

# List of accepted contributions

9th International Conference on Industrial Computed Tomography (iCT 2019)

2019 Feb 13-15 Padova, Italy



<https://www.ict2019.org/>

## Keynotes

**New developments in X-ray CT metrology for Industry 4.0**

*Prof. Wim Dewulf, KU Leuven, BE*

**New applications of X-ray CT to characterisation and failure analysis in composite materials**

*Prof. Ian Sinclair, University of Southampton, UK*

## Session “New Methods & Optimization” - Oral contributions

**Helical XCT measurement for correlative imaging**

*Adam Brinek, Brno University of Technology, CZ*

**Spatial Resolution Enhancement Based on Detector Displacement for Computed Tomography**

*Kaicong Sun, University of Stuttgart, DE*

**Scatter Correction for Industrial Cone-Beam Computed Tomography (CBCT) Using VSHARP, a fast GPU-Based Linear Boltzmann Transport Equation Solver**

*Amy Shiroma, Varex Imaging Corporation, USA*

**Artifact reduction in X-ray computed tomography by multipositional data fusion using local image quality measures**

*Gabriel Herl, Fraunhofer Entwicklungszentrum Röntgentechnik, DE*

**Flexible solutions for lab-based phase contrast and dark field CT and micro-CT**

*Alessandro Olivo, University College London, UK*

**Simulated Talbot-interferometer x-ray phase contrast images with CFRP-like objects**

*Jonathan Sanctorum, University of Antwerp, BE*

## Session “Algorithms & Reconstruction” - Oral contributions

**An Interactive Visual Comparison Tool for 3D Volume Datasets represented by Nonlinearly Scaled 1D Line Plots through Space-filling Curves**

*Johannes Weissenböck, University of Applied Sciences Upper Austria, AU*

**Virtual CT of complex and noisy scanning trajectories using aRTist**

*Carsten Bellon, Bundesanstalt für Materialforschung und -prüfung, DE*

**Strategies in cone beam CT inspection of cylindrical objects**

*Wannes Goethals, Ghent University, BE*

**Accurate surface extraction on CT volume using analytical gradient of FDK formula**

*Yukie Nagai, The University of Tokyo, JP*

**Digging Deeper into High Resolution X-ray Computed Tomography Reconstruction**

*Emre Topal, TU Dresden, Dresden Center for Nanoanalysis, DE*

## Session “Metrology” - Oral contributions

**Comparison of different measures for the single point uncertainty in industrial X-ray computed tomography**

*Andreas Michael Müller, Friedrich-Alexander-University Erlangen-Nuremberg, DE*

**Software-based compensation of CT instrument misalignments**

*Evelina Ametova, Katholieke Universiteit Leuven, BE*

**CT geometry determination using individual radiographs of calibrated multi-sphere standards**

*Benjamin A. Bircher, Federal Institute of Metrology METAS, CH*

**Uncertainty for Uncorrected Measurement Results in X-ray Computed Tomography**

*Herminso Villarraga-Gómez, Nikon Metrology, Inc., USA*

## Session “Metrology & Manufacturing” - Oral contributions

**Investigating of the influence of the workpiece placement on the uncertainty of measurements in the industrial computed tomography**

*Natalia Grozmani, RWTH Aachen University, DE*

**Experimental investigation on the accuracy of CT measurement of fiber length in fiber reinforced polymers**

*Filippo Zanini, University of Padova, IT*

**Sinogram interpolation to decrease acquisition time in X-ray computed tomography measurement of surface topography**

*Lars Körner, University of Nottingham, UK*

**Uncertainty Evaluation of Pore Analysis for Additively Manufactured Parts using Cross Sections**

*Leonard Schild, wbk Institute of Production Science, Karlsruhe Institute of Technology (KIT), DE*

**Characterization of resolution performance of novel high energy X-CT : eXTRACT**

*Katsutoshi Sato, Hitachi Ltd, JP*

## Session “NDT” - Oral contributions

**Fast detection of cracks in ultrasonically welded parts by inline X-ray inspection**

*Eline Janssens, imec - Vision Lab, BE*

**Comparison of X-ray computed tomography and immersion ultrasonic non-destructive testing techniques in the case of qualitative and quantitative assessment of brazing quality level**

*Mariusz Jedrychowski, CERN, CH*

**A Novel Approach for Immediate, Interactive CT Data Visualization and Evaluation using GPU-based Segmentation and Visual Analysis**

*Harald Steinlechner, VRVis Research Center, AU*

**Virtual qualification of novel heat exchanger components with the image-based finite element method**

*Llion Evans, Swansea University, UK*

## Session "Materials characterization" - Oral contributions

**MultiScale and MultiTime Image-Based Control and Characterization of Lithium-Ion Batteries and Materials***Remi Blanc, Thermo Fisher Scientific, FR***In-situ computed tomography investigation of the compression behaviour of strut, and periodic surface lattices***Anton Jansson, Örebro University, SE***X-ray microtomography study of pellet/powder bentonite mixture upon wetting***Agustín Molinero Guerra, Ecole des Ponts ParisTech, CNRS, IFSTTAR, Laboratoire Navier/CERMES, FR***Use of the industrial X-ray computed microtomography to address scientific questions in developmental biology***Markéta Tesařová, Central European Institute of Technology, Brno University of Technology, CZ***Quantitative pore network analysis and permeability evaluation of porous carbonate reservoir rocks using X-ray computed microtomography images***Miller Zambrano, University of Camerino, GeoMORE s.r.l., IT*

## Session "NDT, Materials &amp; Manufacturing" - Oral contributions

**Characterisation of fiber lay-up and defects in CFRP using Talbot-Lau grating interferometry***Sascha Senck, University of Applied Sciences Upper Austria, AU***Combining a Computed Laminography Approach with Tomographic Analysis for a Study of Weld Joints***Marius Costin, The French Alternative Energies and Atomic Energy Commission (CEA), FR***Defect detection in 3D printed carbon fibre composites using X-ray Computed Tomography***Jeroen Soete, Katholieke Universiteit Leuven, BE***Process characterization for moulding of paper bottles using computed tomography and structure tensor analysis***Prateek Saxena, Technical University of Denmark, DK***Methodology of precise In-Situ tensile/compression measurements***Sebastian Wronski, AGH - University of Science and Technology, PL*

## Short Talks

**Generating Meaningful Synthetic Ground Truth for Pore Detection in Cast Aluminum Parts***Patrick Fuchs, Interdisciplinary Center for Scientific Computing (IWR), Heidelberg University, DE***Synchrotron based absorption edge tomography for the analysis of 3D printed polymer embedded MOF***Christian Gollwitzer, Bundesanstalt für Materialforschung und -prüfung, DE***Analysis of Cone Beam Artefact Influences with Respect to Calibration of Metrology Qualified X-Ray Computed Tomography Systems***Dierck Matern, YXLON International GmbH, DE***Development of 950 kV X-ray source with small focal spot using a linear accelerator***Norihito Matsunaga, Nikon Corporation, JP***Thickness Measurement of Metal Plate Using CT Projection Images and Nominal Shape***Tasuku Ito, The University of Tokyo, JP***Realistic Image Synthesis of Imperfect Specimens using Generative Networks***Deniz Neufeld, Pattern Recognition Lab, Friedrich-Alexander-Universität Erlangen-Nürnberg, DE***Tools for the Analysis of Datasets from X-Ray Computed Tomography based on Talbot-Lau Grating Interferometry***Bernhard Fröhler, University of Applied Sciences Upper Austria, AU***Effect of iterative sparse-view CT reconstruction with task-specific projection angles on dimensional measurements***Lorenz Butzhammer, Institute of Manufacturing Metrology, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), DE***A low-cost and easy-to-use phantom for cone-beam geometry calibration of a tomographic X-ray system***Van Nguyen, imec - Vision Lab, Department of Physics, University of Antwerp, Belgium, BE***A Gaussian filter for complex profile filtration***Luca Pagani, University of Huddersfield, UK***Possibilities and Limitations of Automatic Feature Extraction shown by the Example of Crack Detection in 3D-CT Images of Concrete Specimen***Olaf Paetsch, Zuse Institut Berlin (ZIB), DE***Mapping Performance of CT***Nick Brierley, The Manufacturing Technology Centre, UK, UK***MUSICES - Musical Instrument Computed Tomography Examination Standard: The Final Report Featuring Methods for Optimization, Results of Measurements, Recommendations, Check-lists and Meta-Data Models***Theobald Fuchs, Fraunhofer Institute Integrated Circuits, Department for X-ray Technology, DE***Guiding CT Uncertainty Evaluation by the Measurement Realization Process***Christian Baldo, Federal University of ABC, BR***Optimisation of surface determination to improve the accuracy and repeatability of detecting unfused powder in AM Aluminum component***Ahmed Tawfik, Huddersfield University, UK***Analysis of bone microdamage with Twinned Orthogonal Adjustable Tomograph towards fatigue fracture prevention***Gerardo Presbítero, Institute of Theoretical and Applied Mechanics, Centre of Excellence Telč, Academy of Sciences of the Czech Republic, CZ***On nominal-actual comparisons for additive manufacturing applications***Fabien Léonard, Bundesanstalt für Materialforschung und -prüfung, DE***An experimental study on segmentation in X-Ray Computed Tomography***Stefano Petrò, Politecnico di Milano, IT***Custom-made software tool for the automatic implementation of surface extraction methods based on gradient operators***Roberto Jimenez-Pacheco, Centro Universitario de la Defensa - Zaragoza, ES***Comparison of different voxel size calibration strategies***Marko Katic, FSB, HR*

## Short Talks

**Back-projection Filtration Image Reconstruction Approach for Reducing Out-of-plane Artifacts in Laminography***Jeongtae So, Korea Advanced Institute of Science and Technology, KR***A method and data pipeline for real-time tomographic cross-sections visualization and analysis***Eusebio Solórzano, Novadep Scientific SL, ES***Simulation-based sensitivity analysis of geometrical misalignments in X-ray computed tomography systems for dimensional metrology***Elia Sbettega, University of Padova, IT***Modelling of focal spot intensity distribution with the aid of spatial resolution limit obtained with star pattern***Markus Baier, University of Padova, IT*

## Poster Exhibition

**CT machine geometry changes under thermal load***Benjamin A. Bircher, Federal Institute of Metrology, METAS, CH***Comparison of CT and SEM for bone morphometric indices***Kudakwashe Jakata, Evolutionary Studies Institute, University of the Witwatersrand, ZA***How to improve mechanical in-situ test during micro-CT measurements***Jacek Tarasiuk, AGH University of Science and Technology, PL***Convolutional neural networks for reduction of scatter and beam hardening artefacts in industrial computed tomography***Ruben Pauwels, Katholieke Universiteit Leuven, BE***Synchronous dual energy tomography system***Pablo Pérez, University of Valladolid, ES***Investigation of positioning accuracy of industrial robots for robotic-based X-ray computed tomography***Peter Landstorfer, Fraunhofer, DE***Fast 2-dimensional Contour Reconstruction for Industrial Computed Tomography using Crease Cluster***Maximilian Wattenberg, Institut für Medizintechnik, Universität zu Lübeck/International GmbH, DE***Characterization and calibration of high resolution lab-based CT system with small field of view***Pavel Blažek, Central European Institute of Technology, CZ***Suppression of residual gradients in the flat-field corrected images***Michal Vopalensky, Institute of Theoretical and Applied Mechanics, Centre of Excellence Telc, Czech Academy of Sciences, CZ***CAD-based defect inspection with optimal ROI selection based on polychromatic X-ray projection images***Alice Presenti, University of Antwerp, BE***Report of the Progress on a Laboratory X-Ray Source Based Computed Tomographic System at 9.25 keV***Dominik Müller, University of Würzburg, DE***Verifying the measurement accuracy for X-ray cone-beam CT scans of objects smaller than 5 mm diameter***Daniel Weiss, Carl Zeiss IMT GmbH, DE***Combined use of HeliScan µCT, ELITE and FIB-SEM systems for multi-modal and multi-resolution manufacturing quality control***Grzegorz Pyka, Thermo Fisher Scientific, CZ***Lab-based Diffraction Contrast Tomography (LabDCT) for Materials Microstructure Characterization in Industry Applications***Christian Holzner, Xnovo Technology ApS, DE***Porosity determination in additively manufactured Ti parts using X-ray tomography***Jonathan Glinz, University of Applied Sciences Upper Austria, AU***X-ray CT on modeling steel parts made by selective-laser-melting***Ramil Gainov, Institute ZEA-1, Forschungszentrum Jülich GmbH, DE***Characterization of the effects of detector angular misalignments and accuracy enhancement of X-ray CT dimensional measurements***Valentina Aloisi, North Star Imaging, US***Utilization of single point uncertainties for geometry element regression analysis in dimensional X-ray computed tomography***Andreas Michael Müller, Institute of Manufacturing Metrology, Friedrich-Alexander-Universität Erlangen-Nürnberg, DE***High Energy 750kV Microfocus X-ray Sources for Quality Control on Large Metal Printed Parts***David Bate, Nikon Metrology, UK***Non-destructive testing of microelectronic devices using a laboratory multipurpose diffractometer***Natalia Dadivanyan, Malvern Panalytical B.V., NE***Geometry Compensation of 3DPrinted Parts***Gerd Schwaderer, Volume Graphics GmbH, DE***A Curvelet based Sinogram Correction Method for Metal Artifact Reduction***Kiwan Jeon, National Institute for Mathematical Sciences, KR***Fusion of the XCT, XRF and back scattered data to characterize multi-layer coating of the middle age artifact***Daniel Vavrik, Institute of Theoretical and Applied Mechanics, CZ***Evaluation of the uncertainties in X-ray spectral estimation using transmission measurements***Wenchao Cao, Katholieke Universiteit Leuven, BE***X-ray sources for high throughput and extreme resolutions***Emil Espes, Excillum AB, SE***Validation of a Method for the Optimization of Scan Parameters for Measuring with Computed Tomography***Raoul Christoph, TU Dresden, Werth Messtechnik GmbH, Deutsches Krebsforschungszentrum, DE***Optimization of multiple axes control for metal artifact reduction in X-ray CT***Toru Kano, Tokyo University of Technology, Shinshu University, JP***Roughness Investigation of SLM Manufactured Conformal Cooling Channels Using Computed Tomography***Christopher Klingaa, Technical University of Denmark, DE***A versatile and compact laminography/tomography system***Pablo Pérez, University of Valladolid, ES***15 MeV CT for very large objects***Nicolas Estre, The French Alternative Energies and Atomic Energy Commission (CEA), FR*

## Poster Exhibition

**An attempt to detect anomalies in CT-data of car body parts using machine learning algorithms***Thomas Schromm, BMW AG, DE***CCD and scientific-CMOS detectors for submicron laboratory based X-ray Computed tomography***Jakub Salplachta, Central European Institute of Technology, Brno University of Technology, CZ***Microstructural analysis of cement materials by lab and beamline techniques***Luca Valentini, University of Padova, IT***Effect of gravity on porosity and surface roughness of SLM IN-625 parts***Tobias Thiede, Bundesanstalt für Materialforschung und -prüfung, DE***Spot size and detector unsharpness determination for numerical measurement uncertainty determination***Christian Orgeldinger, Institute of Manufacturing Metrology, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), DE***Self-calibrating helical micro-CT and computed tomography dimensional measurements***Trond Varslot, Thermo Fisher Scientific, CZ***Morphological study of defects in laminated joints of composite materials using microCT***Cintia Guimarães Ferreira, Nuclear Engineering Program, Nuclear Instrumentation Laboratory, COPPE/UFRJ, BR***Case studies of predictive analysis and casting process optimization based on CT scans***Marco Giogoli, Metrix3D, IT***Using CT to Image and Investigate the Effect of Low-Velocity Impact Damages on the Structure of Fiber Reinforced Polymer Samples***Christian Baldo, Federal University of ABC, BR***Error Investigations for a CT and Additive Manufacturing based Reverse Engineering Workflow***Fabian Bauer, Siemens Corporate Technology, DE***300kV Open Type Microfocus X-ray source for Industrial X-ray CT***Masayuki Hirano, Hamamatsu Photonics K.K., JP***Synthesis and characterization of metal-ceramic composite 316L/sycro***Haimon Alves, State University of Rio de Janeiro, BR***Shape analysis for grains and pores on 3d digital images***Fabian Biebl, Math2Market GmbH, DE***Study of keyhole-porosities in selective laser melting using X-ray computed tomography***Aditi Thanki, Katholieke Universiteit Leuven, BE***Automated ROI Localization On Tomographic Projections***Marina Chukalina, Shubnikov Institute of Crystallography FSRC "Crystallography and Photonics" RAS, RU***3-in-1 X-ray Computed Tomography***Nathanael Turner, The Manufacturing Technology Centre, UK***Is the metrotomography a reliable method to measure the dimensional and geometric specifications of technical parts? CT machine versus CMM machine****- A practical approach***Fernando Ferreira, CATIM - Technological Center for the Metal Working Industry, PT***Infrared thermography and method of finite elements applied to thermal nondestructive characterization in rails networks***Sougrati Belattar, Cadi Ayyad University, Faculty of sciences, MA***Understanding and improving ultrasonic inspection of the forging titanium alloy***Teodor Tranca, DIAC SERVICII srl, RO***On the impact of probing errors on form measurement in Computed Tomography***Filippo Montanari, Technical University of Denmark, DK***On the systematic design of calibration artefacts for Computed Tomography***Leonardo De Chiffre, Technical University of Denmark, DK***X-ray and FTIR  $\mu$ -CTs for morphological and chemical characterization of eco-sustainable insulating foams***Sandro Donato, Università degli Studi di Trieste, INFN Trieste, IT*