United Kingdom; P. Wilcox, Department of Mechanical Engineering, University of Bristol, Bristol, United Kingdom; M. Lowe and P. Cawley, Department of Mechanical Engineering, Imperial College London, London, United Kingdom
- 4:30 PM**      **Experimental Phased Array Focusing in Pipe Using Ultrasonic Guided Waves**  
---**B. J. Gavigan**, L. Zhang, Z. Sun, and J. L. Rose, The Pennsylvania State University, Engineering Science and Mechanics, 212 EES Building, University Park, PA 16802
- 4:50 PM**      **Application of Guided Wave Signal Processing to Acoustic Emission Data**  
---**P. D. Wilcox**, Department of Mechanical Engineering, University of Bristol, Bristol, United Kingdom

**SESSION 31**  
**EDDY CURRENT PROBES AND APPLICATIONS**

- 3:30 PM**      **A Novel Rotating Magnetic Field Eddy Current Transducer for the Examination of Fuel Channels in PHWR Nuclear Power Plants**  
---**R. Grimberg**<sup>1</sup>, L. Udpa<sup>2</sup>, S. Udpa<sup>2</sup>, and A. Savin<sup>1</sup>, <sup>1</sup>Nondestructive Testing Department, National Institute of Research and Development for Technical Physics, 47 D. Mangeron Blvd., Iasi 700050, Romania; <sup>2</sup>Department of Electrical and Computer Engineering, Michigan State University, 2120 Engineering Building, East Lansing, MI 48824-1226
- 3:50 PM**      **Metallic Bead Detection by Using Eddy-Current Testing Probe with SV-GMR Sensor**  
---**S. Yamada**, K. Chomsuwan, T. Hagino, M. Iwahara, and H. Tian, Institute of Nature and Environmental Technology, Kanazawa University, 2-40-20 Kodatsuno, Kanazawa 920-8667, Japan
- 4:10 PM**      **Detection and Measurement of Fatigue in Ferromagnetic and Austenitic Steels Using Eddy Current Sensor Arrays**  
---**R. Grimberg**, A. Savin, and R. Steigmann, Nondestructive Testing Department, National Institute of Research and Development for Technical Physics, 47 D. Mangeron Boulevard, Iasi, 700050, Romania
- 4:30 PM**      **Characteristics of Remote Field Eddy Current Signals from Small Diameter Gas Pipes**  
---**Y.-K. Shin**, J.-H. Lee, Y.-T. Lee, and S.-C. Song, School of Electronic and Information Engineering, Kunsan National University, San 68, Miryong-dong, Kunsan, Chonbuk, 573-701, Korea
- 4:50 PM**      **Electroelastic Effect for Near-Surface Eddy Current Residual Stress Assessment**  
---F. Yu and **P. B. Nagy**, Department of Aerospace Engineering and Engineering Mechanics, University of Cincinnati, ML 0070, Cincinnati, OH 45221-0070

**SESSION 32**  
**PODS AND NDE RELIABILITY**

- 3:30 PM**      **Linear Array Ultrasonic Transducers: Sensitivity and Resolution Study**  
---**V. A. Kramb**, University of Dayton, University of Dayton Research Institute, Structural Integrity Division, 300 College Park, Dayton, OH 45469-0120
- 3:50 PM**      **The Reflection of Ultrasound from Partially Contacting Rough Cracks**  
---**R. Thomas**, **D. Liaptsis**, and **B. W. Drinkwater**, Department of Mechanical Engineering, University of Bristol, United Kingdom
- 4:10 PM**      **Alternative to Single-Pixel C-Scan Analysis for Measuring POD**  
---**C. Annis**<sup>1</sup> and **D. Annis**<sup>2</sup>, <sup>1</sup>Statistical Engineering, Palm Beach Gardens, FL 33418-7161; <sup>2</sup>Naval Postgraduate School, Monterey, CA 93940
- 4:30 PM**      **Guided Wave Particle Motion in a Hollow Cylinder**  
---**L. Zhang** and **J. L. Rose**, Department of Engineering Science and Mechanics, the Pennsylvania State University, University Park, PA 16802
- 4:50 PM**      **An Approach Toward Determining Default POD Curves for Ultrasonic Billet Inspections**  
---**R. B. Thompson**<sup>1</sup>, **W. Q. Meeker**<sup>2</sup>, **C.-P. Chiou**<sup>1</sup>, and **Y. Wang**<sup>2</sup>, Iowa State University, <sup>2</sup>Center for NDE, 1915 Scholl Road, and <sup>2</sup>Department of Statistics, Ames, IA 50011
- 5:10 PM**      **A Knowledge Based Expert System to Aid Theoretical Ultrasonic Flaw Modelling**  
---**R. J. Robinson** and **A. McNab**, Centre for Ultrasonic Engineering, University of Strathclyde, 204 George Street, Glasgow, Scotland, G1 1XW, United Kingdom

Friday, July 30, 2004

**SESSION 33**  
**BENCHMARK COMPARISONS**  
**L. W. Schmerr, Jr., Chairperson**

- 8:30 AM**      **Results of 2004 UT Modeling Benchmark Obtained with CIVA at CEA: Beam Modeling and Flaws Signal Prediction**  
---S. Mahaut, S. Chatillon, **R. Raillon**, and M. Darmon, CEA/LIST, CEA Saclay, 91191 Gif-sur-Yvette, France
- 8:50 AM**      **Prediction of Ultrasonic Flaw Signals and Model-to-Experiment Comparison**  
---**M. Spies**, Physical Basics Department, Fraunhofer Institute for Nondestructive Testing, IZFP, University of Saarland, Building 37, 66123, Saarbruecken, Germany
- 9:10 AM**      **Numerical Modeling Results Obtained with EFIT: 2004 Ultrasonic Benchmark**  
---**R. Marklein** and K. J. Langenberg, University of Kassel, Department of Electrical Engineering and Computer Science, Electromagnetic Theory, D-34109 Kassel, Germany
- 9:30 AM**      **Ultrasonic Benchmarking with UTDefect**  
---**A. Bostrom**, Department of Applied Mechanics, Chalmers University of Technology, Goteborg, Sweden
- 9:50 AM**      **Patch Element Model for the Evaluation of Displacement Fields Within an Elastic Solid from a Non-Contact Immersion Transducer: Application to the 2004 Ultrasonic Benchmark Problem**  
---**C. V. Krishnamurthy**, M. Shankar, and K. Balasubramaniam, Centre for NonDestructive Evaluation, Department of Mechanical Engineering, Indian Institute of Technology, Chennai, India
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Model Predictions to the 2004 Ultrasonic Benchmark Problems**  
---**S.-J. Song** and J.-S. Park, Sungkyunkwan University, School of Mechanical Engineering, 300 Chonchon-dong, Jangan -gu, Suwon, Kyounggi-do, 440-746, Korea; Y.-H. Choi, S.-C. Kang, and K.-J. Kim, Korea Institute of Nuclear Safety, Daejeon, Korea
- 10:50 AM**      **Simulating the Ultrasonic Experiments of the 2004 Ultrasonic Benchmark Problem**  
---**L. W. Schmerr, Jr.**<sup>1,2</sup>, H.-J. Kim<sup>1</sup>, and A. Lopez-Sanchez<sup>1,2</sup>, <sup>1</sup>Center for NDE and the <sup>2</sup>Department of Aerospace Engineering, Iowa State University, Ames, IA 50011
- 11:10 AM**      **Simplified Numerical Analysis of ECT Probe (Eddy Current Benchmark Problem 3)**  
---R. Sikora, S. Gratkowski, **T. Chady**, and K. Stawicki, Faculty of Electrical Engineering, Technical University of Szczecin, Poland
- 11:30 AM**      **Modeling of the World Federation's Second MFL Benchmark Problem Using the Element-Free Galerkin Method**  
---**Z. Zeng**, B. Shanker, S. Udpa, and L. Udpa, Department of Electrical and Computer Engineering, Michigan State University, 2120 Engineering Building, East Lansing, MI 48824
- 11:50 AM**      **2D-Numerical Simulation Results of Magnetic Flux Leakage Benchmark Problem 1**  
---M. Ruch, ENDE Comisión Nacional de Energía Atómica, Argentina; J. P. A. Bastos, GRUCAD, Universidad de Santa Catarina, Brazil; **Presenter: M. I. López Pumarega**
- 12:10 PM**      **Adjourn**

Friday, July 30, 2004

**SESSION 34**  
**LASER ULTRASONICS**  
**M. Dubois, Chairperson**

- 8:30 AM**      **Laser Based Ultrasonic Technique for All-Optical Determination of Photo-Elastic Constants**  
---**R. J. Filkins**<sup>1</sup>, G. J. Saulnier<sup>2</sup>, and P. K. Das<sup>3</sup>, <sup>1</sup>GE Global Research, Niskayuna, NY;  
<sup>2</sup>Rensselaer Polytechnic Institute, Troy, NY; <sup>3</sup>University of California, San Diego, CA
- 8:50 AM**      **Analysis of Laser-Ultrasonic Dispersive SAW Waveforms for Thin-Film Inspection**  
**C. M. Flannery**, Engineering Division, Colorado School of Mines, Golden, CO 80305; D. C. Hurley,  
Materials Reliability Division, National Institute of Standards and Technology, Boulder, CO 80305
- 9:10 AM**      **Laser Ultrasonic Inspection of Subsurface Defects in Flip-Chips**  
---**T. L. Steen** and T. W. Murray, Boston University, Department of Aerospace and Mechanical  
Engineering, 110 Cummington St., Boston, MA 02215
- 9:30 AM**      **Broadband Attenuation Measurement for an Absorbing Plate**  
---**K. Luangvilai** and L. J. Jacobs, School of Civil and Environmental Engineering, Georgia Institute  
of Technology, Atlanta, GA 30332-0355; P. D. Wilcox, University of Bristol, Department of  
Mechanical Engineering, Bristol, BS8 1TR, United Kingdom; M. J. S. Lowe, Imperial College,  
Department of Mechanical Engineering, London, SW7 2AZ, United Kingdom; J. Qu, School of  
Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA 30332-0405
- 9:50 AM**      **Improved Laser Technology for Industrial Laser Ultrasonics**  
---**T. Drake**, M. Osterkamp, K. Yawn, and T. Do, Lockheed Martin, Laser Ultrasonic Technology  
Center, Fort Worth, TX 76101
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Laser-Ultrasonic Inspection of Mg/Al Castings**  
---**A. Blouin**, D. Lévesque, and J.-P. Monchalain, Industrial Materials Institute, National Research  
Council of Canada, 75 de Mortagne Blvd., Boucherville, Quebec, J4B 6Y4, Canada
- 10:50 AM**      **Simple Laser-Ultrasonic System Using a Single-Frequency Pulsed Laser Oscillator**  
---**A. Blouin**, L. Carrion, C. Padioleau, P. Bouchard, and J.-P. Monchalain, Industrial Materials  
Institute, National Research Council of Canada, 75 de Mortagne Blvd., Boucherville, Quebec, J4B  
6Y4, Canada
- 11:10 AM**      **Progress Towards a Portable Laser-Based Ultrasound Sensor Using Gas-Coupled Laser  
Acoustic Detection**  
---**J. N. Caron**, D. M. Huber, and C. J. Rollins, Research Support Instruments, Lanham, MD 20706
- 11:30 AM**      **Laser Acoustic Imaging of Film Bulk Acoustic Resonator (FBAR) Lateral Mode Dispersion**  
---**K. L. Telschow**, Physics Department, Idaho National Engineering and Environmental  
Laboratory, Idaho Falls, ID 83415-2209
- 11:50 AM**      **An Innovative Interferometer for Industrial Laser Ultrasonic Inspection**  
---**B. Pouet**, S. Breugnot, and P. Clemenceau, Bossa Nova Technologies, 1234 Cabrillo Avenue,  
Venice, CA 90291
- 12:10 PM**      **Adjourn**

Friday, July 30, 2004

**SESSION 35**  
**X-RAY DEVELOPMENTS AND APPLICATIONS**

- 8:30 AM**      **A Review of the Radiography Simulation Efforts**  
---F. Inanc, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 8:50 AM**      **Application of NDE Simulation to Estimate Probability of Detection**  
---J. Gray, I. Zhang, and I. Gray, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 9:10 AM**      **X-Ray Bremsstrahlung Spectrum: Modeling and Experiment**  
---S. Wendt and J. Gray, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 9:30 AM**      **3D Reconstruction from Narrow-Angle Radiographs**  
---L. Fournier, L. Chatellier, B. Charbonnier, and B. Chassignole, Electricite de France, Research and Development Division, 6 Quai Watier, BP 49, 78401 Chatou, France
- 9:50 AM**      **Simulation of Phase Contrast Imaging for Mesoscale NDE**  
---M. Aufderheide, A. Barty, and H. Martz, Lawrence Livermore National Laboratory, L-096, P. O. Box 808, Livermore, CA 94551
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **Estimation of the Thickness of Overlapping Materials by Using Neural Networks**  
---N. Reen, I. N. Tansel, P. Chen, and X. Wang, Florida International University, Mechanical Engineering Department, Center for Engineering and Applied Science, 10555 West Flager Street, (EAS-3473), Miami, FL 33174
- 10:50 AM**      **Quantitative Corrosion Inspection in Pipelines by Radiography**  
---K. Edalati, N. Rastkhah, A. Kermani, and M. Seiedi, Department of NDT, Protection and Safety Technology Center, Atomic Energy Organization of Iran, Tehran, Iran
- 11:10 AM**      **An Algorithm for Decomposition of the Charged Particle Scattering Cross Sections into Singular and Regular Components**  
---F. Inanc, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 11:30 AM**      **Development of a High-Resolution CT System and 3D Data Visualization Tool**  
---J. Zhang, C. Zhou, T. Jensen, and J. Gray, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 12:10 PM**      **Lunch**

Friday, July 30, 2004

**SESSION 36**  
**NEW INSTRUMENTS AND SYSTEMS**

- 8:30 AM**      **Non-Contact Reading of Resistive Strain Gages**  
---**W. F. Schmidt**, University of Arkansas, Mechanical Engineering Department, Fayetteville, AR 72701; **O. H. Zinke**, International Validators, Inc., 817 North Jackson, Fayetteville, AR 72701
- 8:50 AM**      **Adaptive Correction for Acoustic Imaging in Difficult Materials**  
---**S. D. Sharples**, **I. J. Collison**, **M. Clark**, and **M. G. Somekh**, School of Electrical and Electronic Engineering, University of Nottingham, University Park, Nottingham, NG7 2RD, United Kingdom
- 9:10 AM**      **A Two-Wave Mixing Interferometer for Phase and Wavelength Demodulation of Fiber-Optic Ultrasound Sensors**  
---**Y. Zhou**, **Y. Qiao**, and **S. Krishnaswamy**, Center for Quality Engineering and Failure Prevention, Northwestern University, Evanston, IL 60208-3020
- 9:30 AM**      **Elastodynamic Green's Functions for Laminated Piezoelectric Cylinders**  
---**H. Bai**, Lakehead University, Mechanical Engineering, 955 Oliver Road, Thunder Bay, Ontario P7B 5E1, Canada; **A. Shah**, University of Manitoba, Civil Engineering, Manitoba, Canada, S. B. Dong, University of California, Civil and Environmental Engineering, Los Angeles, CA 90095-1593
- 9:50 AM**      **A Boroscope Based Optical Surface Characterization Approach**  
---**F. Inanc**, Iowa State University, Center for NDE, 1915 Scholl Road, Ames, IA 50011
- 10:10 AM**      **Coffee Break**
- 10:30 AM**      **The Remotely Operated Nondestructive Examination System for Examining the Knuckle Region of Hanford's Double Shell Waste Tanks**  
---**S. L. Crawford** and **A. F. Pardini**, Pacific Northwest National Laboratory, Richland, WA 99352
- 10:50 AM**      **Detection of Shape and Depth of Defects in Aluminum Structures Using SQUIDS**  
---**R. Selim**, **M. McFarlane**, and **J. Mast**, Physics, Computer Science and Engineering Department, Christopher Newport University, Newport News, VA 23606; **B. Wincheski**, NASA Langley Research Center, Hampton, VA 23681; **J. Simpson**, Lockheed Martin Space Operation, Hampton, VA 23681
- 11:10 AM**      **Crack Inspection by EddyTherm**  
---**G. Zenzinger**, **J. Bamberg**, and **P. Nutz**, MTU Aero Engines, 80995 Munich, Germany
- 11:30 AM**      **A Low Cost Comparative Pulsed Eddy Current Inspection System for Defect Detection**  
---**N. Eua-anant**, Khon Kaen University, Department of Computer Engineering, Khon Kaen, 40002, Thailand
- 11:50 AM**      **Adjourn**

## AUTHOR LISTING

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