

# **18th World Conference on Non-Destructive Testing 2012**

## **(WCNDT 2012)**

**Durban, South Africa  
16-20 April 2012**

**Volume 1 of 3**

**ISBN: 978-1-62748-093-2**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by the British Institute of Non-Destructive Testing  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact the British Institute of Non-Destructive Testing  
at the address below.

British Institute of Non-Destructive Testing  
Newton Building  
St. George's Avenue  
Northampton, NN2 6JB  
United Kingdom

Phone: 44 0 1604 89 3811  
Fax: 44 0 1604 89 3861

[info@bindt.org](mailto:info@bindt.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## VOLUME 1

### 1. SESSION – KEYNOTE LECTURE

Guided Waves for NDT and Permanently Installed Monitoring.....	1
<i>P. Cawley, Frederick Cegla, Andrea Galvagni</i>	
Methods of Determining Core Competencies of NDT Personnel.....	16
<i>R. Potter</i>	
A Personal Perspective on the Early Developments in Inspection Qualification and Reliability Assessment in the UK Nuclear Industry.....	17
<i>A. Rogerson</i>	
Welding and NDT - Enabling Technologies to Improve the Global Quality of Life.....	26
<i>C. Smallbone</i>	
NDT in Civil Engineering: Research, Application, Validation and Training.....	37
<i>H. Wiggernhauser, A. Taffe</i>	

### 2. SESSION – AFNDT CONFERENCE

Advanced NDT Techniques: A New NDT Method for LPG Storage Tanks Inspection in Tunisia.....	50
<i>K. Bouaziz</i>	
Eddy Current Testing: Profiled Eddy Current Probes for Complex Shape Inspection.....	52
<i>H. Jansen</i>	
Magnetic Particle Inspection: Characterisation of the Magnetic Field for Various Magnetization Techniques.....	63
<i>E. Motukisi</i>	
Radiographic Testing: Increased Detection Sensitivity Using Optimum Source to Object Distance.....	72
<i>J. Cowan</i>	
Advanced Ultrasonic Blade Root Examination.....	82
<i>Dion Agostinho, Tumelo C. Machaha, Jean M. Puybouffat, Fabrice Foucher</i>	
The Contribution of Numeric Modeling During Inspection Design and Inspection Qualification.....	83
<i>A. Prins, G. Wilson</i>	
The Effectiveness of IAEA /AFRA Projects in Development and Sustainability of NDT Capabilities in Sudan.....	84
<i>D. Omar, M. Zeyada</i>	
Radiotracers Applications for Diagnosis in the Moroccan Industry .....	85
<i>A. Bensitel, R. Alami, A. Saadaoui, A. Benahmed, A. Ouardi</i>	
NDE Scope, Comparison Between ASME Section 1 and Chinese Standard DL 5007, Lessons Learned from Khartoum North Power Station Extension Project.....	86
<i>S. Abdalla</i>	
The Evaluation of the Sonic Attenuation in Different Microstructures .....	87
<i>M. Hassan, A. Elbadaw</i>	
Development of New Hardware System for Gamma Scanning.....	88
<i>A. Benahmed, A. Saadaoui, R. Alami, A. Bensitel</i>	
Future Success of NDT Training in Africa .....	89
<i>W. Claassens</i>	
Analysis of Stress Behaviours of Steel Heated and Submitted to the Charge by NDT Methods.....	90
<i>M. Zergoug, S. Makhlouf, Y. Benkedda</i>	
NDT Application of During Chad-Came Roon Pipe Line .....	94
<i>M. Bakoura</i>	
Functional Inspection Industry in Nigeria: An Imperative for Sustainable Development .....	95
<i>G. Aire, M. Adegbite</i>	
The State of Non Destructive Testing in Zambia .....	100
<i>F. Chitalu, K. Nyirenda</i>	
Parallel Classification of Rolling Element Bearing Faults Based on Fuzzy Logic and Kohonen's Self-organising Maps.....	106
<i>J. Nkuna, T. Lago</i>	
Role of the International Atomic Energy Agency in Promotion of Radiation Based Non Destructive Testing Techniques.....	107
<i>P. Bissel, M. Haji-Saeid, M. Venkatesh</i>	
AFRA's Role in NDT in Africa - Past, Present and Future .....	109
<i>N. Jarvis, J. Guild</i>	

### 3. SESSION: CIVIL STRUCTURES, CONCRETE

Characterization of Strength Development of Concrete Using Ultrasonic Method.....	110
<i>K. Sanish, M. Santhanam</i>	

<b>An Instrument for Detecting Corrosion in Anchorage Zones of Parallel Wire Cables Using Guided Waves.....</b>	120
<i>J. Xu, X. Wu, Yihua Kang</i>	
<b>Non-destructive Tests Aimed at Determining the Thickness of the Concrete Shell of a Heat Pipe Carrying Tunnel.....</b>	126
<i>K. Schabowicz, J. Hola, T. Gorzelanczyk</i>	
<b>Condition Assessment of Reinforced Concrete Structures Using Automated Multi-sensor Systems.....</b>	134
<i>J. Kurz, M. Stoppel, A. Taffe, C. Boller</i>	
<b>Signal Processing for Air-Coupled Impact-Echo using Microphone Arrays .....</b>	142
<i>D. Algernon, H. Ernst, K. Dressler</i>	
<b>A Point of View About Diagnostic Investigation for Metallic Tie-rods Between History and Innovation.....</b>	150
<i>A. Bianco</i>	

#### **4. SESSION: CONDITION TOMOGRAPHY**

<b>Characteristics of the Micro-Focus X-ray Tomography System at the MIXRAD Facility at NECSA in South Africa .....</b>	160
<i>J. Hoffman, F. De Beer</i>	
<b>Novel Techniques for High-resolution Computed Tomography of Optoelectronic Devices .....</b>	172
<i>V. Voland, Michael Salamon, Stefan Reisinger, Stefan Schropfer, Norman Uhlmann</i>	
<b>High Resolution X-ray Computed Tomography of Fibre and Particle Filled Polymers.....</b>	183
<i>J. Kastner, D. Salaberger, B. Plank</i>	
<b>Fast and Analytical Exact Reconstruction of Large CT-Volumes .....</b>	192
<i>F. Herold, O. Tischenko, C. Seidl, M. Kurfiss</i>	
<b>3-dimensional X-ray Inspection of Very Large Objects is No Longer a Promise Only - 600 KV Digital Laminography Offers a Solution .....</b>	202
<i>M. Kurfiss, G. Streckenbach</i>	
<b>High Quality Reconstruction of Insufficient Tomographic Data by a New Iterative Procedure .....</b>	208
<i>A. Kupsch, A. Lange, M. Hentschel, R. Grothausmann, T. Arlt, I. Manke</i>	
<b>Reconstruction of Limited View Tomography Data by DIRECTT .....</b>	216
<i>A. Kupsch, A. Lange, M. Hentschel, S. Luck, V. Schmidt, A. Hilger, I. Manke, F. Garcia-Moreno</i>	
<b>Computer Tomography Has Arrived in an Automated Inspection Process Combining Material and Geometry Analyses .....</b>	225
<i>B. Becker, D. Maier, C. Reinhart</i>	
<b>CIVA Computed Tomography Modeling .....</b>	234
<i>S. Legoupil, R. Fernandez, M. Costin, D. Tisseur, A. Leveque</i>	
<b>Comparison of Phase Contrast X-ray Computed Tomography Methods for Non-destructive Testing of Materials .....</b>	243
<i>J. Kastner, B. Plank, C. Kottler, V. Revol</i>	
<b>Investigation of the Isochronal Annealing of Argon Ion Bombarded GaAs with Surface Brillouin and Raman Scattering.....</b>	252
<i>K. Jakata, D. Wamwangi, C. Sumanya, B. Mathe, R. Erasmus, D. Comins, M. Naidoo, T. Derry</i>	
<b>The Influence of Data Filtering on Dimensional Measurements with CT .....</b>	253
<i>M. Bartscher, A. Staude, K. Ehrig, A. Ramsey</i>	
<b>Fully Automated 3D Metrology and Defect Analysis with High-Resolution 300 kV Microfocus Computed Tomography .....</b>	266
<i>O. Brunke</i>	

#### **5. SESSION: CONDITION MONITORING**

<b>Structural Health Monitoring System for the Crane Based on Bragg Grating Sensors .....</b>	272
<i>K. Ding, Zhi-jie Wang, Qiao Song</i>	
<b>The Removal of Speckle Noise from Torsional Laser Doppler Vibrometer Signals in Machine Health Monitoring.....</b>	277
<i>A. Oberholster, S. Heyns, M. Newby</i>	
<b>Efficient Acquisition of Baseline Signals in Ultrasonic Guided Wave Structural Health Monitoring (SHM) .....</b>	290
<i>O. Putkis, A. Croxford</i>	
<b>Quantification and Management of Grid Interaction Effects on Turbo-Generator Sets.....</b>	300
<i>M. Newby, R. Scheepers</i>	
<b>Condition Monitoring of High Temperature, High Stress Components by Means of Core Sampling and Friction Weld Repair .....</b>	309
<i>M. Newby, P. Doubell, D. Hattingh, I. Wedderburn</i>	
<b>Vibration based condition monitoring under fluctuating load and speed conditions.....</b>	320
<i>P. Heyns, C. Stander, T. Heyns, K. Wang, H. Ngwawgwa</i>	
<b>Spectral Features of the Clarinet Sound Revealed by the Set of STFT-Based Parameters .....</b>	327
<i>T. Wilczynski, L. Gelman, P. Kleczkowski</i>	
<b>An Acoustic Method for Condition Classification in Live Sewer Networks .....</b>	335
<i>Z. Feng, K. Horoshenkov, M. Bin Ali, S. Tait</i>	
<b>See the Invisible - Innovative Technology to Predict Safety .....</b>	344
<i>I. Einav</i>	
<b>Automatic Amplitude Estimation Strategies for CBM Applications .....</b>	354
<i>T. Lago</i>	
<b>SHM of Rotating Machinery - Non-classical Approach.....</b>	363
<i>T. Uhl</i>	

<b>Fusion of Maintenance and Control Data: A Need for the Process .....</b>	364
<i>D. Galar, U. Kumar, E. Juuso, S. Lahdelma</i>	

## **6. SESSION: EDUCATION**

<b>The Different Qualification Systems For NDE Personnel .....</b>	380
<i>R. Aljah</i>	
<b>Closing the Gap between Customer Expectations and NDT Services Being Provided .....</b>	384
<i>H. Fourie</i>	
<b>The Challenges between the Older Generation and New Era Level 3's.....</b>	385
<i>H. De Wet, H. Barnard</i>	
<b>Phased Array Training in Olympus NDT.....</b>	386
<i>M. Moles</i>	
<b>The Current Situation and Development of Non-Destructive Testing in Chinese Higher Education .....</b>	394
<i>J. Ji, Y. Wang, Y. Tu</i>	
<b>The Current Situation and Outlook of the NDT Personnel Certification in China.....</b>	399
<i>Y. Wang, J. Ji, Y. Tu</i>	
<b>Quality Management System in NDT Training Center .....</b>	406
<i>K. Sahaimi</i>	
<b>Implementation of New National Standard SDOS 05-2010 'regulations on Strain Stress State Personnel Certification', 5 Year Experience in the Field of Strain Testing NDT Personnel Certification .....</b>	407
<i>S. Kopitov, M. Solovieva, G. Batov</i>	
<b>NDT Training, Working with Generation X .....</b>	410
<i>A. Mahomed</i>	
<b>Qualification and Certification of NDT Personnel in Ukraine in Compliance with Requirements of International Standards.....</b>	416
<i>V. Radko</i>	

## **7. SESSION: ELECTROMAGNETIC, EDDY CURRENT METHODS**

<b>Eddy Current Thickness Monitoring of Aerospace Technics Coatings and Constructions .....</b>	420
<i>V. Syasko, I. Pilatova, A. Ivkin</i>	
<b>Locating Magnetite on the Steam Generator Tubes with Eddy Current.....</b>	433
<i>T. Jappinen, K. Lahdenpera, S. Ala-Kleme</i>	
<b>Development of Pulsed Eddy Current Testing System for Wall Thinning through Insulation with Ferromagnetic Cladding .....</b>	442
<i>X. Wu, H. Ke, C. Huang, Z. Xu</i>	
<b>Modern Electromagnetic Equipment for Non-Destructive Testing.....</b>	448
<i>A. Shubochkin, S. Klyuev, A. Efimov</i>	
<b>Signal Reconstruction and Feature Extraction in Pulsed Eddy Current Stimulated Thermography for Aerospace Composites .....</b>	456
<i>Y. He, G. Tian, M. Pan, D. Chen, F. Luo</i>	
<b>Innovative Flexible Eddy Current Probes for the Inspection of Complex Parts .....</b>	462
<i>B. Marchand, J. Decitre, O. Casula</i>	
<b>A Novel Approach for the Eddy Current Inspection of the Aerospace Structures Based on the Signal Modeling and Signal Processing .....</b>	471
<i>J. Szlagowska Spychalska, K. Dragan, D. Kukla, W. Spychalski, K. Kurzydlowski</i>	
<b>Surface Inspection ABC Of Eddy Current Array Application .....</b>	481
<i>J. Bureau, R. Ward, A. Julien</i>	
<b>Measuring the Surface Residual Stresses in Shot Peened Steel Components by Magnetic Barkhausen Noise Method.....</b>	487
<i>C. Gur, S. Savas</i>	
<b>The First 20 Years of the A.C. Field Measurement Technique.....</b>	494
<i>M. Lugg</i>	
<b>Application of Frequency Spectrum Behaviour in Pulsed Eddy Current NDE.....</b>	501
<i>G. Tian, Y. He, I. Adewale, A. Simm</i>	
<b>New Hand-Held Eddy Currents Flaw Detector .....</b>	502
<i>V. Uchanin, G. Lutenco, A. Dshagjan, A. Opanasenko</i>	
<b>Eddy Current Array Technology for Life Extension of Gas Turbine Rotor Components .....</b>	N/A
<i>G. Bechinini, M. Bandini</i>	
<b>Development of Novel EC-GMR Sensor Systems for Inspection of Multilayer Structures with Steel Fasteners .....</b>	510
<i>G. Yang, Y. Deng, X. Liu, L. Udpa, S. Udpa</i>	

## **8. SESSION: GUIDED WAVES**

<b>Ultrasonic Guided Wave Testing of Cylindrical Bars.....</b>	511
<i>M. Shoji, T. Sawada</i>	

<b>Guided Wave Tomography for Bends.....</b>	521
<i>A. Volker, T. Van Zon</i>	
<b>Experimental Assessment of the Performance of Guided Wave Travel Time Tomography .....</b>	531
<i>A. Volker, R. Vos</i>	
<b>Multiple Defect Detection by Applying the Time Reversal Principle on Dispersive Waves in Beams .....</b>	540
<i>R. Ernst, J. Dual, M. Weder</i>	
<b>Simulation of Ultrasonic Guided Wave Inspection in CIVA Software Platform.....</b>	549
<i>B. Chapuis, K. Jezzine, V. Baronian, D. Segur, A. Lhemery</i>	
<b>Ultrasonic Thickness Measurements of Sub-millimetre Thickness Samples.....</b>	559
<i>K. McAughey, R. Edwards, M. Potter, S. Dixon</i>	
<b>Higher Order Modes Cluster (Home) Guided Waves Technique For Corrosion Detection.....</b>	569
<i>K. Balasubramanian, S. Annamalai, K. Venkatraman</i>	
<b>Guided Wave Inspection of High Temperature Pipe-work .....</b>	570
<i>M. Evans, S. Butler</i>	
<b>Transverse Bends and Plate Guided Ultrasonic Waves .....</b>	577
<i>P. Rajagopal, A. Ramdas, K. Balasubramanian</i>	

## **9. SESSION INVITED OVERVIEW TALKS**

<b>A Review Digital Radiography in the Service of Security .....</b>	583
<i>R. Pincu, O. Kleinberger-Riedrich</i>	
<b>NDT: Surfing the Electromagnetic Spectrum .....</b>	591
<i>H. Ringermacher</i>	
<b>Field Radiography Utilizing Advanced Digital Detector Arrays (DDAs): Improving Safety and Speed.....</b>	611
<i>S. Telesz, J. Gomez</i>	
<b>Real-time Monitoring System for Defects Detection in Wind Turbine Structures and Rotating Components.....</b>	615
<i>T. Gan, S. Soua, V. Dimlaye, K. Burnham</i>	
<b>Pipeline Integrity Management System Centralized Approach for Immediate Defect Repair Prioritization and Future Risk-based Mitigation Strategies .....</b>	629
<i>F. Chembe, S. Ruik Beyhaut</i>	
<b>My Life as a Women in NDT.....</b>	638
<i>G. Long</i>	
<b>The Quest for Digital X-ray Detectors in NDT, An Overview of Technical Solutions That Made it to the Market and Some That Did Not.....</b>	639
<i>P. Willems</i>	
<b>Condition Monitoring Techniques-Present and Future .....</b>	640
<i>L. Gelman</i>	
<b>Guided Wave Testing for Touch Point Corrosion.....</b>	641
<i>D. Alleyne</i>	
<b>Thermographic Techniques for the Detection of Cracks in Metallic Components.....</b>	648
<i>D. Almond</i>	
<b>Air Coupled Ultrasonic NDT and Its Applications.....</b>	649
<i>K. Balasubramanian</i>	
<b>Frontiers of Total Quality Management with Emphasis on NDE.....</b>	650
<i>B. Venkatraman</i>	
<b>Trends and Stakes of NDT Simulation.....</b>	652
<i>P. Calmon</i>	
<b>Holistically Evaluating the Reliability of NDE Systems - Paradigm Shift .....</b>	653
<i>C. Mueller, M. Bertovic, M. Pavlovic, D. Kanzler, U. Ewert, J. Pitkanen, U. Ronneteg</i>	
<b>Acoustic Emission and its NDT Applications .....</b>	667
<i>P. Cole</i>	
<b>Light Scattering Techniques Applied to NDE .....</b>	668
<i>J. Comins</i>	
<b>Ultrasonic NDT of a Corrugated Material: Pandora's Box and a Journey Through Ultrasonics .....</b>	670
<i>N. Declercq</i>	
<b>Essential Parameters and Conditions for Optimum Image Quality in Digital Radiology .....</b>	671
<i>U. Ewert, U. Zscherpel, M. Jechow</i>	
<b>Neutron Imaging - Practice and Role As a Complementary NDE Technique to X-ray Imaging.....</b>	681
<i>F. De Beer, M. Radebe</i>	
<b>Material State Awareness and NDE in CFRP Aerospace Structures.....</b>	685
<i>T. Gordon, R. Bossi</i>	
<b>IR Thermography Applied to Cultural Heritage Conservation.....</b>	686
<i>E. Grinato</i>	
<b>Laser Based Non-Destructive Inspection Techniques .....</b>	690
<i>J. Gryzgoridis</i>	
<b>Atomic Force Microscopy - What is it All About, and What Does it Tell Us About the Microstructure of Metals?.....</b>	691
<i>S. Hirsekorn</i>	
<b>The Civil Aircraft of the Future - IVHM enabled .....</b>	692
<i>I. Jennions</i>	

<b>Signal Processing and Imaging with Ultrasonic Guided Waves: Goals, Challenges and Recent Progress</b>	693
<i>J. Michaels, T. Michaels</i>	
<b>Guided Wave Inspection and Monitoring of Railway Track</b>	703
<i>P. Loveday</i>	
<b>New Challenges for NDT Techniques as Brazil Goes Deeper in Oil Production</b>	706
<i>J. Rebello</i>	
<b>Non-destructive Inspection Reliability - History, Status and Future Path</b>	707
<i>W. Rummel</i>	
<b>Artificial Neural Networks and Fuzzy Logic in Non-Destructive Evaluation</b>	721
<i>R. Sikora, P. Baniukiewicz, T. Chady, P. Lopato, G. Psuj</i>	
<b>Synthetic Aperture Focusing Technique (SAFT) and Time-of-Flight Diffraction Technique (TOFD)Ultrasonic Imaging - Past and Present</b>	732
<i>M. Spies</i>	
<b>Model Based Guided Wave NDE; The Evolution of Guided Wave NDE from 'Magic' to 'Physically Based Engineering Tool'</b>	733
<i>Y. Cho</i>	
<b>In-Line Inspection of High Pressure Transmission Pipelines: State of the Art and Future Trends</b>	735
<i>A. Barbier, M. Beller</i>	
<b>Wind Turbine Inspection and Health Monitoring of Offshore Wind Farms</b>	756
<i>G. Tian</i>	
<b>Recent Trends in Electromagnetic NDE Techniques and Future Directions</b>	757
<i>B. Rao, T. Jayakumar</i>	

## **10. SESSION: MAGNETIC METHODS**

<b>Estimating Residual Stresses in Heat-Treated Carbon Steels by Magnetic Parameters</b>	768
<i>E. Gorkunov, S. Zadvorkin, L. Goruleva</i>	
<b>Magnetic Methods for Estimating Elastic Strains in Steel Structural Members</b>	778
<i>E. Gorkunov, S. Zadvorkin, A. Mushnikov, E. Yakushenko</i>	
<b>Estimating the Stress-strain State of the 'Stainless Steel - Structural Steel' Two-layer Composite by Magnetic Measurements</b>	786
<i>E. Tueva, E. S. Gorkunov, E. Gorkunov, S. M. Zadvorkin, L. S. Goruleva, I. Golubkova, I. S. Kamantsev</i>	
<b>Automated Assessment of Steel Wire Ropes Residual Life Time Based on Magnetic Ndt Data</b>	795
<i>D. Slesarev, A. Vorontsov</i>	
<b>Development of a Portable High-Precision Above Ground Marker System for an MFL Pipeline Inspector</b>	799
<i>Z. Su, S. Huang, W. Zhao, S. Wang, H. Feng, J. Chen</i>	
<b>Evaluating the Welding Residual Stress State by the Residual Magnetic Field Method</b>	804
<i>B. Hu, G. Shen, Y. Liu, Xuerong Tao</i>	
<b>Adapted GMR Sensor Arrays used in Magnetic Flux Leakage Inspection</b>	811
<i>A. Neubauer, M. Pelkner, V. Reimund, M. Kreutzbruck</i>	
<b>Development of a Magnetic Sensor for Detecting and Sizing Paraffin Deposition Inside Pipelines</b>	819
<i>C. Camerini, M. Areiza, I. Janvrot, J. Rebello</i>	

## **11. SESSION: MATERIALS CHARACTERIZATION**

<b>Corrosion and Fatigue Monitoring for Surface Transport Products</b>	820
<i>P. Tscheliesnig</i>	
<b>How Well Does the Poffenberger-Swart Formula Apply to Homogeneous Compact Overhead Line Conductors?</b>	828
<b>Experimental Analysis on an Aero-Z 455 Conductor</b>	828
<i>Y. Kubelwa, K. Papailiou, R. Loubser, P. Moodley</i>	
<b>The Radiography in the Service of the Preservation of the Moroccan Historical Heritage</b>	838
<i>R. Alami, A. Bensitel, K. Bourchouk, A. Saadaoui, A. Ouardi</i>	
<b>Surface Functionalization with Nanodiamond Particles for Corrosion Protection and Corrosion Monitoring</b>	839
<i>J. Opitz, J. Michael, B. Bendjus, I. Hannstein, N. Schreiber, S. Abud, A. Adler, V. Lapina, N. Meyendorf, S. Hillmann</i>	
<b>Characterisation of Residual Stresses Associated with the Production Steps of Cold Coiled Spring Steel Samples</b>	840
<i>A. Venter, V. Luzin, D. Hattingh</i>	
<b>Centre for Non-destructive Evaluation at CSIR-National Metallurgical Laboratory, Jamshedpur for Materials Characterisation and Damage Evaluation: An Overview</b>	841
<i>P. Sagar, N. Parida</i>	
<b>New Polarization Interferometry Approaches for In-situ Process Control and Product Quality Assessment</b>	852
<i>J. Schreiber, V. Gudelev, A. Smirnov</i>	
<b>Ultrasonic Characterization of Standing Tree</b>	857
<i>M. Ahmad, N. Almuin, F. Mohammad</i>	
<b>Evaluation of Fatigue Damage in Composite with Various Defects Using Air-coupled Guided Waves</b>	863
<i>M. Rheinfurth, F. Schmidt, R. Protz, G. Busse, P. Horst, M. Gude, W. Hufenbach</i>	
<b>Advances in industrial Testing Machines for the Automated Inspection of Aerospace Components</b>	870
<i>P. Marty</i>	

## **12. SESSION: MATERIALS: COMPOSITES, POLYMERS, CERAMICS**

<b>Fractal Dimension of Waveforms as a Useful Feature in Ultrasonic Imaging .....</b>	877
<i>D. Datta, S. Samanta</i>	
<b>Imaging of Impacted Composite Armours using Data Clustering .....</b>	887
<i>S. Samanta, D. Datta</i>	
<b>Ultrasonic Characterisation of Non-Planar Composites Using Full Matrix Capture of Array Data .....</b>	896
<i>C. Li, P. Wilcox, B. Drinkwater</i>	
<b>Testing of Carbon Fiber Materials (CFRP) using High-Frequency Eddy Current (HF EC) Techniques .....</b>	897
<i>M. Schulze, S. Hillmann, H. Heuer, N. Meyendorf</i>	
<b>Detection of Fibre Waviness Using Ultrasonic Array Scattering Data .....</b>	904
<i>D. Pain, B. Drinkwater</i>	
<b>Use of Raman Spectroscopy to Study Fatigue Type Processes in Polycrystalline Diamond (PCD). ....</b>	913
<i>M. Vhareta, R. Erasmus, J. Comins</i>	
<b>Characterization of Damages in Honeycomb Structures Using Sonatest DryScan 410D .....</b>	914
<i>W. Sithole, N. Netshiyahini, R. Mabuza</i>	
<b>Nonlinear Ultrasonic Testing Technique for Microdamage of TATB Based Polymer Bonded Explosive .....</b>	920
<i>Z. Yang, W. Zhang, Y. Tian, J. Li, L. Li</i>	

## **VOLUME 2**

<b>Computer-aided Analysis of Ultrasound Data to Speed-up the Release of Aerospace CFRP Components .....</b>	927
<i>S. Barut, V. Bissauge, G. Ithurralde, W. Claassens</i>	

## **13. SESSION: MATERIALS: MICROSTRUCTURE**

<b>Influence of Chemical Composition and Microstructural Parameters on Speed of Sound of Various Materials Used for High-pressure Applications.....</b>	937
<i>M. Prohaska, H. Anderl, W. Kordasch, M. Panzenboeck</i>	
<b>Microstructure Characterization of High-strength Al-alloys by High Resolution X-ray Computed Tomography.....</b>	949
<i>J. Kasner, B. Harrer, G. Requena</i>	
<b>Characterization of Pressing Progress of RDX Crystal Grain by Cone-beam Micro-focus Computed Tomography .....</b>	957
<i>W. Zhang, Y. Tian, R. Yang, B. Dai, X. Yang</i>	
<b>Multidomain Modeling of the Magneto-mechanical Behavior of Dual-phase Steels.....</b>	966
<i>F. Mballa Mballa, O. Hubert, S. Lazreg, P. Meilland</i>	
<b>Ultrasonic Characterization of Intergranular Corrosion to Monitor In-situ Degradation in Nuclear Waste Storage Tanks.....</b>	976
<i>N. Jothilakshmi, P. Nanekar, B. Shah</i>	

## **14. SESSION: MODELLING**

<b>Bending Stress of Stockbridge Damper Messenger Cable: Experimental Data and Modelling.....</b>	977
<i>R. Kalombo, R. Loubser, P. Moodley</i>	
<b>Comparison of Modelling Methods for the Simulation of the Ultrasonic Response from Complex Real Defects .....</b>	987
<i>M. Felice, B. Drinkwater, P. Wilcox, A. Velichko, T. Dunhill, T. Barden</i>	
<b>Numerical Characterisation of Guided Wave Scattering Due to Welds in Rails .....</b>	988
<i>C. Long, P. Loveday</i>	
<b>Modeling of Ultrasonic Non-Destructive Testing of Surface-breaking Cracks .....</b>	998
<i>P. Jansson, A. Bostrom</i>	
<b>Mathematical Modeling of Radiography Experiments .....</b>	1006
<i>M. Zhukovskiy, G. Jaenisch, S. Podoliako, A. Deresch</i>	
<b>Validation of CIVA Ultrasonic Simulation in Canonical Configurations.....</b>	1013
<i>R. Raillon, G. Toullelan, M. Darmon, P. Calmon, Sébastien Lonne</i>	
<b>Simulating X-Ray Spectra: From Tube Parameters to Detector Output .....</b>	1023
<i>A. Deresch, G. Jaenisch, C. Bellon, A. Warrikhoff</i>	
<b>Applications and recent evolutions of the CIVA Simulation Platform .....</b>	1031
<i>F. Foucher, P. Dubois</i>	
<b>Three-Dimensional Elastic Wave Modeling in Austenitic Steel Welds using Elastodynamic Finite Integration Technique .....</b>	1041
<i>P. Chinta, M. Klaus, K. Langenberg, J. Prager</i>	
<b>Experiments and Modelling of Guided Wave Propagation in a Multiple-wire Cable.....</b>	1050
<i>R. Mijarez, O. Ramirez, A. Baltazar</i>	
<b>Graphical Processing Units (GPU)-based modeling for Acoustic and Ultrasonic NDE .....</b>	1059
<i>P. Rajagopal, N. Cheruvallykudy, K. Balasubramanian</i>	
<b>The Effect of Variations of Crack Geometry on the Stress Concentration Factor in a Thin Plate.....</b>	1065
<i>M. Mbandezi, R. Mabuza</i>	

## **15. SESSION: NDT IN SECURITY. EFNDT WG5**

<b>Microwave Radiation in Thermal Detection of Buried Objects - Modeling and Experiments .....</b>	1083
<i>W. Swiderski</i>	
<b>Equipment Based on NDT Technique and Used in Security and Safety Provision Systems .....</b>	1094
<i>I. Pushkina, A. Kovalev</i>	
<b>Approaching an Understanding of Risk: A Subject for the EFNDT Working Group 5 'NDT Technology for Public Security and Safety' .....</b>	1102
<i>K. Osterloh, N. Wrobel</i>	

## **16. SESSION: NDT INSTRUMENTS, TECHNIQUES**

<b>Critical Cleaning Topics in NDT: Understaning the Factors the Govern How Effectively a Part will be Cleaned .....</b>	1110
<i>G. Sanko, H. Becker</i>	
<b>Aluminum Nitride Thin Films for High Frequency Smart Ultrasonic Sensor Systems .....</b>	1114
<i>T. Herzog, S. Walter, S. Hillmann, H. Heuer</i>	
<b>High End Phased Array System for Automatic Inspections.....</b>	1121
<i>J. Buechler, N. Steinhoff</i>	
<b>Lift-off Performance of Receiving EMAT Transducer Enhanced by Voltage Resonance.....</b>	1130
<i>X. Ding, H. Ba, X. Wu, L. He</i>	
<b>High Temperature Ultrasonic Measurements Using a Pulsed-electromagnet Emat .....</b>	1136
<i>J. Hernandez-Valle, S. Dixon</i>	
<b>PROline USB Ultrasonic Testing Instrument - Compact, Powerful and Flexible in Component Testing.....</b>	1137
<i>G. Vogt</i>	
<b>Submarine Nozzle Pipe Manipulator .....</b>	1143
<i>R. Zeilinger, G. Hunies, U. Bartel</i>	

## **17. SESSION: NDT OF WIND TURBINES, ENERGY**

<b>Structural Health Monitoring for Aircraft, Ground Transportation Vehicles, Wind Turbines and Pipes - Prognosis .....</b>	1157
<i>N. Meyendorf, B. Frankenstein, L. Schubert</i>	
<b>How to Meet the Present Requirements of Non Destructive Examination in Turbine Field Service .....</b>	1168
<i>H. Rauschenbach, M. Siegel, S. Frank</i>	
<b>NDE Evaluation of Wind Turbine Blades Using Line Scanning Thermography .....</b>	1175
<i>O. Ley, V. Godinez-Azcuaga, J. Carretero-Villanueva, J. Egiluz-Liso, U. Ocano-Ortiz De Zarate, J. Uzquiza-Corcuera</i>	
<b>Acoustic Emission Sources Location of Damages in the Wind Turbine Blade.....</b>	1176
<i>D. Yoon, B. Han, Y. Huh</i>	
<b>Petrobras' Developments in Underwater Inspection .....</b>	1177
<i>C. Marinho, C. Camerini, L. Mesquita, R. Santos, S. Damasceno, S. Morikawa, C. Patusco</i>	

## **18. SESSION: NEUTRON RADIOGRAPHY**

<b>Scientific Establishment of Standardized Practice for Assessment of Spatial Resolution and Contrast of International Digital Thermal Neutron Imaging Facilities.....</b>	1188
<i>M. Radebe, F. De Beer, E. Lehmann, A. Kaester, C. Sim</i>	
<b>Design of New Neutron Imaging Facility at Triga Reactor in Morocco.....</b>	1197
<i>A. Ouardi, R. Alami, A. Bensitel</i>	
<b>Challenging Non-destructive Applications for Neutron Imaging .....</b>	1198
<i>A. Kaestner, C. Gruenzweig, E. Lehmann</i>	
<b>Applications of Various Imaging Techniques in Neutron Radiography at Barc, Trombay .....</b>	1208
<i>A. Shaikh</i>	

## **19. SESSION: NEW AND NOVEL APPLICATIONS**

<b>High Resolving Eddy Current (EC) Imaging For The Characterization Of Thin-Film Solar Cells.....</b>	1218
<i>H. Heuer, B. Hwang, M. Klein, M. Schulze, S. Hillmann, N. Meyendorf</i>	
<b>Replacement of Manual by Mechanized UT Inspections in the Energy, Forging and Railway Industry .....</b>	1226
<i>K. Leupoldt, H. Otte</i>	
<b>Novell Design of High Resolution Imaging X-ray Detectors.....</b>	1227
<i>L. Hammar</i>	
<b>Detection of Enclosed Diamonds using Dual Energy X-ray imaging .....</b>	1236
<i>M. Firsching, F. Nachtrab, J. Muhlbauer, N. Uhlmann</i>	
<b>The Specification of Target Flaws in Turbine Blades .....</b>	1243
<i>R. Scheepers, C. Booyse</i>	
<b>Detection of Water Transport through Membrane in a PEM Fuel Cell.....</b>	1251
<i>C. Yin, M. Wu, Y. Liu</i>	

<b>Pulse-echo Ultrasonic Inspection of Small Bore Nozzle Welds .....</b>	1255
<i>J. Lilley</i>	

## **20. SESSION: OPTICAL NETWORK**

<b>Pump-Probe Laser Scanning of Surface-Breaking Partially-Closed Cracks: Comparison with Finite-Difference Simulations .....</b>	1256
<i>A. M. Lomonosov, P. Hess</i>	
<b>Scanning Laser Techniques for Characterisation of Different Surface Breaking Defect Geometries .....</b>	1260
<i>J. Hernandez-Valle, R. Edwards, A. Clough, M. Rosli, B. Dutton</i>	
<b>Stress Relaxation of Rf Sputtered Cr<sub>3</sub>C<sub>2</sub> Thin Films by Surface Brillouin Scattering .....</b>	1267
<i>D. Wanwangi, C. Sumanya, T. Wittkowski, J. Comins</i>	
<b>Nonlinear Laser-generated Surface Wave Technique for Evaluation of Surface Damage .....</b>	1273
<i>K. Jhang, C. Kim, S. Choi, J. Kim, T. Nam</i>	
<b>Optical Spectroscopy Techniques for the NDT of Hard Materials .....</b>	1278
<i>R. Erasmus, J. Comins, T. Kubeka</i>	
<b>A Flatbed Scanner Wavefront Sensing Unit for Optics Quality Control .....</b>	1294
<i>J. Kuria, R. Schön, R. Borret</i>	
<b>High Temperature Elastic Modulus Characterisation of Titanium Alloys (TiC and TiCN) Using Surface Brillouin Scattering .....</b>	1309
<i>B. Mathe, J. Comins, A. Every, W. Lengauer</i>	

## **21. SESSION: OPTICAL METHODS, TERAHERTZ**

<b>Real-time Full-field In-depth Polymer Tomography Using Ultrafast Laser .....</b>	1310
<i>A. Shcherbina, G. Jonusauskas</i>	
<b>Computed THz – Tomography .....</b>	1311
<i>D. Fratzscher, U. Ewert, J. Beckmann, L. V. Chranowski</i>	
<b>Advances in High Accuracy Measurement In Remote Visual Inspection .....</b>	1321
<i>D. Jervis, E. Hubben</i>	
<b>A Comparative Study Into the Capability of Shearography and Active Infrared Thermography in Detecting Simulated Subsurface Laminar Discontinuities in Composite Materials .....</b>	1328
<i>M. Johannes, D. Findeis</i>	
<b>Advantages, Risks and Prospects of the Usage of UV-LED Sources for Fluorescence Stimulation in NDT .....</b>	1329
<i>M. Breit</i>	
<b>Inspection of Kissing-bond Defect in Sandwich Structure by Shearography .....</b>	1339
<i>G. Guo, Y. Zhang, J. Tu, Y. Shi</i>	
<b>Material Property/State Characterization by Laser Speckle Photometry .....</b>	1347
<i>U. Cikalova, B. Bendjus, J. Schreiber</i>	
<b>NDE Approaches for Enhanced Performance and Mitigation of Risks in Demanding Technologies .....</b>	1356
<i>B. Raj, B. Raj, B. Venkatraman, P. Chellapandi</i>	
<b>The Changing Face of NDT in the USA of the Past 50 Years .....</b>	1361
<i>W. Runnel</i>	

## **22. SESSION: PIPELINES**

<b>A New Approach to Boiler, Pipeline and Turbine Inspections .....</b>	1369
<i>W. Macmillan, E. Ahrend</i>	
<b>Pipeline External Corrosion Analysis Using a 3D Laser Scanner .....</b>	1379
<i>P. Allard, C. Mony</i>	
<b>A Portable Solution To Enable Guided Ultrasonic Inspection .....</b>	1388
<i>L. Enenkel, J. Poirier, J. Buechler, D. Jervis</i>	
<b>Choosing the Appropriate Digital Radiography (DR) Technology for the Inspection of Aboveground, Non-piggable Pipelines .....</b>	1394
<i>R. Shepard</i>	
<b>Guided Wave Ultrasonic Testing As Part of a Piping Inspection and Integrity Management Programme .....</b>	1395
<i>S. Fewell, P. Mudge, I. Daniel</i>	
<b>Performance of Long Range Ultrasonic Inspection Using Guided Waves for Assessment of Cased Crossings on Pipelines .....</b>	1396
<i>S. Fewell, P. Mudge, N. Farrant, P. Jackson, I. Daniel</i>	
<b>ECHOGRAPH Ultrasonic Testing of Helical Submerged Arc-Welded (HSAW) Pipes .....</b>	1397
<i>W. Deutsch, M. Gessinger, M. Joswig</i>	
<b>Magnetic Barkhausen Noise for Hardness Checking on Steel Pipes .....</b>	1409
<i>F. Deneuville, A. Trillon, S. Petit, B. Bisiaux</i>	

## **23. SESSION: POSTER, ACOUSTIC EMISSION**

<b>Study of the Damage of FRP Composite Based on the Acoustic Emission Testing Technology</b>	1415
<i>W. Li, G. Dai, F. Long, P. Jiang, Y. Wang</i>	
<b>Determine of Damage Grade for Vehicle CNG Cylinder by the Analysis of AE Features during Fatigue</b>	1422
<i>J. Lee, H. Jee, N. Ju, Y. Son, C. So, J. Lee</i>	
<b>Acoustic Emission During Electrochemical Corrosion of Aluminium Alloy in a 0.6 M NaCl Aqueous Solution</b>	1427
<i>J. Grum, U. Trdan, T. Kek</i>	
<b>Possibilities of the Damage Diagnostics of Gearboxes and Bearings with Acoustic Emissions Method</b>	1428
<i>P. Mazal, L. Nohal, V. Koula, F. Hort</i>	
<b>Health Monitoring during Aircraft Vertical Empennage Fatigue Test by Acoustic Emission Method</b>	1436
<i>G. Qi, H. Lei, P. Jing, G. Qiang Fu, R. Sheng Geng</i>	

## **24. SESSION: POSTER, GENERAL**

<b>Vibration Induced Disturbances in Automatic Non-destructive Testing</b>	1441
<i>A. Runnemalm</i>	
<b>Recent Activity in NDT in Belarus</b>	1447
<i>N. Migoun, S. Novikov</i>	
<b>Statistical Evaluation of the Security Chain for Airports</b>	1452
<i>D. Fratzscher, U. Ewert, K. Osterloh, N. Wrobel, C. Mueller, D. Kanzler</i>	
<b>Relevant Parameters of UV-A-LED Sources in NDT</b>	1453
<i>M. Breit</i>	
<b>Endoscopic Analysis Supporting Issues of Historic Stratigraphic Investigations: The Case History of Saint Domenico Monastery in Napoli-Italy</b>	1454
<i>A. Bianco</i>	
<b>ScanMaster Systems - 25 Years of Innovation in Ultrasonic NDT</b>	1462
<i>A. Miltreyger, I. Buchmeier Hevroni, M. Bron, S. Rabinovich</i>	
<b>Non-destructive Inspection of Construction in the Examination of Old Stone Buildings</b>	1463
<i>J. Ausheva</i>	
<b>Internet Collaboration in the Field of NDT</b>	1468
<i>R. Diederichs</i>	

## **25. SESSION: POSTER, MAGNETIC**

<b>Integrative In-situ Detection of Defects in Aeroengine Blades Combining Borescope and Eddy Current Techniques</b>	1477
<i>W. Tian, M. Pan, D. Chen</i>	
<b>Continuous Magnetic Control of Working Objects</b>	1483
<i>V. Miroshnikov, N. Karmanov, S. Kostin</i>	
<b>Electromagnetic Induction Bar and Application on Magnetic Testing</b>	1484
<i>Y. Ma, J. Yang</i>	
<b>Detection of Subsurface Defects Using Pulsed Eddy Current</b>	1485
<i>D. Park, C. Angani, Y. Cheong</i>	

## **26. SESSION: POSTER, MATERIALS**

<b>Research on Damage Mechanisms of 2.25Cr-1Mo Using Cluster Analysis Based on Waveform Features Extracted From Acoustic Emission Signals</b>	1491
<i>G. Dai, W. Li, H. Xu, Y. Wang</i>	
<b>Principal Component Analysis and Discriminant Analysis As a Supervised Pattern Recognition Tool for Classification of AISI 420 Steel Samples Subjected to a Different Heat Treatment Using Magnetic Barkhausen Noise Signals</b>	1497
<i>A. Alvarez-Rosario, L. Padovese, R. Medina-Aguas, C. Serna-Giraldo</i>	
<b>Monte Carlo Modeling of Electron Transport with Use of CUDA Technology</b>	1506
<i>M. Zhukovskiy, G. Jaenisch, R. Uskov, A. Deresch</i>	
<b>Evaluation of Material Degradation in Steam Pipelines</b>	1514
<i>Y. Ivanova, T. Partalin, B. Tabakova</i>	
<b>Measurements of the Material Properties of Liquids Using Normal Acoustic Plate Waves</b>	1523
<i>V. Chuprin, M. Gitis</i>	
<b>A Planar Flexible Electromagnetic Sensor Used for Non-Destructive Stress Estimation of Ferromagnetic Materials</b>	1532
<i>W. Tian, M. Pan, Y. Xu, D. Chen, J. Zhao</i>	
<b>Rapid Complete Inspection of Large-Size Products in Foundry</b>	1539
<i>A. Shteyn, A. Cheprasov, S. Chakhlov, M. Shteyn, V. Klimenov, S. Knyazev</i>	
<b>Multiscale Technique for Localized Strain Investigation in Metal Alloys and Carbon Fiber Reinforced Composites Based on Data of Strain Gauging, Digital Image Correlation and Acoustic Emission</b>	1544
<i>S. Panin, A. Byakov, M. Burkov, P. Lyubutin, M. Poltarannin, O. Bashkov, Y. Altukhov, V. Titkov, V. Grenke, A. Eremin</i>	
<b>Non-destructive Analysis for Dating and Provenancing Glass and Ceramics Artifacts</b>	1545
<i>M. Kos, Z. Smit</i>	

<b>A Study of MFL Signals from a Spectrum of Defect Geometries .....</b>	1546
<i>N. Pearson, R. Priewald, J. Mason, M. Boat, M. Pate</i>	
<b>Development of SMART-6000 - An Integrated Testing Instrument for Composite Materials .....</b>	1553
<i>J. Lin, F. Lin, W. Wang, H. Yang, C. Lin, H. Li</i>	
<b>Spectral Analysis of Ultrasonic Lamb Waves Applied to the Study of the Intermetallic Phase Presence on Plates of AISI 430 Ferritic Stainless Steel Submitted to Isothermal Treatments. ....</b>	1554
<i>Y. Santos, C. T. Farias, M. C. Sobral, M. Oliveira, M. Araújo</i>	
<b>Study of Electrical Conductivity in the Alloy of Aluminium AA5052 During the Homogenization.....</b>	1564
<i>F. Fraudita, D. Delgado, C. González</i>	
<b>Stress Analysis by NDE to Steel Heated and Submitted to the Uniaxial Constraint .....</b>	1565
<i>S. Makhlouf, M. Zergoug, Y. Benkredda</i>	
<b>Analysis of the Behavior of a Galvanization by Immersion by NDE.....</b>	1566
<i>A. Ziouche, M. Zergoug</i>	

## **27. SESSION: POSTER, OPTICAL METHODS**

<b>Elastic Constants of Platinum Group Alloys (Rh<sub>3</sub>Zr and Rh<sub>3</sub>Nb) Using Surface Brillouin Scattering.....</b>	1567
<i>C. Sumanya, B. Mathe, J. Comins, A. Every, M. Osawa, H. Harada, D. Comins</i>	
<b>A Novel Phase-Compensation Algorithm for a Dual-Cavity Fiber Fabry-Perot Interferometer for Structural Health Monitoring .....</b>	1568
<i>D. Kim, B. Ahn, J. Lee</i>	

## **28. SESSION: POSTER, PENETRANT**

<b>Electrochemical Machining for Penetrant Testing in Field Conditions .....</b>	1569
<i>N. Migoun, N. Delenkovsky, A. Gnusin</i>	
<b>The High Sensitivity Fluorescence Penetrant Agent Manufacture.....</b>	1573
<i>Z. Lin, D. Li, Z. Chen, Z. Chen</i>	

## **29. SESSION: POSTER, RADIOGRAPHY**

<b>Intelligent System for Radiogram Analysis for Welds Defects Inspection - Results of Chosen Algorithms Work.....</b>	1581
<i>R. Sikora, T. Chady, P. Baniukiewicz, P. Lopato, L. Napierala, T. Pietruszewicz, G. Psuj</i>	
<b>Implementation of International Guides and National Law for Gamma Radiography in Germany.....</b>	1588
<i>B. Solter, C. Kaps, B. Redmer</i>	
<b>Optimization of the Main Parameters for the Development of Software-hardware Scanning Systems of Digital Radiography.....</b>	1589
<i>V. Klimenov, V. Uvod, M. Shtein, A. Temnik, S. Chakhlov, M. Lebedev</i>	
<b>X-ray Backscattering: Variable Irradiation Geometry Facilitates New Insights .....</b>	1590
<i>N. Wrobel, K. Osterloh, M. Jechow, U. Ewert</i>	
<b>New Requirements on Source Object Distances for Digital Radiographic Testing of Welds in ISO/FDIS 17636-2.....</b>	1597
<i>M. Jechow, U. Zscherpel, U. Ewert</i>	
<b>Radiographic Simulator aRTist: Version 2 .....</b>	1598
<i>C. Bellon, A. Deresch, C. Gollwitzer, G. Jaenisch</i>	
<b>Results of Usage Universal X-ray Gas Porosity Scale for Aluminum Alloys in Digital X-ray Inspection System 'Leda' .....</b>	1605
<i>V. Usachev, E. Kasarina, A. Spepanov</i>	
<b>Monte Carlo Dose Calculation to Aim of Dose Assessment in Industrial Radiography Accidents.....</b>	1606
<i>J. Rouzitalab, A. Zamani, A. Yazdandout, L. Eshraghi</i>	

## **30. SESSION: POSTER, THERMOGRAPHY**

<b>Detection of Surface Cracks in Welds using Active Thermography .....</b>	1611
<i>P. Broberg, A. Runnemalm</i>	
<b>Internal SCC Detection of Pipe Using Ultrasonic Infrared Thermography .....</b>	1616
<i>M. Choi, H. Park, J. Park, S. Lee</i>	
<b>Infrared Thermographic Testing of Composite Materials with Adhesive Joints.....</b>	1621
<i>R. Sikora, T. Chady, B. Szymanik</i>	
<b>Use of Back Scattered Ionizing Radiation for Measurement of Thickness of the Catalytic Agent Active Material.....</b>	1629
<i>B. Artemiev, A. Shubochkin, A. Bukley</i>	
<b>Infrared Thermography Inspection of Ball Bearing; Condition Monitoring for Defects under Dynamic Loading Stages .....</b>	1637
<i>W. Kim, J. Seo, D. Hong</i>	
<b>Use of Thermography and Ultrasonic Inspection for Evaluation of Crimped Wire Connection Quality.....</b>	1641
<i>M. Finc, T. Kek, J. Grum</i>	

## **31. SESSION: POSTER, TOMOGRAPHY**

Preliminary Study for a Low Cost Gamma Tomography Tool for Corrosion Detection in Industry .....	1651
A. Saadaoui, R. Alami, A. Bensitel	
Research on the Method to Determine Effective Energy in Materials Density Test Using X-ray CT .....	1652
P. Ni, W. Zhang, Z. Guo, X. Wang, X. Xu	
CT Inspection of Welding Seam for Half-Axes of Maneuverable Aircraft's Stabilizers.....	1658
G. Qi, G. Fu, P. Jing, H. Lei	
Study on Scan Techniques Dedicated for Analysis of Computed Tomography (CT) System Performance .....	1662
G. Zhimin, N. Peijun, X. Xiangqun, Z. Weiguo, Q. Ridong, R. Lihong	
Estimation of Detect Ability of Gas Cavity Using Disc Phantom in Industrial Computed Tomography .....	1667
Z. Weiguo, X. Xiangqun, Q. Ridong, G. Zhimin, L. Yan	

## **32. SESSION: POSTER, TRANSPORT**

Research on the Detecting System of High-speed Railway Wheel Defect based on Laser Method.....	1673
Y. Kai, P. Chaoyong, W. Li, G. Xiaorong, W. Zeyong, Z. Yu, P. Jianping	

## **33. SESSION: POSTER, UT**

Study on Ultrasonic Second Bottom Echo Method to Examine Granularity Grades for 20Cr1Mo1V(Nb)TiB	
Fasteners.....	1680
W. Lixin, S. Changming, S. Bingxin, T. Feng	
A Data-Driven Correction of Ultrasonic Source and Receiver Spectral Amplitude Variations .....	1690
A. Volker, P. Van Capel, R. Van Vossen	
Testing of the Bond Between Concrete Floor Layers by Non-destructive Acoustic Methods .....	1700
J. Hola, L. Sadowski	
Eddy Current Evaluation and CIVA Simulation of Denting Indication for Nuclear Power Plant Steam Generator	
Tubes.....	1708
Y. Bei, G. Lin, Y. Kong, T. Song	
Automatic Ultrasonic testing for Metal Deposition .....	1709
P. Nilsson, A. Appelgren, P. Henrikson, A. Runnemalm	
Probability of Detection Simulations for Ultrasonic Pulse-echo Testing .....	1719
J. Haapalainen, E. Leskela	
The Design and Application of Lateral Phased Array Probe for Railway Wheel Rim Ultrasonic Detection System .....	1724
J. Peng, L. Wang, Y. Zhang, X. Gao, Z. Wang, Q. Zhao, C. Peng, K. Yang	
Nonlinear Ultrasonic Technique for Degradation Characterization of Dissimilar Metal Welds in Nuclear Facilities .....	1729
K. Jhang, C. Kim, C. Cheon, L. Yang, D. Yun	
Spectral Analysis of the Propagation of Lamb Waves on Fibre-Metal Laminated Plates to Detect and Evaluate	
Different Defects .....	1733
C. T. Farias, E. F. Simas Filho, Y. Santos, M. S. S. Araujo, I. Ribeiro	
Signal Processing Techniques for Ultrasound Automatic Identification of Flaws in Steel Welded Joints – A	
Comparative Analysis .....	1743
I. Souza, M. S. Albuquerque, E. F. Simas Filho, C. Farias	
Viewing the Vibration and Checking the Condition of an UT Probe.....	1752
Y. Kim, B. Ahn, D. Yoon, Y. Kim	
Non-Destructive Testing of Continuously Cast Billets by Means of the Laser Triangulation Method .....	1759
L. Pindor, S. Hefner, J. Cibulka, R. Turon	

## **34. SESSION: POWER GENERATION, NUCLEAR**

Weld Root Measurement by TOFD for Inspection of Flow-Accelerated Corrosion Susceptible Welds.....	1767
D. Delacoux, S. Trevin, P. Caylar	
Simulations and Impact on NDE Development and Qualification .....	1775
L. Truchetti, L. Chatellier, P. Peureux	
Optimization of EDF's NPPs NPPs Maintenance due to Flow Accelerated Corrosion and BRT-CICERO	
Improvement by NDT Results Analysis.....	1779
S. Trevin, M. Moutrille	
Application of NDE on Intricate and Triple Point Weld Joints of Main Reactor Vessel for 500 MWe PFBR Project .....	1789
T. Loganathan, P. Kumar, B. Venkatraman	
Plastic Fantastic? - An NDE Inspection Solution for HDPE Butt Welds.....	1790
D. Macleanan, I. Pettigrew, C. Bird	
A Phased Array Inspection Solution for the Assessment of Thin Stainless Welds .....	1799
C. Bird, I. Pettigrew	
Practice on NDE Licensing and Inspection Qualifications for Nuclear Power Plant In-service Inspections .....	1809
J. Liu, Z. Lin, H. Chen, A. Yan	
Ultrasonic Phased Array Examination of Roll Joint in PHWR Coolant Channels .....	1816
P. Nanekar, B. Shah	

<b>Evolution of Ultrasonic Testing for End Closure Welds for PHWR Fuel Elements at NFC</b> .....	1817
<i>M. Viswanath, K. Subramanian, R. Mistry, B. Prahad, R. Jayaraj</i>	

### **35. SESSION: PRESSURE EQUIPMENT, REGULATION, WELDS**

<b>A New Ultrasonic Phased Array Testing System for Dissimilar Welds</b> .....	1823
<i>F. Schubert, H. Scholz, P. Heilmann, R. Schallert, M. Froehlich, S. Heilmann, M. Barth, S. Hillmann, Z. Bor, N. Meyendorf</i>	
<b>Developments in the Application of NDT Data in Integrity Assessment of Pressure Equipment</b> .....	1833
<i>M. Stone</i>	
<b>Selection of Evaluation Methods for New Weld Demands: Pitfalls and Possible Solutions</b> .....	1834
<i>A. Oberg, P. Hammersberg, L. Svensson</i>	
<b>ASME Codes and Standards for Boiler Inspections</b> .....	1844
<i>M. Moles</i>	
<b>Flaw Assesment Using Shear Wave Phased Array Ultrasonic Transducer</b> .....	1851
<i>D. Bracconier, B. Yoon, H. Lee</i>	

### **VOLUME 3**

<b>Qualification Process and Inspection Validation of Computed Radiography Technique for DWI Weld Inspection</b> .....	1860
<i>C. Marinho, J. Rabello, M. Aiub, E. Iguchi, R. Lopes, D. Oliveira, A. Silva</i>	

### **36. SESSION: RADIATION PROTECTION**

<b>Radiation Safety Practices of Industrial Radiography License Holders in South Africa</b> .....	1869
<i>E. Mosokoiso, W. Mogoru, I. Sikakana, H. Neeson</i>	
<b>A Snapshot of Current Practice of Occupational Radiation Protection in Industrial Radiography</b> .....	1876
<i>R. Van Sonsbeek, J. Le Heron, G. Abela, F. Da Silva, A. Hamzah, T. Levey, M. Purschke, K. Sahaimi, C. Lefauvre</i>	
<b>A 'Road Map' and an International Database - Tools to Assist in the Implementation of Optimization of Occupational Radiation Protection in Industrial Radiography</b> .....	1878
<i>R. Van Sonsbeek, J. Le Heron, G. Abela, F. Da Silva, A. Hamzah, M. Purschke, K. Sahaimi, C. Lefauvre</i>	
<b>Bio-Monitoring of Radiation Workers – Recent Advancements in Research and Developments in South Africa</b> .....	1880
<i>J. Slabbert, A. Baeyens, A. Vral</i>	
<b>PROJECT IAEA-ARCAL-RLA/8/044: "Establishing Regional Harmonization in the Qualification and Certification of Personnel and in the Infrastructure Used in the Non-Destructive Testing of Systems, Structures and Components"</b> .....	1881
<i>C. Belinco, A. Pastorini, H. Espejo</i>	

### **37. SESSION: RADIOGRAPHY**

<b>Wall Thickness Measurement Techniques Using Digital Radiography</b> .....	1882
<i>R. Pincu, L. Pick, O. Kleinberger-Riedrich, R. Lieberman</i>	
<b>The HOIS Recommended Practice for In-service Computed Radiography of Pipes</b> .....	1883
<i>S. Burch</i>	
<b>New X-ray Complexes Based on Transmission and Back Scattered Radiation</b> .....	1893
<i>I. Parshin, A. Buckley, E. Blokhin, E. Fedorovsky</i>	
<b>Straightforward Correction of X-Ray Detector Backlighting</b> .....	1894
<i>A. Lange, A. Kupsch, M. Hentschel, B. Muller</i>	
<b>Optimization of the Main Parameters for the Development of Software-hardware Scanning Systems of Digital Radiography</b> .....	1902
<i>V. Klimenov, V. Uddod, A. Temnik, V. Solodushin, M. Lebedev</i>	
<b>Mobile Digital Radiography System for Nondestructive Testing of Large Diameter Pipelines</b> .....	1906
<i>V. Klimenov, A. Buller, Y. Moskalev, S. Chakhlov, M. Shteyn</i>	
<b>Edge Artifacts of Radiographic Images by X-ray Refraction</b> .....	1912
<i>A. Lange, A. Kupsch, B. Muller, M. Hentschel</i>	
<b>Ways of Digital Image Processing to Obtain Fast and Unbiased Results</b> .....	1923
<i>K. Osterloh, U. Zscherpel</i>	
<b>Industrial X-ray Generation: New Technologies for Expanding Application Spaces</b> .....	1933
<i>M. Sauerschnig, M. Schaefer</i>	
<b>X-ray Endoscopy for Inspection of Tube to Tube Sheet Welds in Heat Exchangers</b> .....	1942
<i>U. Zscherpel, U. Ewert, P. Rost, M. Schmid, K. Spartiotis, A. Warrikhoff</i>	
<b>Reliability Investigations of Radiographic Testing Using aRTist as a Simulation Tool</b> .....	1949
<i>C. Gollwitzer, C. Bellon, A. Deresch, G. Jaenisch, H. Baron, U. Ewert</i>	
<b>New Measurement Methods of Focal Spot Size and Shape of X-ray Tubes in Digital Radiological Applications in Comparison to Current Standards</b> .....	1959
<i>K. Bavendiek, U. Heike, U. Zscherpel, U. Ewert, A. Riedo</i>	
<b>Method for Dual High Energy X-ray Imaging with Flat Panel Detectors</b> .....	1971
<i>M. Firsching, F. Nachtrab, T. Fuchs, N. Uhlmann</i>	

<b>Imaging Corrosion Under Insulation by Gamma Ray Backscattering Method.....</b>	1976
<i>S. Abdul-Majid, A. Balamesh</i>	
<b>Three-dimensional Reconstruction of Serial Industrial Computed Tomography Images.....</b>	1983
<i>Z. Ai Dong, L. Ju, S. Ling-Xia, Z. Ying</i>	

## **38. SESSION: RELIABILITY IN NDT, POD**

<b>Comparison of Experimental and Model Based POD in a Simplified Eddy Current Procedure .....</b>	1987
<i>A. Rosell, G. Personn</i>	
<b>Bayesian Approach for the Evaluation of the Reliability of Non-Destructive Testing Methods.....</b>	1997
<i>D. Kanzler, C. Mueller, U. Ewert, J. Pitkanen</i>	
<b>Human Factors Approach to the Acquisition and Evaluation of NDT Data: Examples of Experiments .....</b>	2003
<i>M. Bertoic, B. Fahlbruch, C. Mueller, J. Pitkänen, U. Ronneteg, M. Gaal, D. Kanzler, U. Ewert, D. Schombach</i>	
<b>Synthetic Non-Parametric POD for Large Defects.....</b>	2013
<i>G. Personn, P. Hammersberg, H. Wirdelius</i>	
<b>Safe Product Design - The Role of the NDE Reliability Analysis.....</b>	2023
<i>M. Pavlovic, C. Mueller, U. Ronneteg, U. Ewert, C. Boller</i>	
<b>Probability of Detection (POD) Determination Using Ultrasound Phased Array for Considering NDT in Probabilistic Damage Assessments.....</b>	2032
<i>J. Kurz, A. Jungert, S. Dugan, G. Dobmann</i>	
<b>Numerical Analysis of Probability of Detecting Defects in Engineering Materials .....</b>	2042
<i>R. Mabuza</i>	
<b>Putting MAPOD to Work - Aero Life Management Experiences in Reducing MAPOD Concepts to Practice .....</b>	2049
<i>L. Schaefer</i>	

## **39. SESSION: SIGNAL PROCESSING, IMAGING**

<b>Data-driven Imaging in Anisotropic Media.....</b>	2050
<i>A. Volker, A. Hunter</i>	
<b>Evaluation of an X-ray Digital Radiography System .....</b>	2059
<i>I. Sikakana, M. Thebe</i>	
<b>3D Ultrasonic Imaging by Cone Scans and Acoustic Antennas .....</b>	2068
<i>I. Bolotina, M. Dennis, F. Mohr, M. Kroening, K. Reddy, Y. Zvantsev</i>	
<b>Effective Non-Destructive Imaging of Defects in Engineering Components .....</b>	2079
<i>B. Rao, T. Jayakumar, S. Thirunavukkarasu, W. Sharatchandra Singh, G. Sharma, A. Kumar, C. Babu Rao</i>	
<b>Three-dimensional Image Reconstruction Method for Minute Internal Flaw by Use of Focused Ultrasonic Beam.....</b>	2087
<i>T. Ozeki, H. Takada</i>	
<b>Experimental Comparison of Wave-field Based Ultrasonic Imaging with Other Advanced Ultrasonic Weld Inspection Techniques.....</b>	2094
<i>X. Deleye, L. Horchens, K. Chougrani</i>	
<b>Ultrasound Imaging for Quantitative Measurement of Immersed Plastic Waste Particles.....</b>	2104
<i>S. Sanaee, M. Bakker</i>	
<b>Cloud Testing: Development Trend of Non-Destructive Testing and Evaluation Techniques.....</b>	2114
<i>J. Lin, L. Wu, H. Li</i>	
<b>Acoustic Resonance Testing Using Transform Decomposition and Support Vector Machines for Efficient and Accurate Detection of Defects in Forged Components .....</b>	2122
<i>V. Hari Sankaran</i>	

## **40. SESSION SIGNAL PROCESSING, IMAGING, INVERSE PROBLEMS**

<b>Improving the Reliability of Automated Non-Destructive Inspection.....</b>	2132
<i>N. Brierley, T. Tippetts, P. Caviley</i>	
<b>Improved Image Quality in Phased Array Ultrasound by Deconvolution.....</b>	2141
<i>P. Broberg, M. Sjodahl, A. Runnemalm</i>	
<b>Practical Limits of MFL in Steel Plate Inspection .....</b>	2146
<i>N. Pearson, R. Prialwad, J. Mason, M. Boat, M. Pate</i>	
<b>Improvements on Tendon Duct Examination by Modeling and Imaging with Synthetic Aperture and One-Way Inverse Methods.....</b>	2154
<i>G. Ballier, K. Mayer, K. Langenberg, S. Schulze, M. Krause</i>	
<b>Ultrasonic Imaging of Defects in Known Anisotropic and Inhomogeneous Structures with Fast Synthetic Aperture Methods .....</b>	2162
<i>K. Mayer, P. Chinta, K. Langenberg, M. Krause</i>	
<b>Progress in Acoustical Defect Sizing NDT Methods for the Inspection of Power-Plant Components.....</b>	2172
<i>M. Kreutzbrück, J. Prager, R. Bohn, J. Kitze, G. Brekow</i>	
<b>3D Modeling and Visualization-SW for Complex Geometries.....</b>	2180
<i>G. Guse, L. Bucklisch, F. Mohr, S. Smalley, G. Willson, U. Bartel</i>	

## **41. SESSION: STEEL INDUSTRY**

<b>Using NDT Methods for Inspection Rolls of Cold Roll Mill .....</b>	2181
<i>P. Chen, K. Tsai</i>	
<b>10 Years Experience in Industrial Phased Array Testing of Rolled Bars.....</b>	2186
<i>J. Maier, G. Ferstl</i>	
<b>Testing of Forged Bars with Phased Arrays for Aerospace Applications.....</b>	2198
<i>R. Krenn, M. Wasserbauer, P. Widek, G. Fuchs, S. Falter</i>	
<b>Manual Weld Inspection with Ultrasound - Conventionally or with Phased Arrays? .....</b>	2206
<i>W. Deutsch, S. Kierspel</i>	
<b>Non-Destructive Testing and Inspection of Rails at JSPL - Ensuring Safety and Reliability .....</b>	2216
<i>M. Raj, D. Mallik, S. Bansal, R. Ajmeria, R. Saini</i>	

## **42. SESSION: THERMOGRAPHY**

<b>In-Line Inspection of Hot-Rolled Steel Billets by Heat Flux Thermography .....</b>	2227
<i>S. Koch, J. Schroeder</i>	
<b>Modelling Thermal NDT Problems.....</b>	2232
<i>V. Vavilov</i>	
<b>A Heat Transfer Methodology to Monitor Flow Accelerated Internal Corrosion in Industrial Steam Pipes .....</b>	2242
<i>A. Davis, B. Venkatraman</i>	
<b>The Vibrational Response of a Turbine Blade Under Thermosonic Excitation.....</b>	2249
<i>A. Gachagan, G. Bolu, G. Pierce, T. Barden</i>	
<b>Advantages and Applications of Eddy Current Thermography Testing for Comprehensive and Reliable Defect Assessment.....</b>	2250
<i>I. Zainal Abidin, M. Umar, M. Yusof, M. Ibrahim, A. Hamzah, M. Salleh</i>	
<b>Thermal Imaging NDT at General Electric.....</b>	2260
<i>H. Ringermacher, B. Knight, D. Howard</i>	
<b>Ultrasonic Thermal Imaging .....</b>	2264
<i>C. Gonzalez, R. Reyna, J. Chitty</i>	
<b>Combining a New Form of Pulsed Phase Thermography with Enhanced Image-processing Techniques to Evaluate the Structure Integrity of Objects Made from Lightweight Materials.....</b>	2267
<i>G. Arroud, P. Guillaume</i>	
<b>Flying Laser Spot Thermography for the Fast Detection of Surface Breaking Cracks .....</b>	2268
<i>J. Schlichting, M. Ziegler, C. Maierhofer, M. Kreutzbruck</i>	
<b>In-service Flare Inspection by Unmanned Aerial Vehicles (UAVs).....</b>	2275
<i>C. Marinho, C. Souza, T. Motomura, A. Da Silva</i>	

## **43. SESSION: TIME OF FLIGHT DIFFRACTION (TOFD)**

<b>Planar Or Volumetric, the Detected Defects in Weld: Experimental Tests on Pattern Recognition Based on Diffracted Echo in Phased Array and Pulse Echo Technique .....</b>	2283
<i>G. Nardoni, M. Certo, P. Nardoni, M. Feroldi, D. Nardoni, L. Possenti, S. Quetti, A. Filosi, S. Riva</i>	
<b>Flaw Size and Position Measurement by Multiple Probe TOFD Method.....</b>	2291
<i>Y. Kurokawa, H. Inoue</i>	
<b>Classification of TOFD Signals by Artificial Neural Network .....</b>	2298
<i>S. Lalithakumari, B. Sheelarani, B. Venkatraman</i>	
<b>Developments in Time-Of-Flight Diffraction (TOFD) .....</b>	2304
<i>M. Moles, L. Robertson, T. Sinclair</i>	
<b>Sectorial Scan PAUT Combined with TOFD, a Robust Weld Inspection Technique in Lieu of RT .....</b>	2314
<i>F. Laprise, J. Berlanger, G. Maes</i>	

## **44. SESSION: TRANSPORT: AEROSPACE**

<b>In-service Inspection Guidelines for Composite Aerospace Structures .....</b>	2324
<i>J. Heida, D. Platenkamp</i>	
<b>Latest Aerospace Composites Testing Solutions using Off-the-shelf Industrial Robots .....</b>	2338
<i>A. Maurer, W. De Odorico, R. Huber, T. Laffont</i>	
<b>Advanced NDT Diagnostics applied to the Control of Space Motors The Experience in AVIO Space Division .....</b>	2345
<i>E. Tosti</i>	
<b>Fatigue Life Assessment of Aircraft Alloys Using Fractal Analysis in Combination with Eddy Current Testing .....</b>	2351
<i>J. Schreiber, U. Cikalova, J. Hoffmann, N. Meyendorf, S. Hillmann</i>	
<b>Non-destructive Testing Methodologies on Helicopter Fiber Composite Components - Challenges Today and in the Future - .....</b>	2361
<i>R. Oster</i>	
<b>Cract Detection in Aluminium 2024-T3 Plates in an Airbus A320 Slat-Track using Electrical Crack Gauges.....</b>	2371
<i>I. Pitropakis, H. Pfeiffer, T. Gesang, S. Janssens, M. Wevers</i>	

<b>Inspection of Tail Boom/Fenestron Junction Frame on EC130 B4 Eurocopter Aircraft Using Phased Array</b>	2385
<i>M. Blanchet, L. Mauzeroll</i>	

#### **45. SESSION: TRANSPORT: RAILROAD, AUTOMOTIVE**

<b>Research on Automatic Defect Localization Method for Mobile Wheel Ultrasonic Inspection system</b>	2389
<i>L. Wang, J. Peng, Y. Zhang, X. Gao, Z. Wang, Q. Zhao, Z. Wang, C. Peng, K. Yang</i>	
<b>Application of Phased Array Ultrasonic Testing Technology on Inservice Wheel</b>	2395
<i>Y. Zhang, L. Wang, J. Peng, X. Gao, Z. Wang, Q. Zhao, C. Peng, K. Yang</i>	
<b>Development of Ultrasonic Testing System for Large Diameter Hollow Shaft</b>	2400
<i>J. Lin, K. Zhang, F. Lin, X. Yu</i>	
<b>A New Concept for High-Speed AtLine and InLine CT for up to 100% Mass Production Process Control</b>	2405
<i>O. Brunke, F. Hansen, I. Stuke, F. Butz</i>	
<b>Inspection of Projection Welded Automotive Nuts Through B-scan Ultrasonic Acoustic Imaging</b>	2412
<i>V. Furlanetto, D. Stocco, G. Batalha, F. Szabados</i>	
<b>Benefits of Phased Array Imaging Capability for Laser Welded Blanks</b>	2422
<i>M. Blanchet, S. Bastien</i>	
<b>Eddy Currents Versus Magnetic Particles</b>	2423
<i>V. Uchanin, G. Lutenco, V. Mishchenko, A. Opanasenko</i>	

#### **46. SESSION: TRANSPORT: RAILROAD, AXLES, RAILS**

<b>Application of Eddy Currents to the Inspection of Fatigue-corroded Railway Axles</b>	2431
<i>M. Carboni</i>	
<b>High-Power Locomotive Solid Axle Defect on-line Detection Technique</b>	2441
<i>C. Peng, L. Wang, X. Gao, Z. Wang, Q. Zhao, Y. Zhang, J. Peng, K. Yang</i>	
<b>Phased Array Scanner Head for train axle inspection</b>	2447
<i>G. Landry, R. Sicard, S. Serhan</i>	
<b>A 'model Assisted Probability of Detection' Approach for Ultrasonic Inspection of Railway Axles</b>	2457
<i>M. Carboni, S. Cantini</i>	
<b>Development of Components for an Industry Approved Hollow-Axle Testing System</b>	2467
<i>C. Richter, M. Froehlich, H. Scholz, N. Meyendorf</i>	
<b>Scanning Laser Vibrometer Measurement of Guided Waves in Rails</b>	2474
<i>P. Loveday, C. Long</i>	
<b>A Novel Crack Location Method Based on the Reflection Coefficients of Guided Waves</b>	2483
<i>Q. Fan, Z. Huang, D. Chen</i>	
<b>Effects of Various Couplants on Carbon Steel, Perspex and Aluminium Materials By Means of Ultrasonic Testing</b>	2493
<i>N. Netshidavhini, R. Mabuza</i>	
<b>New Methods of Rail Axle Inspection</b>	2503
<i>J. Rudlin, A. Raude, U. Volz, A. Loconte</i>	
<b>RAILECT the Solution for Volumetric Assessment of Aluminothermic Rail Welds</b>	2513
<i>A. Raude, T. Colombier, E. Jasuniene, G. Kotsikos, J. Rudlin</i>	
<b>Latest Development in the UT Inspection of Train Wheels and Axles</b>	2523
<i>P. Marty</i>	
<b>A Practical Continuous Operating Rail Break Detection System Using Guided Waves</b>	2534
<i>F. Burger</i>	
<b>Rail Track Condition Monitoring Using Electromagnetic Acoustic Transducers</b>	2542
<i>K. McAughey, M. Potter, P. Petcher, S. Dixon</i>	

#### **47. SESSION: UT PHASED ARRAYS**

<b>Calculating a 3D Map of Sensitivity, Resolution and Contrast for 2D Sparse Phased Array Probes</b>	2543
<i>J. Dziewierz, A. Gachagan</i>	
<b>Damage State Evaluation of X6CrNiNb18-10Alloys During Cyclic Deformation by Exploiting the Fractal Analysis of Ultrasonic Sampling Phased Array Backscattering Signals</b>	2544
<i>J. Schreiber, U. Cikalova, A. Bukavinnov, S. Dugan, H. Maier</i>	
<b>Real-Time Inspection of Complex Composite Structures with a Self-Adaptive Ultrasonic Technique</b>	2553
<i>S. Robert, O. Casula, O. Roy, G. Neau</i>	
<b>Development of Innovative Transducer Designs for NDT Applications: From 1-3 Piezocomposite Definition to 2D Array Probe Manufacture</b>	2562
<i>S. Michau</i>	
<b>Advanced Ultrasonic 2D Phased-Array Probes</b>	2572
<i>F. Reverdy, G. Ithurralde, N. Dominguez</i>	
<b>Demonstration of the Capability of Phased Array technique for Detecting Defects in Thick-Section welds</b>	2582
<i>M. Bokaba, N. Netshidavhini, R. Mabuza</i>	
<b>An Adaptive Phased Array Imaging Method for Ultrasonic Testing</b>	2588
<i>J. Qiao, M. Jobst</i>	

<b>Ultrasonic Phased Array Inspection on PE Pipe Heat Fusion Joint and Electro-Fusion Joint .....</b>	2593
<i>H. Chen, C. Zheng, C. Hong, F. Yang</i>	
<b>Simulation Studies for Design of an Encircling and Annular Phased Array Probe for Ultrasonic Examination of Zircaloy Billet.....</b>	2608
<i>P. Nanekar, N. Jothilakshmi, B. Shah</i>	
<b>Real Implementation of Ultrasonic Phased Array Technology Using Advanced Signal Processing Algorithms.....</b>	2609
<i>S. Starman, V. Matz</i>	
<b>Risk and Reliability of Radiographic and Phased Array Ultrasonic Test on the Boiler Connections, Based on FMEA Model.....</b>	2615
<i>F. Marefat, A. Khodabandeh, M. Afshar, A. Amadeh, M. Faghedi</i>	
<b>Flexible Phased Array for Inspecting Curved Composites.....</b>	2624
<i>N. Hankinson, R. Freeman, A. Bond-Thorley, V. Dumali</i>	

#### **48. SESSION: UT, ACOUSTIC EMISSION**

<b>GALS-1 AE System With Distributed Structure For Diagnostics Of Critical Objects .....</b>	2625
<i>D. Galanenko, G. Lutsenko</i>	
<b>Intrinsically Safe Acoustic Emission Equipment Opens the Door to Permanent Monitoring Applications in the Oil and Gas Industry .....</b>	2634
<i>H. Vallen, T. Thenikulam</i>	
<b>Structural Integrity Monitoring for Smelting Furnaces Based on Acoustic Emission Data Acquisition and Analysis.....</b>	2645
<i>P. Gebski, A. Sadri</i>	
<b>Corrosion Detection &amp; Monitoring .....</b>	2653
<i>P. Cole, W. Henrico</i>	
<b>Advanced Acoustic Methods for On-Stream Inspection .....</b>	2654
<i>P. Cole, W. Henrico</i>	
<b>Acoustic Emission - Multiple Non Destructive Methods For Inspecting Mobile Elevated Work Platforms .....</b>	2655
<i>D. Wilkinson, W. Henrico</i>	
<b>An Acoustic Emission Wireless Sensor Node for Structural Health Monitoring of Bridges Powered by Novel Energy Harvesting Devices .....</b>	2656
<i>V. Godinez-Azcuaga, D. Inman, P. Ziehl, A. Nanni</i>	
<b>A Novel Optical Fiber-Based Acoustic Emission System.....</b>	2657
<i>D. Nguyen, S. Momeni, V. Godinez-Azcuaga</i>	
<b>Acoustic Emission monitoring of Lube Oil Condition in Large IC Engines.....</b>	2658
<i>P. Sreedhar, K. Balasubramanian</i>	

#### **49. SESSION: UT: GENERAL**

<b>Investigation into the use of Bismuth Titanate as a High Temperature Piezoelectric Transducer.....</b>	2659
<i>K. McAughey, S. Burrows, R. Edwards, S. Dixon</i>	
<b>Phased Array for Small Diameter, Thin-Walled Piping Inspections.....</b>	2667
<i>M. Moles, E. Ginzel</i>	

#### **50. SESSION: UT: GENERAL, NON LINEAR**

<b>A Local Defect Resonance to Enhance Acoustic Wave-Defect Interaction in Nonlinear Spectroscopy and Ultrasonic Thermography .....</b>	2680
<i>I. Solodov, J. Bai, S. Bekgulyan, G. Busse</i>	
<b>Images of Cracks using a Localized Nonlinear Ultrasonic Parameters .....</b>	2690
<i>Y. Cheong, H. Kim, H. Jung</i>	
<b>Differences in Ultrasonic Indications - Thermal Fatigue Cracks and EDM Notches .....</b>	2691
<i>A. Koskinen, J. Haapalaainen, I. Virkkunen, M. Kempainen</i>	
<b>Detection of Transparent Cracks Using Non-linear Acoustics.....</b>	2699
<i>K. Chougrani, A. Gisolf, F. Dijkstra</i>	
<b>Nonlinear Ultrasonic Spectroscopy and Acoustic Emission in SHM of Aircrafts.....</b>	2708
<i>Z. Prevorovsky</i>	
<b>Mercury Cavitation Damage Evaluation by Using Nonlinear Ultrasonic Method .....</b>	2709
<i>T. Wakui, T. Wan, T. Naoe, K. Kawashima, K. Maekawa</i>	
<b>Development of an Ultrasonic C-Scan Imaging Technique for Optimization of Electro Magnetic Stirrer to Improve Steel Billet Quality .....</b>	2710
<i>M. Raj, R. Saini, K. Balasubramanian</i>	

#### **51. SESSION: UT: LASER ULTRASOUND, CONTACT PROBLEMS**

<b>Ultrasonic Multi-skip Tomography for Pipe Inspection .....</b>	2720
<i>A. Volker, R. Vos, A. Hunter</i>	

<b>Ultrasonic Multi-Skip Inspection for Clamped Saddle Supports .....</b>	2727
<i>M. Lorenz, S. Lewandowski</i>	
<b>The Use of Ultrasonic Inspections at Elevated Temperature .....</b>	2737
<i>A. McLay, J. Verkooijen</i>	
<b>NDT Precise Ultrasonic Velocity Measurement by Laser Ultrasonics.....</b>	2745
<i>S. Han, Y. Kim, S. Lee</i>	
<b>Novel Technique for Velocity and Thickness Measurements with Laser Ultrasonic's.....</b>	2746
<i>M. Engman, M. Falkenstrom</i>	
<b>Case Depth Profile Measurement of Hardened Components Using Ultrasonic Backscattering Method .....</b>	2754
<i>F. Honarvar, R. Bageri, R. Mehdizad</i>	

## **52. SESSION: WELDS**

<b>The HOIS Recommended Practice for the Inspection of Weld Corrosion .....</b>	2762
<i>S. Burch</i>	
<b>Statistical Fluctuation and Fractal Analyses of Weld Defect Patterns Obtained from D-Scan Images .....</b>	2763
<i>L. Goncalves, F. Silva, E. Moura</i>	
<b>Automated Testing of SAW Welds Using Phased Arrays.....</b>	2773
<i>J. Ininger, U. Semmler, O. Schroeder, S. Falter, F. Kahmann</i>	
<b>X-ray Based Inspection of Tube-to-tube-sheet Welding Joints .....</b>	2781
<i>V. Usachev, E. Usachev, V. Tverdoxlebov, S. Chakhlov</i>	
<b>Development of Phased Array Ultrasonic Inspection Techniques for Testing Welded Joints in Plastic (PE) Pipes .....</b>	2782
<i>F. Hagglund, M. Spicer, M. Troughton</i>	
<b>Author Index</b>	