

TABLE OF CONTENTS

Keynotes

K.E. Cramer -NASA Langley Research Center, USA

NASA thermographic inspection of advanced composite materials

**B. Jähne, -Interdisciplinary Center for Scientific Computing (IWR),
Germany**

Spatiotemporal active thermography

A - Solids Mechanics

A.1 QIRT 2004-043

Analysis of thermoelastic and dissipative effects related to fatigue of aluminium alloys

A.E. Morabito¹, A. Chrysochoos², V. Dattoma¹, U. Galietti³ - ¹ *University of Lecce, Italy* & ² *University Montpellier II, France* & ³ *Polytechnic of Bari, Italy*

A.2 QIRT 2004-071

High speed non contact imaging of stress in materials. Application on blade vibration analysis

Bremond, P. - *CEDIP Infrared Systems, France*

A.3 QIRT 2004-055

Advances in investigation of the nucleation and propagation of phase transitions in a thin shape memory alloy

E. Pieczynska¹, S. Gadaj¹, w. Nowacki¹, H. Tobushi² - ¹ *Institute of Fundamental Technological Research PAS, Poland* & ² *Aichi Institute of Technology, Japan*

A.4 QIRT 2004-008

Technology of non destructive check up in industry

G. Kurilenko, M. Sazonov, N. Troitsky - *Novosibirsk State Technical University, Russia*

B -Lock-in for Electronics and Semi Conductors

B.1 QIRT 2004-059

Fault localisation of ICs by lock-in fluorescent microthermal imaging (Lock-in FMI)

F. Altmann¹, Th. Riediger¹, O. Breitenstein², J.P. Rakotoniaina²

¹ *Fraunhofer Institute for Mechanics of Materials* & ² *Max Planck Institute of Microstructure Physics, Germany*

- B.2 QIRT 2004-002
Lock-in thermography on electronic devices using spatial deconvolution
M. Hejjo AI Rifai, O. Breitenstein, J.P. Rakotoniaina - *Max Planck Institute of Microstructure Physics, Germany*
- B.3 QIRT 2004-003
Lock-in IR thermography for functional testing of electronic devices
Breitenstein, O. - *Max Planck Institute of Microstructure Physics, Germany*
- B.4 QIRT 2004-004
Quantitative analysis of the influence of shunts in solar cells by means of lock-in thermography
J.P. Rakotoniaina, M.H. AI Rifai, O. Breitenstein - *Max Planck Institute of Microstructure Physics, Germany*
- B.5 QIRT 2004-052
Thermographic imaging of free carrier density in silicon for solar cells
M.C. Schubert, J. Isenberg, S. Riepe, W. Warta – *Fraunhofer Institute for Solar Energy Systems, Germany*
- B.6 QIRT 2004-061
Capillary pumped loop for cooling of electronic devices
T. Wajman, B. Wiecek, B. Ostrowski, R. Danych – *Technical University of Lodz, Poland*
- B.7 QIRT 2004-062
Modelling and thermography measurements of thermal wake effect in electronic components
M. Felczak & B. Wiecek - *Technical University of Lodz, Poland*
- B.8 QIRT 2004-087
IR thermography for quality assessment of microelectronic devices
Z. Radivojevic¹, I. Kassamakov², M. Oinonen², P. Vihinen²,
H. Seppanen² - ¹ *Nokia Research Center* & ² *University of Helsinki, Finland*

C - Image Processing and Data Reduction

- C.1 QIRT 2004-023
Estimation of motion and parameters of heat transport from thermography
C.S. Garbe & B. Jähne - *University of Heidelberg, Germany*

- C.2 QIRT 2004-051
Measurements of physical parameters of laboratory forest fires by bi-spectral infrared imaging
J.M. Aranda, J. Melendez, A.J. de Castro, F. Lopez- *Universidad Carlos III, Spain*
- C.3 QIRT 2004-096
A new experimental techniques for inspection of operating furnaces by use of IR radiometers
P. Pregowski¹, G.Goleniewski², W.Komosa², W. Korytkowski², SI.Zwolenik³ - ¹ *Pregowski Infrared Services* & ² *PKN ORLEN S.A.* & ³ *NeoVision, Poland*
- C.4 QIRT 2004-065
Terrain-adaptive infrared line-scan coding: a new image segmentation scheme
D. Milovanovic¹, A. Marincic¹, B. Wiecek²- ¹ *University of Belgrade, Serbia and Montenegro* & ² *Technical University of Lodz, Poland*
- C.5 QIRT 2004-011
Combining video and thermal imagery for robust pedestrian tracking
H. Torresan, B. Turgeon, P. Hebert, X. Maldague - *Université Laval, Canada*
- C.6 QIRT 2004-028
Thermal tomography on the basis of an information method
S. Melnyk - *Kharkov National University of Radio-Electronics, Ukraine*
- C.7 QIRT 2004-022
A bias error effect of sub-pixel edge location measurement by means of thermal camera
R. Babka - *Czestochowa University of Technology, Poland*
- C.8 QIRT 2004-057
Infrared homing head for rotating missiles
J. Piotrowski, W. Swiderski, D. Szabra - *Military Institute of Armament Technology, Poland*

D -Fluid Mechanics & Energetics

- D.1 QIRT 2004-026
Heat flux characterisation in hot jet and flame/wall interaction by IHCP resolution coupled with infrared measurements
R. Loubat¹, P. Reulet², B. Estebe¹, P. Millan² - ¹ *AIRBUS France ESANT* & ² *ONERA/DMAE, France*

- D.2 QIRT 2004-027
Rear infrared thermography in heat fluxes determination on hypersonics vehicles
A. Hoornaert, Ch. Pelissier, Y. Le Sant, F. Thivet, P. Millan - *ONERA, France*
- D.3 QIRT 2004-017
Determination of the conjugate heat transfer performance of a turbine blade cooling channel
R. Fedrizzi & T. Arts - *von Karman Institute, Belgium*
- D.4 QIRT 2004-009
Flame IR thermography used for combustion research and testing of fuel oils
V. V. Ghia - *Polytechnic University of Bucharest, Romania*
- D.5 QIRT 2004-037
Thermography measurements of heat transfer distributions for an array of impinging jets -comparison with numerical results
V. Feldheim¹, C. Deventer¹, P. Evrard¹, P. Lybaert¹, J. Muller² - ¹ *Faculty of Engineering, Mons, Belgium* & ² *IRSID -ARCELOR, France*
- D.6 QIRT 2004-078
Measurement of local heat transfer coefficients of developing flows using IR-thermography
M.C. Diaz, H. Woche, J. Schmidt, E. Specht - *Otto-von-Guericke University, Germany*
- D.7 QIRT 2004-082
Influence of gravitation on heat transfer by natural convection
A. Willockx¹, G. De Mey¹, M. De Paepe¹, B. Wiecek², M. Felczak², M. De Craemer³, A. Stouff³, C. Van Rumst³ - ¹ *Ghent University, Belgium* & ² *Technical University of Lodz, Poland* & ³ *Hogeschool Gent, Belgium*
- D.8 QIRT 2004-085
Validation of large eddy simulation of the heat transfer induced by an impinging jet using quantitative infrared thermography
Ph. Planquart & J.-M. Buchlin - *von Karman Institute for Fluid Dynamics, Belgium*
- D.9 QIRT 2004-013
Simulation of pipeline gas leakage
S. Sadovnychiy¹, J. Valadez¹, I. Bulgakov¹, A. Sadovnychy¹ - ¹ *Mexican Petroleum Institute, Mexico* & ² *National Aerospace University, Ukraine*
- D.10 QIRT 2004-086
Studies of roughness induced transition at Mach 6 using IR thermography
D.G. Fletcher, S. Paris, C.O. Asma, G.A. Garzon - *von Karman Institute for Fluid Dynamics, Belgium*

- D.11 QIRT 2004-090
Roughness induced BL transition measurements in hypersonic flow using infrared thermography
F. Schrijer, F. Scarano, B. van Oudheusden - *Delft University of Technology, The Netherlands*
- D.12 QIRT 2004-091
IR heat fluxes measurements in hypersonic plasma flow
G. Cardone¹, A. Del Vecchio², G.M. Carlomagno¹ - ¹ *University of Naples "Federico II"* & ² *CIRA - Italian Center for Aersopace Research, Italy*
- D.13 QIRT 2004-092
Coherent thermal structures in a turbulent channel flow
D. Frontoso Silvestri, T. Astarita, G. Cardone - *University of Naples, Italy*
- D.14 QIRT 2004-089
Thermal barrier properties of nonwovens multilayer structures investigated by infrared thermography
M. Michalak, B. Wiccek, I. Krucirlska, M. Lis - *Technical University of Lodz, Poland*
- D.15 QIRT 2004-042
Local heat transfer coefficient measurements, using a transient Imaging method with an inverse scheme
A. El Abbadi, D. Bougeard, B. Baudoin - *DEI, Ecole des Mines de Douai, France*
- D.16 QIRT 2004-036
Convective heat transfer from a surface to a slot jet using infrared thermography: Effect of the temperature on flux measurements
P. Gervais, E. Estiot, D. Varietas - *Centre de Thermique de Lyon, France*
- D.17 QIRT 2004-101
Infrared thermography study of heat transfer in an array of round jets
J.-M. Buchlin, J. Brassard, J.-B. Gouriet - *von Karman Institute, Belgium*

E -EMIR

- E.1 QIRT 2004-053
Some applications of infrared thermography for antenna characterization in the Polytechnic University of Catalonia
J.M. Gonzalez-Arbesu & J. Romeu - *Universitat Politecnica de Catalunya (UPC), Spain*

- E.2 QIRT 2004-066
Mine detection using the EMIR® method - Improved configuration using a mobile detection system
D. Balageas, M. Lemistre, P. Levesque - *ONERA, France*
- E.3 QIRT 2004-093
Compared improvement by time, space and frequency data processing of the performances of IR cameras. Application to electromagnetism
P. Levesque¹, P. Bremond², J.-L. Lasserre³, A. Paupert³, D.L. Balageas¹ –
¹ *ONERA* & ² *CEOIP Infrared Systems* & ³ *DGA/DCE, France*
- E.4 QIRT 2004-098
Direct IR diagnostics of antenna aperture distributions
J. Norgard¹ & R. Musselman² - ¹ *University of Colorado* & ² *US Air Force Academy, USA*

F - Process Monitoring

- F.1 QIRT 2004-016
Infrared surface temperature measurements for long pulse operation, and real time feed-back control in Tore-Supra, an actively cooled Tokamak
D. Guilhem, C. Balorin, B. Bertrand, J.L. Bondil, C. Desgranges, E. Gauthier, M. Lipa, P. Messina, M. Missirlian, R. Mitteau, C. Pocheau, C. Portafaix, R. Reichle, H. Roche, A. Saille, S. Vallet - *Commissariat à l'énergie atomique - Cadarache, France*
- F.2 QIRT 2004-020
Quantitative infrared thermography applied to blow moulding process: measurement of a heat transfer coefficient
S. Monteix¹, V. Le Maoult², F. Schmid, J.- P. Arcens² - ¹ *Philips Special Lighting* & ² *Ecole des Mines d'Albi Carmaux, France*
- F.3 QIRT 2004-035
Quality control of invisible defects in the laminating process using a new thermographic online system
V. Margner¹, H. EI-Abed¹, P. Meinschmidt², F. Schlüter² – ¹ *Institute for Communications Technology, Braunschweig* & *Wilhem-Klauditz- Institut, Germany*
- F.4 QIRT 2004-100
A resection method applied to infrared measurements
Le Sant, Y. - *ONERA, France*

- F.5 QIRT 2004-041
Photothermal infrared thermography applied to the nondestructive characterisation of the interface between liners and engine blocks
P. Laloue¹, J.-F. Henry¹, H. Pron¹, J. L'Ecolier², F. Nigon²,
Ch. Bissieux¹ - ¹Universite de Reims & ²PSA Peugeot Citroen, France
- F.6 QIRT 2004-050
Investigations on active thermographic testing techniques for manufacturing processes
J. Baumann¹, U. Netzelmann², W. Heinrich¹, V. Carl³, R. Bilgram⁴, T. Hierl⁵,
H.-R. Schubach⁶, G. Zenzinger⁷ - ¹Siemens AG & ²Fraunhofer-Institute for
Nondestructive Testing IZFP & ³T-ZfP Dinslaken & ⁴EADS Deutschland &
⁵Thermosensorik GmbH & ⁶Dantec Ettemeyer GmbH & ⁷MTU Aero Engines,
Germany
- F.7 QIRT 2004-083
Thermographic evaluation of Er-doped silica fiber as IR-to-visible image converter
G. Paez¹ & M. K. Scholl² - ¹Centro de Investigaciones en Optica, Mexico &
²Alenka Associates, USA
- F.8 QIRT 2004-038
Application of infrared thermography in investigation of hydrostatic extrusion
T. S. Wisniewski¹, W. Pachla², D. Kukla¹, A. Mazur², K.J. KurzydJowski¹ -
¹Warsaw University of Technology & ²Polish Academy of Sciences UNIPRESS,
Poland
- F.9 QIRT 2004-088
Infrared thermography applied to spontaneous combustion monitoring of coal tips
O. Carpentier, D. Defer, E. Antczak, B. Duthoit - Universit  d'Artois, Technoparc
Futura, France

G -Metrology

- G.1 QIRT 2004-018
Local thermal diffusivity measurement
P .G. Bison, E. Grinzato, S. Marinetti - CNR-ITC, Italy
- G.2 QIRT 2004-040
Focal plane array infrared cameras as research tools
H. Pron & C. Bissieux- Universit  de Reims, France

- G.3 QIRT 2004-007
The statistical approach to the sensitivity analysis of the ThermaCAM PM595 measurement model
W. Minkina & S. Dudzik- *Czestochowa University of Technology, Poland*
- G.4 QIRT 2004-045
Infrared temperature measurements on solar thermal high temperature receivers
M. Pfänder & P. Heller- *German Aerospace Centre (DLR), Institute for Technical Thermodynamics, Germany*
- G.5 QIRT 2004-046
Analysis of the impact of surface heat transfer on a new modification of the Angstroem's method
C. Bussi, A. Muscio, M.A. Corticelli - *Universita di Modena e Reggio Emilia, Italy*
- G.6 QIRT 2004-084
Tungsten lamp as radiation standard and the emissivity effects
M. Strojnik & G. Paez - *Centro de Investigaciones en Optica, Mexico*
- G.7 QIRT 2004-005
From Hershel's discovery to the thermal camera calibration
W. Minkina & R. Babka - *Czestochowa University of Technology, Poland*

H - NDE

- H.1 QIRT 2004-021
Thermal diffusivity evaluation of thermal barrier coatings by photothermal and thermographic techniques
F. Cernuschi, A. Figari, L. Lorenzoni, D. Robba- *CESI, Italy*
- H.2 QIRT 2004-025
Development and trials of through skin sensing of aircraft fixtures using pulsed thermography
N. Avdelidis^{1,2}, L. Nelson¹, D. Almond -¹ *University of Bath, United Kingdom* & ²*IRT & Materials Consultancy, Greece*
- H.3 QIRT 2004-072
Compact thermal model of a D2Pak case with convection
M. Lis, B. Wiecek, K. Tomalczyk - *Technical University of Lodz, Poland*
- H.4 QIRT 2004-048
Reconstruction and analysis of pulsed thermographic data
S.M. Shepard, J.R. Lhota, Y. Hou, D. Wang, T. Ahmed – *Thermal Wave Imaging, Inc., USA*

- H.5 QIRT 2004-060
Autoregressive algorithms and spatially random flash excitation for 2D non destructive evaluation with infrared cameras
J.C. Batsale¹, J.L. Battaglia¹, O. Fudym² - ¹*Laboratoire inter-etablissements TREFLE-Site ENSAM & ²Centre Energetique- ENSTIMAC, France*
- H.6 QIRT 2004-034
Frequency-modulated wave thermography for non-destructive characterisation
S. Tuli & R. Mulaveesala - *Indian Institute of Technology, India*
- H.7 QIRT 2004-074
Lockin thermography with eddy current excitation
G. Riegert, Th. Zweschper, G. Busse - *Institute of Polymer Testing and Polymer Science (IKP), Germany*
- H.8 QIRT 2004-075
Ultrasound excited thermography -advances due to frequency modulatted elastic waves
Th. Zweschper, G. Riegert, A. Dillenz, G. Busse - *Institute of Polymer Testing and Polymer Science (IKP), Germany*
- H.9 QIRT 2004-077
Application of infrared thermography to the analysis of welding processes
J. Al-Karawi & J. Schmidt - *Otto-von-Guericke University, Germany*
- H.10 QIRT 2004-030
Thermoinductive investigations of magnetic materials for surface cracks
B. Oswald-Tranta - *University of Leoben, Austria*
- H.11 QIRT 2004-019
Peculiarities of detecting Teflon defect surrogates in CFRP by transient IR thermography
V. Vavilov¹, G. Xingwang², S. Wei², L. Yingtao² - ¹*Tomsk Polytechnic University, Russia & ²Beihang University, China*
- H.12 QIRT 2004-058
A quantitative investigation of thermosonics
T.J. Barden¹, D.P. Almond¹, M. Morbidini², P. Duffour², P. Cawley² –
¹*University of Bath, United Kingdom & ²Imperial College, United Kingdom*
- H.13 QIRT 2004-15
Pulsed phase thermography reviewed
C. Ibarra-Castanedo & X. Maldague - *Laval University, Canada*

- H.14 QIRT 2004-054
A thermographic study for the assessment of historic structures
N.P. Avdelidis¹, A. Moropoulou², E.T. Delegou² - ¹*IRT& Materials Consultancy &* ²*National Technical University of Athens, Greece*
- H.15 QIRT 2004-024
Defect detection capability of pulsed transient thermography
S. Quek & D.P. Almond - *University of Bath, United Kingdom*
- H.16 QIRT 2004-014
Automatic interpolated differentiated absolute contrast algorithm for the analysis of pulsed thermographic sequences
D. A. Gonzalez¹, C. Ibarra-Castanedo², M. Pilla², M. Klein², J.M. Lopez-Higuera¹, X. Maldague² - ¹*University of Cantabria, Spain &* ²*Université Laval, Canada*
- H.17 QIRT 2004-029
Square pulsed thermography applied to thermal defaults characterization
S. Datcu, L. Ibos, Y. Candau - *CERTES, University of Paris XII, France*
- H.18 QIRT 2004-081
Micro-cracks detection in photo-voltaic cells by infrared thermography
L. St-Laurent, M. Genest, C. Simon, X. Maldague - *Université Laval, Canada*
- H.19 QIRT 2004-032
Numerical modelling and IR thermography measurements in the heat transfer assesment of the solar collector
D. Dovic & S. Svaic - *University of Zagreb, Croatia*
- H.20 QIRT 2004-033
Defect indications in sono-thermography in relation to defect location and structure
G. Walle, M. Abuhamad, E. Toma, U. Netzelmann - *Fraunhofer IZFP University, Germany*

I - Civil Engineering

- I.1 QIRT 2004-001
Application of thermogrammetry in panel heating and cooling systems
B.L. Kilgis - *WattsRadiant, USA*

- I.2 QIRT 2004-012
Emissivity measurements of road materials
M. Marchetti¹, V. Muzet¹, R. Pitre¹, S. Datcu², L. Ibos², J. Livet² - ¹ *Centre d'études techniques de reéquipement de l'Est* & ² *Université Paris XII Val de Marne, France*
- I.3 QIRT 2004-044
Structural investigation of concrete and masonry structures behind plaster by means of pulse phase thermography
R. Arndt, Ch. Maierhofer, M. Rollig, F. Weritz, H. Wiggerhauser – Federal Institute for Material Research and Testing (BAM), Germany
- I.4 QIRT 2004-080
Dynamic IRT for the frescoes assessment, the study case of Danza Macabra in Clusone
N. Ludwig¹ & E. Rosina² - ¹ *Università degli studi di Milano* & ² *DCSA - Politecnico di Milano, Italy*
- I.5 QIRT 2004-094
Infrared thermography combined with geophysical techniques for the cultural heritage conservation
G.M. Carlomagno, R. Di Maio, C. Meola, N. Roberti - *Università di Napoli "Federico II", Italy*
- I.6 QIRT 2004-079
Transient thermographic evaluation of plastered mosaics
M. Kouli¹, N.P. Avdelidis², Ch. Arvanitis¹ - ¹ *National Technical University of Athens* & ² *IRT & Materials Consultancy, Greece*
- I.7 QIRT 2004-069
Practical thermal testing of buildings
O.V. Lebedev, Do Kirzhanov, V. Avramenko, O.N. Budadin - *Technological Institute of Energetic Investigations, Diagnostic and Nondestructive Testing "WEMO", Russia*
- I.8 QIRT 2004-070
Correction the temperature magnitudes from IR camera depending on the angle of aspect and the object distance
O.V. Lebedev, V.G. Avramenko, E.V. Abramova, O.N. Budadin - *Technological Institute of Energetic Investigations, Diagnostic and Nondestructive Testing "WEMO", Russia*

J - Bio

- J.1 QIRT 2004-010
Infrared thermography applied to acupuncture
V. Narongpant^{1,3}, S. Datcu¹, L. Ibos¹, F. Adnet^{2,3}, B. Fontas¹,
Y. Candau¹, David Alimi³ - ¹ *Université Paris XII Val de Marne* &
² *SAMU 93* & ³ *Université Paris XIII, France*
- J.2 QIRT 2004-097
Quantitative thermography in breast cancer detection
M. Zaviscek, A. Drastich, J. Sandera - *Brno University of Technology, Czech Republic*
- J.3 QIRT 2004-099
Comparison of thermal and electrical tomography in medicine
A. Nowakowski - *Gdansk University of Technology, Poland*
- J.4 QIRT 2004-047
Evaluation of cutaneous flap survival by IR thermography
P. Drvis¹, D. Shejbal¹, S. Svaic², I. Boras², I. Sundov², M. Susa²,
V. Bedekovic¹, L. Kalogjera¹, I. Petrovic², P. Sikiric² - ¹ *University hospital "Sestre milosrdnice"* & ² *University of Zagreb, Croatia*
- J.5 QIRT 2004-031
Verification of 1D numerical model for heat conduction in human tissue by means of thermography
I. Boras, M. Susa, S. Svaic - *University of Zagreb, Croatia*
- J.6 QIRT 2004-056
Preliminary model of the thermographic image of the periodontum proposed on the basis of results for healthy subjects - preliminary study
D. Burchardt¹ & S. Gorski² - ¹ *University of Medical Sciences* & ² *J.Strus Municipal Hospital, Poland*
- J.7 QIRT 2004-006
Infrared thermography for the use in facial surgery
W. Wild, J. Ritzke, B. Kramp, J.-H. Lenz, K.K.H. Gundlach - *Rostock University, Germany*
- J.8 QIRT 2004-049
Use of IR thermography for bioheat transfer studies
B. Vainer¹, P. Belozarov¹, V. Baranov² - ¹ *Russian Academy of Sciences* & ² *Russian Academy of Medical Sciences, Russia*

J.9 QIRT 2004-076

Thermographic assessment of thermal effects during laser sterilisation of pathological periodontal pocket

M. Dqbrowski¹, R. Dulski¹, S. Zmuda², P. Zaborowski³ - ¹*Military University of Technology & ²Military Institute of Medicine & ³Central Out-patient Clinic, Poland*