German Society for Non-Destructive Testing

NDT in Aerospace

Fraunhofer

sponsored by BOEING AIRBUS

7th International Symposium on NDT in Aerospace

16 – 18 November 2015 in Bremen, Germany

REGISTRATION
via conference website www.ndt-aerospace.com

FEES
Registration fee	730.00 €
Students (for persons 30 and under and with a current International Student Identity Card (ISIC); proof of enrolment during on-site check-in)	200.00 €

including scientific programme, exhibition visit, proceedings, participation in social programme, daily lunch and refreshments

CANCELLATION
by 5 October 2015: 50 % of the participation fee
from 6 October 2015: no refund possible

PAYMENT
The payment of the participation fees is requested only in EUR and has to be done after receipt of invoice by 2 November 2015 (receipt of payment). Please quote invoice no. and name of participant. All payments after this date have to be done by credit card (VISA or Mastercard) or cash at the registration desk.

CONFERENCE VENUE
ATLANTIC Hotel Universum | Wiener Strasse 4 | 28359 Bremen | Germany
www.atlantic-hotels.de/universum

HOTEL RESERVATION
We have special conditions in the following hotels – till 1 October 2015:

ATLANTIC Hotel Universum (conference hotel)
single room: 109.00 €, double room: 139.00 €

7 THINGS – my basic hotel (walking distance: 5 minutes)
single room: 72.50 €

More information and the reservation form or online reservation system please find on the conference website. Please bear in mind that the hotel bill must be settled with the hotel.

SOCIAL PROGRAMME
Tuesday, 17 November 2015 | from 14:30 h Excursions to aviation companies
19:00 h Conference evening including invited lecture at restaurant „Ratskeller“

Participants have the possibility to visit the **Aerospace Electrical System Expo Europe**, 17 – 19 November 2015 in Bremen, Germany. The trade fair is not part of our symposium and is only offered in cooperation with the trade fair organisers.

CONFERENCE SECRETARIAT
Ms. Steffi Dehlau | German Society for Non-Destructive Testing (DGZfP)
Max-Planck-Str. 6 | 12489 Berlin | Germany
Phone: +49 30 67807-120 | Fax: +49 30 67807-129 | E-mail: tagungen@dgzfp.de

LANGUAGE
All technical papers will be presented in English, simultaneous translation will not be provided.

CONFERENCE MATERIALS
At the conference, participants will get a booklet of all abstracts of the programme contributions and the proceedings with full papers.

SCIENTIFIC COMMITTEE
G. Akhras | Royal Military College of Canada, Kingston, Canada
P. Benoist | M2M, Les Ulis, France
C. Bockenheimer | Airbus Operations, Germany
C. Boller | Saarland University, Saarbrücken, Germany
V. Cortés | Airbus, Madrid, Spain
E. Cuevas Aguado | Tecnatom, Madrid, Spain
U. Ewert | BAM, Berlin, Germany
S.C. Galea | Defence Science and Technology Organisation, Melbourne, Australia
G. Georgeson | Boeing Commercial Aircrafts, Seattle, USA
S. Gopalakrishnan | Indian Institute of Science, Bangalore, India
C.U. Große | TU Munich, Germany
A. Güemes | Universidad Politecnica de Madrid, Spain
R. Hanke | Fraunhofer IIS, Fürth & University of Würzburg, Germany
P. Irving | Cranfield University, Cranfield, United Kingdom
J. Kastner | University of Applied Sciences Upper Austria, Wels, Austria
M. Kreutzbruck | University of Stuttgart, Germany
A. Malcolm | Singapore Institute of Manufacturing Technology, Singapore
P. Masson | GAUS – Université de Sherbrooke, Canada
W. Ostachowicz | Polish Academy of Sciences, Gdansk, Poland
W. H. Prosser | NASA, Hampton, USA
M. Purschke | DGZfP, Berlin, Germany
R. Smith | University of Bristol, United Kingdom
N. Uhlmann | Fraunhofer EZRT, Fürth, Germany
S. Yuan | Nanjing University of Aeronautics and Astronautics, Nanjing, China

ORGANISING COMMITTEE
C. Boller | Saarland University, Saarbrücken, Germany
R. Hanke | Fraunhofer IIS, Fürth & University of Würzburg, Germany
M. Purschke | DGZfP, Berlin, Germany
S. Dehlau | DGZfP, Berlin, Germany

Non-Destructive Testing and Evaluation (NDT&E) is one of the major requirements in aerospace structural design. Hardly any of the components manufactured is not allowed to pass quality assurance without having gone through any of the various NDT procedures being around. For damage tolerant design as used in aviation NDT is a prerequisite. Appropriate use of NDT guarantees safety in aerospace and is thus a subject of highest attention. Major topics to be discussed among others at this event will include the physics of NDT, sensors and material interaction, design of complete inspection systems and data evaluation such as for automated image processing. A special focus will also be towards improvement in inspection speed and transfer of laboratory NDT into production and manufacturing process integrated testing for in-line inspection.

The Symposium on NDT in Aerospace will be run this time in a very unique and possibly novel way. In a single session all papers will be presented orally as short presentations without any discussion. This will allow all attendees to follow the full programme and to select which topic, possibly related to some exciting paper, he/she wants to further follow up in more detail. Further details of the papers as well as discussions will then take place in parallel sessions where each session is tailored in accordance to the needs of the topic it addresses as well as the papers being allocated to it. This will avoid the burden of swapping between sessions or missing any paper of relevance having been overseen. It may also provide room for important discussions on sometimes very relevant papers and topics, which often have to be suppressed due to time constraints.

Five reputable invited speakers have been won which will talk during one hour each including discussion on exciting subjects. Those include Prof. W. Arnold (formerly Saarland University) on Mechanical Properties of Comet 67P/Churyumov-Gerasimenko Measured by CASSE and DIM on board Rosetta's Lander Philae, Ms. M. Bertovic on psychological issues in the man-machine interface along NDT processes, Prof. S. Gopalakrishnan (Indian Inst. of Science) on Indian Initiatives in the Areas of Structural Health Monitoring and Integrated Vehicle Health Management, Dr. E. Lindgren (US Air Force WPAFBL) on Recent and Future Enhancements in NDI for Aircraft Structures and Prof. J. Qiu (Nanjing Univ. of Aeronautics and Astronautics) on NDT Methods for Composites and Aerospace Engineering.

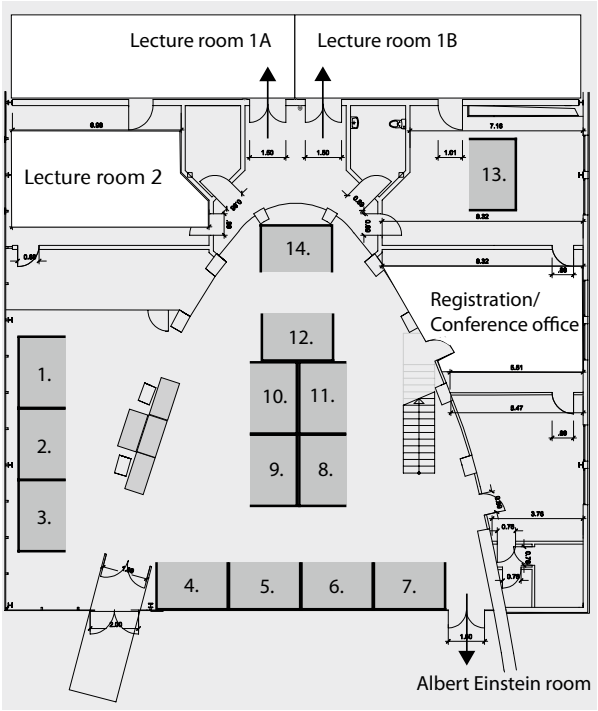
The symposium will be complemented by an exhibition of NDT technology providers, which has been completely sold out in the meantime. The symposium is also run adjacent to the Aerospace Electrical Systems Expo Europe, which takes place in Bremen/Germany too. Another important feature of the symposium not to be missed are the technical visits where visits to organisations such as in aviation (Airbus, Premium Aerotec) and space (OHB, ZARM) are targeted. All those features do allow 'to kill more than two birds with a stone' and are therefore worth for a visit to be considered.

Prof. Dr.
Randolf Hanke
Fraunhofer IIS, Fürth and
University of Würzburg

Prof. Dr.-Ing.
Christian Boller
Saarland University

Dr.-Ing.
Matthias Purschke
German Society for
Non-Destructive Testing

COMPANY	COUNTRY	BOOTH
Dantec Dynamics GmbH	Germany	8
ETher NDE	United Kingdom	4
EXEL Technology GmbH	Germany	13
FEI	France	14
GE Sensing & Inspection Technologies GmbH	Germany	3
Imaginos NDE	United Kingdom	5
IMASONIC S.A.S	France	11
LOT-QuantumDesign GmbH	Germany	2
M2M NDT	France	10
NDT-Service GmbH	Germany	7
RIL-CHEMIE Marc Breit	Germany	1
Testia GmbH	Germany	12
X-RAY WorX GmbH	Germany	9
YXLON International GmbH	Germany	6



The floor plan is not drawn to scale.

The participation in the symposium is connected with a visit to aviation and space companies, starting on Tuesday, 17 November 2015, after the scientific programme. The following tours are available, on a first come, first served basis:

AIRBUS DEFENCE & SPACE

At Airbus D & S you can gain exciting insights into the latest space technology made in Bremen. During your guided tour you will learn more about the everyday life in space while sightseeing the original modules of the International Space Station (ISS) and the construction elements of Ariane 5. You can even watch the scientists and engineers at work during a visit to the 'clean Saal'. → Participation only with a valid identity card.
14:30 h bus departure from Atlantic Hotel

ZARM DROP TOWER OPERATION AND SERVICE COMPANY

The Center of Applied Space Technology and Microgravity (ZARM) is a research institute of the University of Bremen operating the ZARM Drop Tower, a microgravity laboratory that is unique in Europe and open to scientists from all over the world. With a height of 146 meters, it is possible to conduct experiments under conditions of weightlessness for a time period of up to 9.3 seconds – a feature no other drop tower can provide. During the guided tour you will not only get a look into the drop tube, but also explore other test laboratories that ZARM has to offer. This includes the vibration test lab, the thermal vacuum chamber and the largest 30g-centrifuge in Europe.
14:45 h bus departure from Atlantic Hotel

OHB – TECHNICAL VISIT

The systems specialist OHB System AG is one of the leading independent forces in European space. They have been making a name for themselves on the market with their creative and business approach for a good 35 years particularly in core business comprising low-orbiting and geostationary satellites. They are developing and executing some of the key projects of our times such as the Galileo navigation satellites, the SARah reconnaissance system, the MTG meteorological satellites, the EnMAP environment satellite, the TET-1 technology testing vehicle and the HispaSat, ELECTRA and EDRS-C telecommunications satellites. The tour programme includes a presentation of the OHB company profile and a visit of integration halls.
15:00 h bus departure from Atlantic Hotel

AIRBUS BREMEN

Guided tour by foot of the manufacturing facilities: wings and flaps production.
If applicable you may also visit the Condor Project and/or part production and/or A400M Hall. → Participation only with a valid identity card.
15:15 h bus departure from Atlantic Hotel

The tours end in the city centre (bus transfer).
From 19:00 h the conference evening will take place at the restaurant „Ratskeller", including the invited lecture of Professor Arnold (page 15).

Additional information is published on the conference website and will be distributed to all registered participants.

	Saal 1a
MONDAY, 16 NOVEMBER 2015	
09:30 – 09:45	**Opening** – *C. Boller, R. Hanke*
09:45 – 10:45	**Mo.1.A – Invited Lecture 1**
	C. Boller
11:15 – 12:15	**Mo.2.A – Invited Lecture 2**
	C. Boller
13:15 – 14:05	**Mo.3.A – Plenary Session**
	ACOUSTIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES *R. Groves*
14:05 – 15:00	**Mo.4.A – Plenary Session**
	STRUCTURAL HEALTH MONITORING IN GENERAL *E.A. Lindgren*
15:30 – 16:20	**Mo.5.A – Plenary Session**
	MATERIALS CHARACTERISATION *W. Ostachowicz*
16:30 – 17:40	**Mo.6.A, B, C – Workshops on Plenary Sessions (Saal 1a, 1b, 2)**
18:00	**Get-together in the exhibition area**
TUESDAY, 17 NOVEMBER 2015	
08:30 – 09:20	**Tu.1.A – Plenary Session**
	ELECTROMAGNETIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES *H. Heuer*
09:20 – 10:10	**Tu.2.A – Plenary Session**
	GUIDED WAVES FOR STRUCTURAL HEALTH MONITORING *D.R. Mahapatra*
10:40 – 11:30	**Tu.3.A – Plenary Session**
	EMERGING EQUIPMENT TECHNOLOGIES AND VALIDATION IN MANUFACTURING AND MAINTENANCE *H.-U. Baron*
11:40 – 12:50	**Tu.4.A, B, C – Workshops on Plenary Sessions (Saal 1a, 1b, 2)**
from 14:30	**Excursions to aviation and space companies**
19:00	**Conference evening including invited lecture at restaurant „Ratskeller“**

WEDNESDAY, 18 NOVEMBER 2015

	Saal 1a
08:30 – 10:30	**We.1.A – Invited Lectures**
	C.U. Große
11:00 – 11:50	**We.2.A – Plenary Session**
	NDT ALONG COMPOSITES MANUFACTURING AND MAINTENANCE *G. Georgeson*
11:50 – 12:40	**We.3.A – Plenary Session**
	EMERGING TECHNOLOGY IN ACOUSTICS, LIQUID PENETRANT, OPTICS AND POTENTIAL MEASUREMENT *J. Qiu*
13:30 – 14:20	**We.4.A – Plenary Session**
	IT DEVELOPMENTS AND SOLUTIONS *S. Gopalakrishnan*
14:20 – 15:10	**We.5.A – Plenary Session**
	EMERGING TECHNOLOGY IN ELECTROMAGNETISM *P. Starke*
15:40 – 16:50	**We.6.A, B, C – Workshops on Plenary Sessions (Saal 1a, 1b, 2, Room Albert Einstein)**
16:50	**Closing**

Saal 1a

09:30 **Opening** – *C. Boller, R. Hanke*

Mo.1.A – Invited Lecture 1
C. Boller

09:45 **Mo.1.A.1**

RECENT AND FUTURE ENHANCEMENTS IN NDI FOR AIRCRAFT STRUCTURES
E.A. Lindgren[1], J. Brausch[1], C. Buynak[1], C. Babish[2]
[1] US Air Force Research Laboratory, Wright-Patterson, USA; [2] US Air Force Life Cycle Management Center, Wright-Patterson, USA

10:45 Break

Mo.2.A – Invited Lecture 2
C. Boller

11:15 **Mo.2.A.1**

INDIAN INITIATIVES IN THE AREAS OF STRUCTURAL HEALTH MONITORING AND INTEGRATED VEHICLE HEALTH MANAGEMENT
S. Gopalakrishnan[1], K. Vijayaraju[2]
[1] Indian Institute of Science, Bangalore, India;
[2] Aeronautical Development Agency, Bangalore, India

12:15 Lunch

Mo.3.A – Plenary Session
ACOUSTIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES
R. Groves

13:15 **Mo.3.A.1**

A STATE SPACE APPROACH FOR THE NON-DESTRUCTIVE EVALUATION OF CFRP WITH ULTRASONIC TESTING
C. Brandt[1], P. Maaß[2]
[1] Airbus Operations, Bremen, Germany; [2] Universität Bremen, Germany

13:21 **Mo.3.A.2**

LASER ULTRASONICS INSPECTIONS OF AERONAUTICAL COMPONENTS VALIDATED BY COMPUTED TOMOGRAPHY
E. Cuevas Aguado[1], F. Lasagni[2]
[1] Tecnatom, San Sebastian de los Reyes, Spain;
[2] CATEC, La Rinconada, Spain

13:27 **Mo.3.A.3**

COMPARATIVE STUDY OF DIFFERENT NONDESTRUCTIVE TESTING METHODS TO DETECT DAMAGES IN GFRP
C.T. Geiss[1]
[1] TU München, Germany

Saal 1a

13:33 **Mo.3.A.4**

ULTRASONIC TRACKING OF PLY DROPS IN COMPOSITE LAMINATES – EXPERIMENTAL VALIDATION

M. Mienczakowski[1], L. Nelson[1], R. Smith[1], P. Wilcox[1]
[1] University of Bristol, United Kingdom

13:39 **Mo.3.A.5**

NDE OF DISSIMILAR JOINTS USING ULTRASONICS AND X-RAY TOMOGRAPHY

E. Jasiuniene[1], L. Mazeika[1], E. Zukauskas[1], V. Samaitis[1], V. Cicenas[1]
[1] Kaunas University of Technology, Kaunas, Lithuania

13:45 **Mo.3.A.6**

HIGH RESOLUTION NDT&E OF CARBON FIBER REINFORCED COMPOSITES

Y. Petronyuk[1], V. Levin[1], T. Ryzhova[2], A. Chernov[2], S. Liu[3], E. Morokov[1]
[1] Russian Academy of Sciences, Moscow, Russia; [2] Central Aerohydrodinamic Institute, Zhukovsky, Russland; [3] Beijing Aeronautical Manufacturing Technology Research Institute, China

13:51 **Mo.3.A.7**

ANALYSIS OF INVERSION METHODS TO CHARACTERISE THE VOID INCLUSIONS: APPLICATION TO GLASS LAMINATED ALUMINIUM REINFORCED EPOXY AND CARBON FIBRE REINFORCED POLYMER

R. Tayong Boumda[1], R. Smith[1], V.J. Pinfield[2]
[1] University of Bristol, United Kingdom; [2] Loughborough University, Leicestershire, United Kingdom

13:57 **Mo.3.A.8**

TOWARDS A BETTER LIFETIME PREDICTION OF COMPOSITE STRUCTURES UNDER IN-SERVICE CONDITIONS: ROBUST AND REAL-TIME PROCESSING OF ACOUSTIC EMISSION TIME-SERIES IN PRESENCE OF DAMAGE ACCUMULATION

M. Kharrat[1], E. Ramasso[1], D.D. Doan[1], V. Placet[1], L. Boubakar[1]
[1] FEMTO-ST Institute, Besançon, France

Mo.4.A – Plenary Session

STRUCTURAL HEALTH MONITORING IN GENERAL

E.A. Lindgren

14:05 **Mo.4.A.1**

AUTONOMOUS WIRELESS ACOUSTIC SENSORS FOR AERONAUTICAL SHM APPLICATIONS

G. Ferin[1], T. Hoang[1], P. Chatain[1], C. Bantignies[1], H. Le Khanh[1], A. Nguyen-Dinh[1], E. Flesch[1]
[1] Vermon SA, Tours, France

14:11 **Mo.4.A.2**

IN-SERVICE STRUCTURAL HEALTH MONITORING TECHNIQUE FOR LARGE AEROSPACE COMPOSITE STRUCTURES

A. Naghash Pour[1], S.V. Hoa[1]
[1] Concordia University, Montreal, Canada

Saal 1a

14:17 **Mo.4.A.3**

METHOD FOR FIBER OPTIC STRAIN AND TEMPERATURE MEASUREMENTS OF RAPIDLY ROTATING AEROSPACE STRUCTURES

E. Shafir[1], S. Zilberman[1], T. Goichman[1], O. Mazor[1], Y. Saadi [1], G. Berkovic[1]
[1] Soreq NRC, Yavne, Israel

14:23 **Mo.4.A.4**

SIMULATION OF STRUCTURAL DAMAGE AND ITS DETECTION BY METHOD OF ELECTRO-MECHANICAL IMPEDANCE

V. Pavelko[1]
[1] Riga Technical University, Latvia

14:29 **Mo.4.A.5**

A ROUND ROBIN TEST OF FLASH THERMOGRAPHY OF CFRP STRUCTURES

N. Rothbart[1], C. Maierhofer[1], M. Goldammer[2], F. Hohlstein[3], J. Koch[4], I. Kryukov[5], G. Mahler[6], B. Stotter[7], G. Walle[8], C. Wulz[9]
[1] BAM, Berlin, Germany; [2] Siemens, München, Germany; [3] Block Materialprüfung, Berlin, Germany; [4] edevis, Stuttgart, Germany; [5] Universität Kassel, Germany; [6] InfraTec, Dresden, Germany; [7] University of Applied Sciences Upper Austria, Wels, Austria; [8] Fraunhofer IZFP, Saarbrücken, Germany; [9] Optris, Berlin, Germany

14:35 **Mo.4.A.6**

POSITIONING NDT SENSORS WITH A MOBILE ROBOT FOR EFFICIENT AIRCRAFT INSPECTIONS

C. Deneke[1], C. Schlosser[1], S. Mehler[2], T. Schüppstuhl[1]
[1] Technische Universität Hamburg-Harburg, Germany; [2] Lufthansa Technik, Frankfurt am Main, Germany

14:41 **Mo.4.A.7**

EXPERT SYSTEM TO SUPPORT OPERATIONAL SAFETY OF THE TS-11 “ISKRA” AIRCRAFT AND OVERHAULS OF THE SO-3 ENGINES

M. Witos[1], M. Wachlaczenko[1]
[1] Air Force Institute of Technology, Warsaw, Poland

14:47 **Mo.4.A.8**

ON-LINE DAMAGE MONITORING AND EVALUATION IN CFRP AEROSPACE STRUCTURES DURING MECHANICAL TESTING

F. Lasagni[1], B. Rodriguez[1], M.d. Santamaria[1], C. Galleguillos[1], S. Hernández[2], E. Cuevas Aguado[2]
[1] CATEC, La Rinconada, Spain; [2] Tecnatom, San Sebastian de los Reyes, Spain

15:00 Break

Saal 1a

Mo.5.A – Plenary Session

MATERIALS CHARACTERISATION

W. Ostachowicz

15:30 **Mo.5.A.1**

INVESTIGATIONS ON RELATIONSHIP BETWEEN POROSITY AND ULTRASONIC ATTENUATION COEFFICIENT IN CFRP LAMINATES BASED ON RMVM

S. Ding[1], S. Jin[1], Z. Luo[1], H. Liu[1], J. Chen[1], L. Lin[1]

[1] Dalian University of Technology, Dalian, China

15:36 **Mo.5.A.2**

IMPACT DAMAGE DETECTION IN GRAPHENE DOPED CFRP LAMINATES

A. Güemes[1], B. Larrañaga[1], R. Moriche[2], M. Sanchez[2]

[1] Universidad Politecnica de Madrid, Spain; [2] URJC, Madrid, Spain

15:42 **Mo.5.A.3**

EVALUATION OF CFRP-REFERENCE SAMPLES FOR POROSITY MADE BY DRILLING AND COMPARISON WITH REAL POROSITY SAMPLES BY MEANS OF QUANTITATIVE X-RAY COMPUTED TOMOGRAPHY

B. Plank[1], G. Rao[2], J. Kastner[1]

[1] University of Applied Sciences Upper Austria, Wels, Austria

15:48 **Mo.5.A.4**

INSPECTION OF SICF/SIC CERAMIC MATRIX COMPOSITE SPECIMENS EMPLOYED FOR THERMO-MECHANICAL FATIGUE EXPERIMENTS VIA LABORATORY X-RAY COMPUTED MICROTOMOGRAPHY

M. Bache[1], J. Jones[1], Z. Quiney[1]

[1] Swansea University, United Kingdom

15:54 **Mo.5.A.5**

SHORT TIME EVALUATION OF METALLIC MATERIALS' FATIGUE POTENTIAL COMBINING DESTRUCTIVE AND NON-DESTRUCTIVE TESTING METHODS

P. Starke[1], H. Wu[1], C. Boller[1]

[1] Saarland University, Saarbrücken, Germany

16:00 **Mo.5.A.6**

FAULT DETECTION IN AIRCRAFT WIRING USING ENHANCED MULTI-PULSE TDR TECHNIQUE

M. Shirkoohi[1]

[1] London South Bank University, United Kingdom

Saal 1a

16:06 **Mo.5.A.7**

NON-DESTRUCTIVE EVALUATION OF AIRCRAFT CABLES USING ULTRASONIC GUIDED WAVE TECHNIQUE

A.Y. Chong[1], S.-M. Tan[1], R. Arondekar[1], T. Parthipan[2], P. Jackson[2], S. Moustakidis[3], V. Kappatos[1], C. Selcuk[1], T.-H. Gan[1]

[1] Brunel University, Cambridge, United Kingdom; [2] Plant Integrity, Cambridge, United Kingdom; [3] Centre for Research & Technology Hellas, Athens, Greece

16:12 **Mo.5.A.8**

ON- AND OFF-LINE ULTRASONIC INSPECTIONS TO CHARACTERIZE COMPONENTS BUILD BY SLM ADDITIVE MANUFACTURING

H. Rieder[1], M. Spies[1], J. Bamberg[2], B. Henkel[2], S. Müller[2], H.-U. Baron[2]

[1] Fraunhofer IZFP, Saarbrücken, Germany; [2] MTU Aero Engines, München, Germany

16:20 Break

Mo.6. – Workshops

	Saal 1a	Saal 1b	Saal 2
16:30	**Mo.6.A**	**Mo.6.B**	**Mo.6.C**
	WORKSHOP ON ACOUSTIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES (presentations from Mo.3.A) *R. Groves*	WORKSHOP ON STRUCTURAL HEALTH MONITORING IN GENERAL (presentations from Mo.4.A) *E.A. Lindgren*	WORKSHOP ON MATERIALS CHARACTERISATION (presentations from Mo.5.A) *W. Ostachowicz*

18:00 **Get-together in the exhibition area**

Saal 1a

Tu.1.A – Plenary Session

ELECTROMAGNETIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES

H. Heuer

08:30 **Tu.1.A.1**

NDT OF SPECIAL HONEYCOMB STRUCTURES BY USING MICROWAVES

J.H. Hinken[1], C. Ziep[1]

[1] FI Test- und Messtechnik, Magdeburg, Germany

08:36 **Tu.1.A.2**

CHARACTERIZATION OF PRODUCTION-INDUCED DEFECTS IN CARBON FIBER REINFORCED THERMOPLASTIC TECHNOLOGY

F.J. Fischer[1], Y. Mezakeu Tongnan[1], M. Beyrle[1], T. Gerngross[1], M. Kupke[1]

[1] DLR, Augsburg, Germany

08:42 **Tu.1.A.3**

FTIR SPECTROSCOPY AS A NONDESTRUCTIVE TESTING METHOD FOR CFRP SURFACES IN AEROSPACE

S. Heckner[1], M. Geistbeck[1], C.U. Große[2], S. Eibl[3], A. Helwig[1]

[1] Airbus Group Innovations, München, Germany; [2] TU München, Germany; [3] Bundeswehr Research Institute for Materials, Fuels and Lubricants (WIWeB), Erding, Germany

08:48 **Tu.1.A.4**

COMPOSITES SURFACE STATE ASSESSMENT BY LIF METHOD

P. Malinowski[1], M. Sawczak[1], T. Wandowski[1], W. Ostachowicz[1], A. Cenian[1]

[1] Polish Academy of Sciences, Gdansk, Poland

08:54 **Tu.1.A.5**

NEAR-INFRARED OPTICAL COHERENCE TOMOGRAPHY FOR THE INSPECTION OF FIBER COMPOSITES

P. Liu[1], L. Yao[1], R. Groves[1]

[1] Delft University of Technology, Netherlands

09:00 **Tu.1.A.6**

ADVANCES IN AUTOMATIC CHARACTERIZATION OF DEFECTS IN CFRP BY INFRARED THERMOGRAPHY

P. Venegas[1], R. Usamentiaga[2], L. Vega[1], I. Saez de Ocariz[1]

[1] CTA, Miñano, Spain; [2] Universidad de Oviedo, Spain

09:06 **Tu.1.A.7**

DEVELOPMENT OF A PROBE OF EDDY CURRENT TESTING FOR DETECTION OF IN-PLANE WAVINESS IN CFRP CROSS-PLY LAMINATES

K. Mizukami[1], Y. Mizutani[1], A. Todoroki[1], Y. Suzuki[1], A.Sato[2], K. Kimura[2]

[1] Tokyo Institute of Technology, Japan; [2] IHI Aerospace, Tomioka, Japan

Saal 1a

09:12 **Tu.1.A.8**

ULTRAFAST PULSED TERAHERTZ SENSING FOR THE CONTACT-FREE CONTROL OF COMPOSITES AND ADHESIVE ASSEMBLIES
X. Neiers[1], P. Jeunesse[1], U. Schmidhammer[1]
[1] Université Paris Sud - CNRS, Orsay, France

Tu.2.A – Plenary Session
GUIDED WAVES FOR STRUCTURAL HEALTH MONITORING
D.R. Mahapatra

09:20 **Tu.2.A.1**

DURABILITY ASSESSMENT OF PZT-TRANSDUCERS FOR GUIDED WAVE BASED SHM SYSTEMS USING TENSILE STATIC AND FATIGUE TEST
C. Meisner[1], C. Stolz[1], F. Hofmann[2]
[1] Airbus Defence and Space, Manching, Germany; [2] WIWeB, Erding, Germany

09:26 **Tu.2.A.2**

APPLICATION OF THE FATIGUE CRACK OPENING/CLOSING EFFECT FOR AIRCRAFT SHM
V. Pavelko[1]
[1] Riga Technical University, Latvia

09:32 **Tu.2.A.3**

IMPLEMENTATION OF GUIDED WAVE BASED DAMAGE LOCALIZATION ALGORITHM IN ANDROID OS
T. Wandowski[1], P. Malinowski[1], W. Ostachowicz[1], G. Borowik[2], T. Luba[2], K. Kowalski[2], P. Pecio[2]
[1] Polish Academy of Sciences, Gdansk, Poland; [2] Warsaw University of Technology, Warsaw, Poland

09:38 **Tu.2.A.4**

PZT ARRAY FOR PASSIVE GUIDED WAVE TOMOGRAPHY OF EXTENDED DEFECTS USING AMBIENT ELASTIC NOISE CROSS-CORRELATIONS
T. Druet[1], B. Chapuis[1], M. Jules[1], G. Laffont[1], E. Moulin[2]
[1] CEA LIST, Gif-sur-Yvette, France; [2] IEMN - DOAE, Valenciennes, France

09:44 **Tu.2.A.5**

DESIGN OF A STRUCTURAL HEALTH MONITORING SYSTEM FOR A DAMAGE TOLERANCE FUSELAGE COMPONENT
V. Ewald[1], P. Ochoa[1], R. Groves[1], C. Boller[2]
[1] Delft University of Technology, Netherlands; [2] Saarland University, Saarbrücken, Germany

09:50 **Tu.2.A.6**

SIMULATION OF GUIDED WAVES SHM SYSTEM IN CIVA PLATFORM
B. Chapuis[1], K. Jezzine[1], V. Baronian[1], L. Taupin[1], D. Ségur[1]
[1] CEA LIST, Gif-sur-Yvette, France

Saal 1a

09:56 **Tu.2.A.7**

ESTABLISHING A SIMULATION PLATFORM FOR ACOUSTICS BASED SHM SYSTEM CONFIGURATION
R. Sridaran Venkat[1]
[1] *Saarland University, Saarbrücken, Germany*

10:02 **Tu.2.A.8**

FREQUENCY STEERABLE TRANSDUCERS WITH 360° DIRECTIVITY FOR GUIDED WAVES INSPECTIONS IN PLATE-LIKE STRUCTURES
L. De Marchi[1], *N. Testoni*[1], *A. Marzani*[1]
[1] *University of Bologna, Italy*

10:10 Break

Tu.3.A – Plenary Session

EMERGING EQUIPMENT TECHNOLOGIES AND VALIDATION IN MANUFACTURING AND MAINTENANCE
H.-U. Baron

10:40 **Tu.3.A.1**

PORTABLE LOW-COST FLAT PANEL DETECTORS FOR REAL-TIME DIGITAL RADIOGRAPHY
M. Iovea[1], *M. Neagu*[1], *B. Stefanescu*[1], *G. Mateiasi*[1], *I. Porosnicu*[1], *E. Angheluta*[1]
[1] *Accent Pro 2000, Bucharest, Romania*

10:46 **Tu.3.A.2**

CRACKED SAMPLES FOR AIRFRAME COMPONENTS
I. Virkkunen[1], *J. Patronen*[2]
[1] *Trueflaw, Espoo, Finland;* [2] *Patria Aviation, Halli, Finland*

10:52 **Tu.3.A.3**

FROM X-RAY FILM TO DIGITAL RADIOGRAPHY: A GUIDELINE FOR A SUCCESSFUL TRANSITION
K. Bavendiek[1], *J. Robbins*[1], *T. Wenzel*[1]
[1] *YXLON International, Hamburg, Germany*

10:58 **Tu.3.A.4**

CHECK OF HYBRID STRUCTURES AND LIGHTWEIGHT CONSTRUCTION MATERIALS – LOOK AT THE NEW INNOVATIVE MEASURING AND ANALYSIS INSTRUMENT 3D-CT
A. Kleinfeld[1]
[1] *Hachtel Werkzeugbau, Aalen, Germany*

11:04 **Tu.3.A.5**

DATA ASSIMILATION FOR MONITORING RESIN TRANSFER MOLDING OF COMPOSITE MATERIALS
R. Matsuzaki[1], *A. Todoroki*[2], *M. Murata*[1], *M. Shiota*[1]
[1] *Tokyo University of Science, Chiba, Japan;* [2] *Tokyo Institute of Technology, Japan*

Saal 1a

11:10 **Tu.3.A.6**

PRODUCTION INTEGRATED NDT: USING A DATA BANK FOR FURTHER DATA PROCESSING
S. Nuschele[1], T. Schmidt[1]
[1] DLR, Augsburg, Germany

11:16 **Tu.3.A.7**

DEVELOPMENT OF AN AUTOMATED INSPECTION METHOD TO CHARACTERIZE PRE-BOND CONDITIONS OF CFRP ADHERENT SURFACES
F. Stark[1], C. Tornow[2], R. Ganss[1], C. Cherrier[1], K. Brune[2]
[1] Automation W+R, München, Germany; [2] Fraunhofer IFAM, Bremen, Germany

11:22 **Tu.3.A.8**

DEVELOPMENT AND DEMONSTRATION OF AN AUTOMATED SYSTEM FOR LIMITED ACCESS WELDS INSPECTION BY USING INFRARED ACTIVE THERMOGRAPHY
A.M. Beizama[1], P. Broberg[2], E. Fernández[1], R. Fuente[1], A. García de la Yedra[1], P. Henrikson[3], A. Runnemalm[2], N. Thorpe[4]
[1] IK4-LORTEK, Ordizia, Spain; [2] University West, Trollhättan, Sweden; [3] GKN Aerospace, Trollhättan, Sweden; [4] Tecnitestest ingenieros, Madrid, Spain

11:30 Break

Tu.4. – Workshops

	Saal 1a	Saal 1b	Saal 2
11:40	**Tu.4.A**	**Tu.4.B**	**Tu.4.C**
	WORKSHOP ON ELECTRO-MAGNETIC METHODS FOR COMPOSITE MATERIALS & STRUCTURES (presentations from Tu.1.A) *H. Heuer*	WORKSHOP ON GUIDED WAVES FOR STRUCTURAL HEALTH MONITORING (presentations from Tu.2.A) *D.R. Mahapatra*	WORKSHOP ON EMERGING EQUIPMENT TECHNOLOGIES AND VALIDATION IN MANUFACTURING AND MAINTENANCE (presentations from Tu.3.A) *H.-U. Baron*

12:50 Lunch

from 14:30 **Excursions to aviation and space companies** (page 3)

19:00 **Conference evening including invited lecture at restaurant „Ratskeller“**

Invited Lecture

MECHANICAL PROPERTIES OF COMET 67P/CHURYUMOV-GERASIMENKO MEASURED BY CASSE AND DIM ON BOARD ROSETTA'S LANDER PHILAE

W. Arnold[1], T. Albin[2], C. Faber[3], H.-H. Fischer[4], A. Flandes[5], A. Hirn[6], M. Knapmeyer[3], H. Krüger[2], A. Loose[2], D. Möhlmann[3], K. Seidensticker[5], K. Thiel[7]

[1] Saarland University, Saarbrücken, Germany; [2] Max Planck Institute for Solar System Research, Göttingen, Germany; [3] DLR, Berlin, Germany; [4] DLR MUSC, Köln, Germany; [5] Universidad Nacional Autónoma de México, Mexico; [6] Hungarian Academy of Sciences Centre for Energy Research, Budapest, Hungary; [7] Universität Köln, Germany

Saal 1a

We.1.A – Invited Lectures

C.U. Große

08:30 **We.1.A.1**

NDT METHODS FOR COMPOSITES AND AEROSPACE ENGINEERING

J. Qiu[1], H. Ji[1], J. Cheng[1], C. Zhang[1]

[1] Nanjing University, Nanjing, China

09:30 **We.1.A.2**

IN PURSUIT OF RELIABLE NDT: HUMAN FACTORS PERSPECTIVE

M. Bertovic[1]

[1] Berlin, Germany

10:30 Break

We.2.A – Plenary Session

NDT ALONG COMPOSITES MANUFACTURING AND MAINTENANCE

G. Georgeson

11:00 **We.2.A.1**

PROCESS MONITORING OF RESINS, FABRICS, PREFORMS AND CFRP BY HF RADIO WAVE TECHNIQUES

H. Heuer[1]

[1] Fraunhofer IKTS, Dresden, Germany

Saal 1a

11:06 **We.2.A.2**

SHEAROGRAPHY – A FAST AND FLEXIBLE NDI TECHNIQUE FOR COMPOSITE MATERIALS NEW APPLICATIONS IN VARIOUS INDUSTRIES

R. Schoen[1]
[1] *Dantec Dynamics, Ulm, Germany*

11:12 **We.2.A.3**

INDUSTRIAL APPLICATIONS OF AIR-COUPLED ULTRASONIC TECHNIQUE

W. Hillger[1], *D. Ilse*[1], *L. Bühling*[1]
[1] *Ingenieurbüro Dr. Hillger, Braunschweig, Germany*

11:18 **We.2.A.4**

TECHNOLOGY LEAPS IN PRODUCTION READINESS OF COMPUTED TOMOGRAPHY TECHNOLOGY AND SOLUTIONS

S. Telesz[1], *J. Lübbehüsen*[2]
[1] *GE Sensing & Inspection Technologies, Lewistown, USA;* [2] *GE Sensing & Inspection Technologies, Wunstorf, Germany*

11:24 **We.2.A.5**

INNOVATIVE VISUALISATION (3D, AR) OF ULTRASONIC TESTING DATA

J.C. Meyer[1], *J. Holtmannspötter*[1], *J. Rehbein*[1], *J. de Freese*[1]
[1] *WIWEB, Erding, Germany*

11:30 **We.2.A.6**

NUTHIC: NON-CONTACT ULTRASOUND INSPECTION MACHINE OF HIGHLY INTEGRATED COMPOSITE PARTS

R. Giacchetta[1], *R.G. Bueno*[1], *J.M. Moreno Llamas*[2], *J. Fernández Cruza*[2]
[1] *DASEL, Madrid, Spain*
[2] *ITEFI CSIC, Madrid, Spain*

11:36 **We.2.A.7**

ROBOTICS BASED ULTRASONIC TESTING TOMOGRAPHY FOR IN-LINE MANUFACTURING QUALIFICATION OF CFRP COMPONENTS

A. Lozak[1], *R. Pinchuk*[1], *A. Bulavinov*[1], *C. Boller*[2], *A. Sednev*[3], *A. Lider*[3], *V. Zhvyrblya*[3], *G. Filippov*[3], *S. Pudovikov*[4]
[1] *I-Deal Technologies, Saarbrücken, Germany;* [2] *Saarland University, Saarbrücken, Germany;* [3] *Tomsk Polytechnic University, Russia;* [4] *Fraunhofer IZFP, Saarbrücken, Germany*

11:42 **We.2.A.8**

LAMINOGRAPHIC INSPECTION OF LARGE CARBON FIBRE COMPOSITE STRUCTURES AT THE PRODUCTION SITE

B. Redmer[1], *M. Tschaikner*[1], *U. Ewert*[1], *O. Bullinger*[2], *U. Schnars*[3], *D. Schulting*[2]
[1] *BAM, Berlin, Germany;* [2] *Airbus Operations, Stade, Germany;* [3] *Airbus Operations, Bremen, Germany*

Saal 1a

We.3.A – Plenary Session

EMERGING TECHNOLOGY IN ACOUSTICS, LIQUID PENETRANT, OPTICS AND POTENTIAL MEASUREMENT

J. Qiu

11:50 **We.3.A.1**

NEW NETWORK PROTOCOL STANDARD FOR HIGH SPEED CAMERAS

R. Huber[1]

[1] *AOS Technologies, Baden-Daettwil, Switzerland*

11:56 **We.3.A.2**

PRECISION DIAGNOSIS ON HIDDEN DAMAGE OF MICRO/NANO STRUCTURED THIN FILM USING GHZ-ACOUSTIC MICROSCOPY SYSTEM

I.-K. Park[1], *Y. Cho*[2], *B.-S. Jo*[1]

[1] *SeoulTech, Seoul, South Korea;* [2] *Pusan National University, South Korea*

12:02 **We.3.A.3**

IDENTIFICATION OF GAGE FACTORS OF A UNIDIRECTIONAL CARBON FIBER REINFORCED PLASTIC BY MULTIPOINT POTENTIAL MEASUREMENT

M. Ueda[1], *A. Todoroki*[2]

[1] *Nihon University, Tokyo, Japan;* [2] *Tokyo Institute of Technology, Japan*

12:08 **We.3.A.4**

ADVANCES IN AEROSPACE THERMOGRAPHY USING THERMOGRAPHIC SIGNAL RECONSTRUCTION

S.M. Shepard[1]

[1] *Thermal Wave Imaging, Ferndale, USA*

12:14 **We.3.A.5**

TECHNICAL AND PRACTICAL REQUIREMENTS, NEW POSSIBILITIES, ACTUAL AND UPCOMING STANDARDIZATION OF UV-LED LAMPS FOR FLUORESCENT MAGNETIC-PARTICLE- (MPI) AND PENETRANT INSPECTION (FPI)

M. Breit[1]

[1] *RIL-CHEMIE/SECU-CHEK, Kleinblittersdorf, Germany*

12:20 **We.3.A.6**

INSPECTION OF WELDS WITH IMPULSE ACOUSTIC MICROSCOPY

Y. Petronyuk[1], *V. Levin*[1], *E. Morokov*[1], *S. Liu*[2]

[1] *Russian Academy of Sciences, Moscow, Russia;* [2] *Beijing Aeronautical Manufacturing Technology Research Institute, China*

Saal 1a

12:26 **We.3.A.7**

THREE DIMENSIONAL EXAMINATION OF DIRECTIVITY PATTERN IN IMMERSION TANK TESTING
D. Kotschate[1], T. Heckel[1], D. Gohlke[1]
[1] BAM, Berlin, Germany

12:32 **We.3.A.8**

THE FUTURE OF ON-WING-INSPECTION
R. Weger[1]
[1] SCHÖLLY FIBEROPTIC, Denzlingen, Germany

12:40 Lunch

We.4.A – Plenary Session
IT DEVELOPMENTS AND SOLUTIONS
S. Gopalakrishnan

13:30 **We.4.A.1**

GKSPRO® – A MODERN SOFTWARE SOLUTION FOR DATA ANALYSING, STORING; MANAGING AND VISUALISATION
M.-B. Schaller[1], J.-O. Brentle[1]
[1] GGB, Rötha, Germany

13:36 **We.4.A.2**

SMART MOBILE WORKER, THE SOLUTION TO IMPROVE PRODUCTIVITY
A. Cottet[1], B. Ehrhart[2], A. Rodriguez-Alvarez[2], H. Speckmann[2]
[1] Testia France, Toulouse, France; [2] Testia, Bremen, Germany

13:42 **We.4.A.3**

IT SUPPORT OF NDE AND SHM WITH APPLICATION OF THE METAL MAGNETIC MEMORY METHOD
M. Witos[1], M. Zieja[1], B. Kurzyk[1]
[1] Air Force Institute of Technology, Warsaw, Poland

13:48 **We.4.A.4**

PROCESS INTEGRATED INSPECTION OF THERMOPLAST CLIPS
W. Holub[1], T. Grulich[1], M. Rehak[1], U. Haßler[1]
[1] Fraunhofer EZRT, Fürth, Germany

13:54 **We.4.A.5**

NON-DESTRUCTIVE MATERIAL TESTING WITH INFRARED THERMOGRAPHY
A. Kipp[1]
[1] InfraTec, Dresden, Germany

Saal 1a

14:00 **We.4.A.6**

LASER ULTRASONIC MODELLING FOR NDT APPLICATIONS
D. Ségur[1]
[1] *CEA-LIST, Toulouse, France*

14:06 **We.4.A.7**

SIMULATION OF NON DESTRUCTIVE TESTING PROCESS BY MESHLESS TECHNIQUE
S. Bennoud[1], *M. Zergoug*[2], *S.E. Guergour*[1], *Y. Behilil*[1]
[1] *University of Saad Dahlab, Blida, Algeria;* [2] *Welding and NDT Research Centre, Algiers, Algeria*

14:12 **We.4.A.8**

ADVANCED SOLUTIONS FOR ONSIDE C-SCAN INSPECTION
U. Bücher[1]
[1] *Olympus Deutschland, Hamburg, Germany*

We.5.A – Plenary Session
EMERGING TECHNOLOGY IN ELECTROMAGNETISM
P. Starke

14:20 **We.5.A.1**

GEOMETRIC CALIBRATION FOR THERMOGRAPHY CAMERAS
T. Schmidt[1], *C. Frommel*[1]
[1] *DLR, Augsburg, Germany*

14:26 **We.5.A.2**

THICKNESS MEASUREMENT OF MULITLAYER COATING USING TERAHERTZ TECHNIQUES
J. Jonuscheit[1], *J. Klier*[1], *S. Krimi*[1], *G. von Freymann*[1]
[1] *Fraunhofer IPM, Kaiserslautern, Germany*

14:32 **We.5.A.3**

NON-DESTRUCTIVE EVALUATION, INSPECTION AND TESTING OF PRIMARY AERONAUTICAL COMPOSITE STRUCTURES USING GRATING-BASED PHASE CONTRAST X-RAY IMAGING
V. Revol[1], *K. Kitsianos*[2], *M. Gresil*[3], *H. Trétout*[4], *G. Kanderakis*[5], *M.-O. Sauer*[2], *I. Koulalis*[2], *T. Stadelmann*[1], *A.-M. Madrigal*[6]
[1] *CSEM, Alpnach Dorf, Switzerland;* [2] *GMI Aero, Paris, France;* [3] *University of Manchester, United Kingdom;* [4] *Dassault Aviation, Argenteuil, France;* [5] *National Technical University of Athens, Kesariani, Greece;* [6] *CSEM, Neuchâtel, Switzerland*

14:38 **We.5.A.4**

EDDY CURRENT TESTING WITH HIGH-SPATIAL RESOLUTION PROBES USING MR ARRAYS AS RECEIVER
M. Pelkner[1], *T. Erthner*[1], *R. Pohl*[1], *M. Kreutzbruck*[2], *N. Sergeeva-Chollet*[3]
[1] *BAM, Berlin, Germany;* [2] *Universität Stuttgart, Germany;* [3] *CEA, Gif-sur-Yvette, France*

Saal 1a

14:44 **We.5.A.5**

LASER SPOT THERMOGRAPHY FOR CRACK DETECTION IN ALUMINUM STRUCTURES
J. Roemer[1], T. Uhl[1], L. Pieczonka[1]
[1] AGH University, Cracow, Poland

14:50 **We.5.A.6**

NOVEL ILLUMINATION AND PARAMETER EXTRACTION TECHNIQUE FOR THE CHARACTERIZATION OF MULTILAYER STRUCTURES IN THE GHZ RANGE WITH DEEP SUB-WAVELENGTH RESOLUTION
A. Pourkazemi[1], J. Stiens[1], M. Becqaert[2], M. Vandewal[2]
[1] Vrije Universiteit Brussel, Belgium
[2] Royal Military Academy, Brussels, Belgium

14:56 **We.5.A.7**

DIAGNOSTICS OF DEGRADATIVE CHANGES IN PARAMAGNETIC ALLOYS WITH THE USE OF LOW FREQUENCY IMPEDANCE SPECTROSCOPY
Z.H. Zurek[1], M. Witos[2]
[1] Silesian University of Technology, Katowice, Poland; [2] Air Force Institute of Technology, Warsaw, Poland

15:02 **We.5.A.8**

IMPLEMENTATION OF MICROFOCUS X-RAY TECHNOLOGY IN DIGITAL TESTING PROCEDURES
J.P. Steffen[1]
[1] X-RAY WorX, Garbsen, Germany

15:10 Break

We.6. – Workshops

	Saal 1a	Saal 1b	Saal 2	Room Albert Einstein
15:40	**We.6.A**	**We.6.B**	**We.6.C**	**We.6.D**
	WORKSHOP ON NDT ALONG COMPOSITES MANUFACTURING AND MAINTENANCE (presentations from We.2.A) *G. Georgeson*	WORKSHOP ON EMERGING TECHNOLOGY IN ACOUSTICS, LIQUID PENETRANT, OPTICS AND POTENTIAL MEASUREMENT (presentations from We.3.A) *J. Qiu*	WORKSHOP ON IT DEVELOPMENTS AND SOLUTIONS (presentations from We.4.A) *S. Gopalakrishnan*	WORKSHOP ON EMERGING TECHNOLOGY IN ELECTROMAGNETISM (presentations from We.5.A) *P. Starke*

16:50 Closing

P1

INFLUENCE OF THE GEOMETRIC AND ACOUSTIC PROPERTIES OF COMPOSITE STRUCTURES IN ULTRASONIC PHASED-ARRAY IMAGING

A. Aschy[1], N. Terrien[1], S. Robert[2], M. Bentahar[3]
[1] CETIM, Nantes, France; [2] CEA LIST, Saclay, France; [3] Laboratoire d' Acoustique de l'Université du Maine, Le Mans, France