

# CT Meeting 2020

## Program

The 6<sup>th</sup> International Meeting on  
**Image Formation in X-Ray Computed Tomography**  
August 3 - August 7, 2020, Regensburg (virtual only), Germany  
[www.ct-meeting.org](http://www.ct-meeting.org)



Conference Chair:

Marc Kachelrieß (German Cancer Research Center, DKFZ)

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We would like to thank the members of the scientific committee for their great work by taking the opportunity to mention them in alphabetical order:

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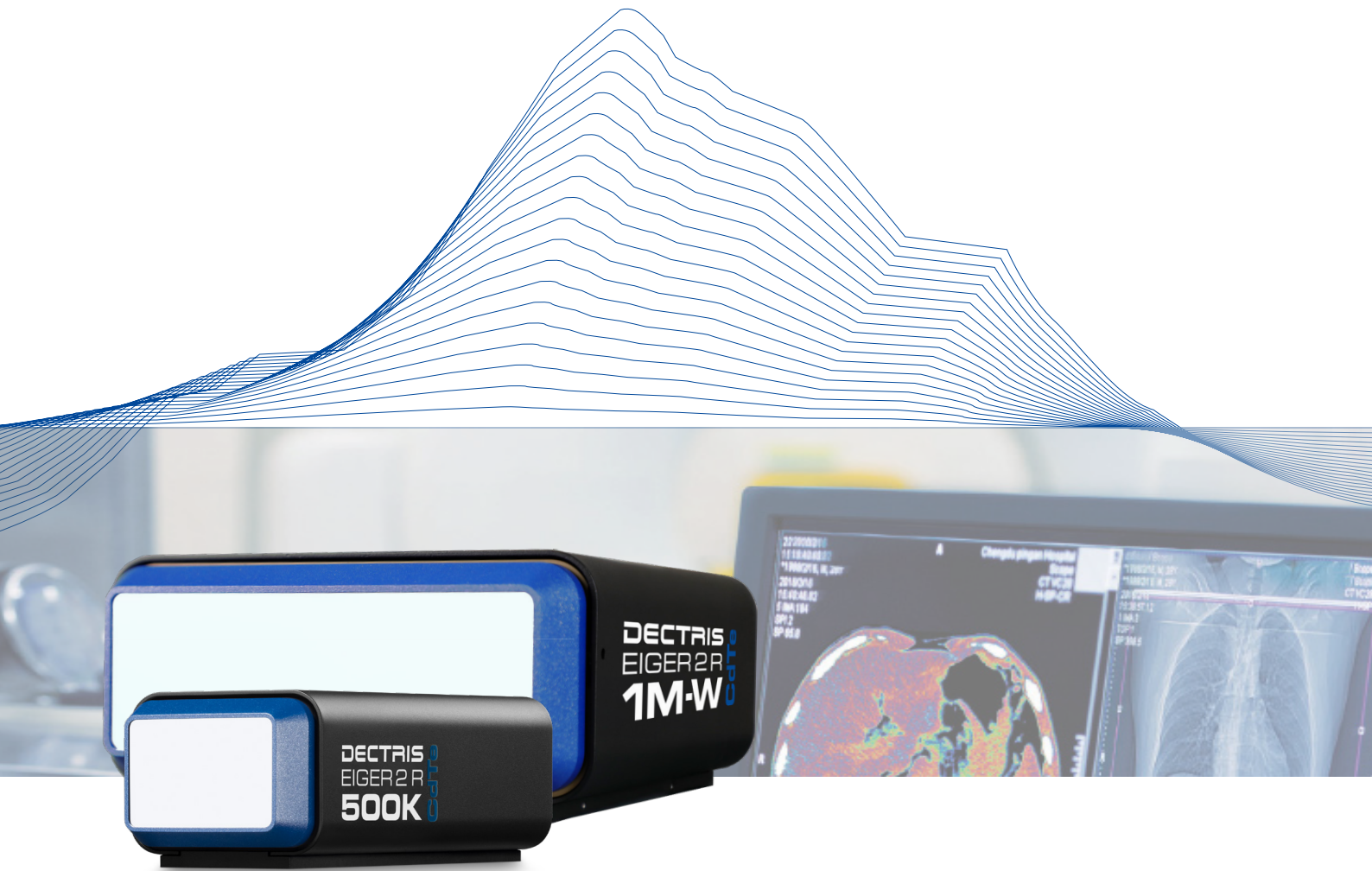
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DKFZ = German Cancer Research Center

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## Schedule CT Meeting 2020

	<b>Monday</b> <i>August 3</i>	<b>Tuesday</b> <i>August 4</i>	<b>Wednesday</b> <i>August 5</i>	<b>Thursday</b> <i>August 6</i>	<b>Friday</b> <i>August 7</i>
10:00 - 11:40 CEST	<b>Test Session</b>	<b>Image Re- construction</b> Opening remarks + 5 talks <i>(Page 30)</i>	<b>Deep Learning</b> Basic short course: Deep Learning + 3 talks <i>(Page 224)</i>	<b>Photon Counting</b> Basic short course: Photon Counting + 3 talks <i>(Page 422)</i>	
		<b>Coffee</b>	<b>Coffee</b>	<b>Coffee</b>	
12:00 - 13:40 CEST		<b>Dual and Multi- Energy Imaging</b> 5 talks <i>(Page 50)</i>	<b>Motion Estimation and Com- pensation</b> 5 talks <i>(Page 236)</i>	<b>Breast CT</b> Introduction: Breast CT + 4 talks <i>(Page 434)</i>	<b>Observer</b> Basic short course: Observer + 3 talks <i>(Page 618)</i>
		<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>
14:40 - 16:20 CEST		<b>Poster Session 1</b> Poster FF + 35 posters <i>(Page 70)</i>	<b>Poster Session 2</b> Poster FF + 36 posters <i>(Page 256)</i>	<b>Poster Session 3</b> Poster FF + 36 posters <i>(Page 450)</i>	<b>Novel CT Technolo- gies</b> 4 talks + Fully 3D 2021 & CT Meeting 2022 previews <i>(Page 630)</i>
		<b>Coffee</b>	<b>Coffee</b>	<b>Coffee</b>	
16:40 - 18:20 CEST	<b>Test Session</b>	<b>Diagnostic and Inter- ventional</b> Plenary: Intelligent clinical CT + 3 talks <i>(Page 210)</i>	<b>Artifact and Noise Reduction</b> 5 talks <i>(Page 400)</i>	<b>Security and Phase Contrast CT</b> 5 talks <i>(Page 594)</i>	



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## Tuesday, August 4

### Oral Session : Image Reconstruction

**Time** : Tuesday, 09:55 – 11:40

**Chairs** : J. Webster Stayman and Xiaochuan Pan

Time	Author	Title	Page
09:55 – 10:00	Marc Kachelrieß	<i>Opening Remarks</i>	
10:00 – 10:20	Baiyu Chen, Erich Kobler, Aaron Sodickson, Daniel K. Sodickson, Ricardo Otazo	<i>Benefits of Distributed Multidimensional Undersampling for Compressed Sensing CT</i>	30
10:20 – 10:40	Jingyan Xu, Frédéric Noo	<i>A k-Nearest Neighbor Regularizer for Model Based CT Reconstruction</i>	34
10:40 – 11:00	Yongyi Shi, Yongfeng Gao, Jiaying Tan, Siming Lu, Xuanqin Mou, Zhengrong Liang	<i>Learned Texture Prior for Bayesian Reconstruction of Super-Resolution CT</i>	38
11:00 – 11:20	Xiaojuan Deng, Xing Zhao, Hongwei Li	<i>Limited-Angle CT Reconstruction with Random Walk Regularization</i>	42
11:20 – 11:40	Nicolas Gindrier, Rolf Clackdoyle, Simon Rit, Laurent Desbat	<i>Cone-Beam Reconstruction from n-sin Trajectories with Transversely-Truncated Projections</i>	46

### Coffee Break

### Oral Session : Dual and Multi-Energy Imaging

**Time** : Tuesday, 12:00 – 13:40

**Chairs** : Katsuyuki Taguchi and Thomas Koenig

Time	Author	Title	Page
12:00 – 12:20	Sen Wang, Yuxiang Xing, Hwei Gao, Marc Kachelrieß, Ao Zheng, Li Zhang	<i>Experimental Feasibility of a Residual-Modelled Material Decomposition Method for Spectral CT</i>	50
12:20 – 12:40	Weibin Zhang, Shusen Zhao, Huiying Pan, Xing Zhao	<i>An Iterative Reconstruction Method for Material Decomposition of Dual Spectral Computed Tomography Based on Monochromatic Images</i>	54
12:40 – 13:00	Pierre-Antoine Rodesch, Salim Si-Mohamed, Simon Rit	<i>Spatially Varying Regularization Weights for One-Step Spectral CT with SQS</i>	58
13:00 – 13:20	Yiqun Q. Ma, Wenying Wang, Matthew Tivnan, Junyuan Li, Minghui Lu, Jin Zhang, Josh Star-Lack, Richard E. Colbeth, Wojciech Zbijewski, J. Webster Stayman	<i>High-Resolution Model-Based Material Decomposition for Multi-Layer Flat-Panel Detectors</i>	62
13:20 – 13:40	Yifan Deng, Hwei Gao	<i>Triple-Energy X-Ray CT Using Spectral Modulator with Flying Focal Spot: Modulator Design and Scatter-Modeled Material Decomposition</i>	66

### Lunch Break



**Poster Session : Poster Session 1**  
**Time : Tuesday, 14:40 – 16:20**

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15:00 – 16:20	Gengsheng L. Zeng	<i>A Pre-Filter that Incorporates the Noise Model</i>	74
15:00 – 16:20	Hao Zhao, Yanyan Liu, Guotao Quan	<i>Cone Beam Artifacts Correction in Multi-detector Computed Tomography Using Deep Neural Networks</i>	78
15:00 – 16:20	Guotao Quan, Jiao Tian, Yi Wang	<i>Cardiac Motion Correction of Computed Tomography (CT) with Spatial Transformer Network</i>	82
15:00 – 16:20	Daniël M. Pelt, Charlotte Maughan-Jones, Oriol Roche i Morgó, Alessandro Olivo, Charlotte K. Hagen	<i>Rapid and Flexible High-Resolution Scanning Enabled by Cycloidal Computed Tomography and Convolutional Neural Network (CNN) Based Data Recovery</i>	86
<b>Poster Session 1b (Chair: Bruno De Man and Zhicong Yu)</b>			
15:00 – 16:20	Joaquim G. Sanctorum, Sam Van Wassenbergh, Van Nguyen, Jan De Beenhouwer, Jan Sijbers, Joris J.J. Dirckx	<i>Projection-Angle-Dependent Image Intensifier Distortion Correction in High-Speed Tomography</i>	90
15:00 – 16:20	Jochen Butzer, Annika Döring, Sven Gondrom-Linke, Markus Harbecke	<i>Dual-Energy in Industrial CT – How Simple Math Can Reveal Structures Hidden by Artefacts</i>	94
15:00 – 16:20	Genwei Ma, Xing Zhao, Shusen Zhao	<i>Dual Domain Learning Basis Material Decomposition for Dual-Spectral CT via Attention Mechanism</i>	98
15:00 – 16:20	Yan Ren, Wenting Long, Huiqiao Xie, Xi-angyang Tang	<i>Improving the Accuracy and Dose Efficiency of Photon-Counting Spectral CT via Source Spectrum Shaping</i>	102
15:00 – 16:20	Marina Eckermann, Mareike Töpferwien, Anna-Lena Robisch, Franziska van der Meer, Christine Stadelmann, Tim Salditt	<i>Phase-Contrast X-Ray Tomography of Neuronal Tissue with Laboratory Sources at Sub-micron Resolution</i>	106

**Poster Session 1c (Chair: Adam Wang and Elias Eulig)**

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15:00 – 16:20	Cristóbal Martínez, Jeffrey A. Fessler, Manuel Desco, Mónica Abella	<i>Segmentation-Free Statistical Method for Polyenergetic X-Ray Computed Tomography with a Calibration Step</i>	118
15:00 – 16:20	Alexander Katsevich, Seongjin Yoon, Michael Frenkel, Peter Munro, Pascal Paysan, Igor Peterlik, Dieter Seghers, Adam Strzelecki	<i>A Motion Estimation and Compensation Algorithm for 4D CBCT with Cyclic Deformation Model</i>	122
15:00 – 16:20	Kihong Son, Doil Kim, Seokhwan Jang, Kyoung-Yong Lee	<i>Capability of a Novel Head Motion Correction Algorithm for X-Ray CT Imaging</i>	126

**Poster Session 1d (Chair: Hengyong Yu and Ioannis Sechopoulos)**

15:00 – 16:20	Junyoung Park, Jiyoung Choi, Duhgoon Lee, Minkook Cho, Kyoung-Yong Lee	<i>Performance of a Novel Cardiac Motion Correction in CT scans of 0.33 Seconds Rotation</i>	130
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15:00 – 16:20	Sui Li, Manman Zhu, Danyang Li, Qi Gao, Zhaoying Bian, Dong Zeng, Jianhua Ma	<i>Self-Supervised Reconstruction of Cerebral Perfusion CT Images Based on Noise Properties</i>	138
15:00 – 16:20	Stefan Haninger, Matthias Wiecek, Wolfgang Wein, Tobias Lasser	<i>Deep Learning Acceleration of OS-SIRT in X-Ray Cone-Beam Computed Tomography</i>	142
15:00 – 16:20	Markus Susenburger, Pascal Paysan, Adam Strzelecki, Igor Peterlik, Dieter Seghers, Marc Kachelrieß	<i>4D Segmentation-Based Anatomy-Constrained Motion-Compensated Reconstruction of On-Board 4D CBCT Scans</i>	146

**Poster Session 1e (Chair: Cyril Riddell and Frédéric Noo)**

15:00 – 16:20	Eri Haneda, Bernhard Claus, Jed D. Pack, Bruno De Man	<i>Projection-Based Cardiac Phase Estimation: Towards ECG-less Prospective Cardiac CT Gating</i>	150
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15:00 – 16:20	Stanislav Žabić, Liuchun He, Yuan Bao	<i>A Method for Reduction of Axial Truncation Artifacts</i>	158
15:00 – 16:20	Oriol Roche i Morgó, Fabio Vittoria, Marco Endrizzi, Alessandro Olivo, Charlotte K. Hagen	<i>Three Different Ways of Implementing Cycloidal Computed Tomography: a Discussion of Pros and Cons</i>	162
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**Poster Session 1f (Chair: Tobias Lasser and Guang-Hong Chen)**

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15:00 – 16:20	Mayank Patwari, Ralf Gutjahr, Rainer Raupach, Andreas K. Maier	<i>Low Dose CT Denoising via Joint Bilateral Filtering and Intelligent Parameter Optimization</i>	174
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15:00 – 16:20	Matt D. Holbrook, Darin P. Clark, Cristian T. Badea	<i>Deep Learning Based Distortion Correction and Material Decomposition for Photon Counting CT: A Simulation Study</i>	182
15:00 – 16:20	Seongjin Yoon, Alexander Katsevich, Michael Frenkel, Ed Morton, William Thompson	<i>Reduction of Artifacts in Multi-Energy Imaging for a Stationary Gantry CT Scanner</i>	186

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15:00 – 16:20	John Boone, Ali Uneri, Jeffrey H. Siewerdsen	<i>A Modular Phantom for Cone Beam and Whole-Body CT Image Quality Assessment</i>	194
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15:00 – 16:20	Hyoungh Suk Park, Kiwan Jeon	<i>Low-Dose CT Image Reconstruction with a Deep Learning Prior</i>	206

**Coffee Break**

**Oral Session : Diagnostic and Interventional**

**Time : Tuesday, 16:40 – 18:20**

**Chairs : Frédéric Noo and Norbert Pelc**

<b>Time</b>	<b>Author</b>	<b>Title</b>	<b>Page</b>
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17:20 – 17:40	Chumin Zhao, Thomas Weber, Magdalena Herbst, Ludwig Ritschl, Sebastian Vogt, Steffen Kappler, Jeffrey H. Siewerdsen, Wojciech Zbijewski	<i>Advanced Scan Trajectories for Chest Tomosynthesis on Robotic X-Ray Systems</i>	210
17:40 – 18:00	Sascha Manuel Huck, George S.K. Fung, Katia Parodi, Karl Stierstorfer	<i>Fluence Field Modulation in X-Ray CT for ROI Imaging: Optimization of Primary Fluence and Comparison of Attenuator Scenarios</i>	214
18:00 – 18:20	S. Principi, Adam Wang, A. Maslowski, T. Wareing, P. Jordan, Taly Gilat-Schmidt	<i>Deterministic Boltzmann Transport Equation Solver for Patient-Specific CT Dose Estimation: Validation for Realistic Scanner Configurations and Patient Models</i>	218

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## Wednesday, August 5

### **Oral Session : Deep Learning**

**Time** : Wednesday, 10:00 – 11:40

**Chairs** : Hongbing Lu and Xun Jia

Time	Author	Title	Page
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11:20 – 11:40	Muge Du, Hwei Gao, Kaichao Liang, Yinnong Liu, Yuxiang Xing	<i>Unsupervised Domain Adaptation for Practical Metal Artefact Reduction in X-Ray CT</i>	232

### **Coffee Break**

### **Oral Session : Motion Estimation and Compensation**

**Time** : Wednesday, 12:00 – 13:40

**Chairs** : Cristian T. Badea and Pascal Paysan

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12:20 – 12:40	Igor Peterlik, Adam Strzelecki, Mathias Lehmann, Philippe Messmer, Peter Munro, Pascal Paysan, Mathieu Plamondon, Dieter Seghers	<i>Motion Resilient Iterative 3D CBCT Reconstruction Based on Gradient Weighting</i>	240
12:40 – 13:00	Rob Heylen, Johan Nuyts	<i>Motion Correction for 4D CBCT Reconstruction with TV Regularization</i>	244
13:00 – 13:20	Johan Nuyts, Roger Fulton	<i>Iterative FDK Reconstruction for Helical CT of the Head with Rigid Motion Compensation</i>	248
13:20 – 13:40	Joscha Maier, Sergej Lebedev, Elias Eulig, Stefan Sawall, Eric Fournié, Karl Stierstorfer, Marc Kachelrieß	<i>Coronary Artery Motion Compensation for Short-Scan Cardiac CT Using a Spatial Transformer Network</i>	252

### **Lunch Break**

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15:00 – 16:20	Tobias Würfl, Nicole Maaß, Frank Dennerlein, Andreas K. Maier	<i>Projective Reconstruction of Acquisition Geometry without Point Correspondences</i>	264
15:00 – 16:20	Yidi Yao, Liang Li, Zhiqiang Chen, Wuyang Liang, Xin Jin	<i>Multi-Energy Monte Carlo Simulation of the Multi-Sources Static CT System</i>	268
15:00 – 16:20	Frédéric Jolivet, Clarisse Fournier, Jérôme Lesaint, Andrea Brambilla	<i>A One-Step Algorithm for Spectral CT with an Application on Multi-Source Inverse Geometry</i>	272
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15:00 – 16:20	Zhitao Guo, Hengyong Yu	<i>Low-Dose CT Denoising with Convolutional Neural Network for Unknown Noise Levels</i>	288
15:00 – 16:20	T. W. Holmes, C. N. De Cecco, A. Pourmorteza	<i>Investigating the Utility of Virtual Monoenergetic Images in Non-Contrast Lung CT Scans</i>	292

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15:00 – 16:20	Kaichao Liang, Li Zhang, Le Shen, Zhiqiang Chen, Yuxiang Xing	<i>Method of Deep Distribution Learning from Noisy Samples and an Application for Low Dose CT</i>	304
15:00 – 16:20	Berk Iskender, Yoram Bresler	<i>X-Ray CT Scatter Correction by a Physics-Motivated DNN with Opposite View Processing</i>	308
15:00 – 16:20	Gilad Shechter	<i>Projection Domain Decomposition for Photon Counting CT</i>	312

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15:00 – 16:20	Tao Zhang, Hwei Gao, Yuxiang Xing, Li Zhang, Zhiqiang Chen	<i>Prior-Knowledge Based Linogram Reconstruction Neural Network for X-Ray Computed Tomography</i>	324
15:00 – 16:20	Nargiza Djurabekova, Andrew Goldberg, David Hawkes, Guy Long, Luke Shepherd, Marta M. Betcke	<i>Segmented Static CBCT as Initialization of Fully Dynamic Tomography Reconstruction of Foot and Ankle</i>	328
15:00 – 16:20	Erich Kobler, Baiyu Chen, Alexander Effland, Thomas Pock, Daniel K. Sodickson, Ricardo Otazo	<i>Total Deep Variation for SparseCT Reconstruction</i>	332



**Poster Session 2e (Chair: Hongbing Lu and Katsuyuki Taguchi)**

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15:00 – 16:20	Shaohua Zhi, Marc Kachelrieß, Xuanqin Mou	<i>A Novel 4D-CBCT Reconstruction Framework via a Joint of Spatiotemporal Dictionary Learning and Prior Constraint</i>	344
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15:00 – 16:20	Mengfei Li, Hao Gao, Yunsong Zhao	<i>Fused Analytical Iterative Reconstruction for Sparse View Dual Energy Computed Tomography</i>	352

**Poster Session 2f (Chair: Michael McNitt-Gray and Michael Knaup)**

15:00 – 16:20	Taejin Kwon, Da-in Choi, Jaehong Hwang, Jaesung Lee, Jihwan Lim, Inje Lee, Seungryong Cho	<i>Dental Panoramic Image Reconstruction from Cone-Beam CT Projection Data</i>	356
15:00 – 16:20	Genwei Ma, Yinghui Zhang, Tong Wang, Xing Zhao, Hongwei Li	<i>An Intelligent Alternating Edge-Preserving Diffusion and Smoothing Neural Network for Limited-Angle Computed Tomography Reconstruction</i>	360
15:00 – 16:20	Jiayu Duan, Yang Li, Jianmei Cai, Xuanqin Mou	<i>A New Imaging Modality Based on The Flat Panel-Sources</i>	364
15:00 – 16:20	Masoud Elhamiasl, Sara Teruel Rivas, Koen Salvo, Edmond Sterpin, Johan Nuyts	<i>The Effect of CT Dose Reduction on Proton Therapy Dose Calculation</i>	368
15:00 – 16:20	Sarah Muller, Joscha Maier, Elias Eulig, Michael Knaup, Stefan Sawall, Marc Kachelrieß	<i>Deep Learning-Based Real-Time Estimation of Patient Dose Distributions for Various Medical CT Scan Protocols</i>	372

**Poster Session 2g (Chair: Thomas Koehler and Xun Jia)**

15:00 – 16:20	Shaojie Chang, Qiong Xu, Xi Chen, Xuanqin Mou	<i>Joint Spectrum Estimation and Image Reconstruction in Spectral CT</i>	376
15:00 – 16:20	Shabab Bazrafkan, Vincent Van Nieuwenhove, Joris Soons, Jan De Beenhouwer, Jan Sijbers	<i>Ringling Artefact Removal from Sparse View Tomosynthesis using Deep Neural Networks</i>	380
15:00 – 16:20	Ao Zheng, Zhiqiang Chen, Kaichao Liang, Li Zhang, Yuxiang Xing	<i>A CT Image Feature Space (CTIS) Loss for Reconstruction with Deep Learning Methods</i>	384
15:00 – 16:20	Hye Sun Yun, Tae Jun Jang, Sung Min Lee, Sang-Hwy Lee, Jin Keun Seo	<i>3D Landmark Annotation for Automatic 3D Cephalometry</i>	388
15:00 – 16:20	Florian Schiffers, Thomas Bochynek, André Aichert, Tobias Würfl, Michael Rubenstein, Oliver Cossairt	<i>Disassemblable Fieldwork CT Scanner Using a 3D-Printed Calibration Phantom</i>	392
15:00 – 16:20	Nele Blum, Maik Stille, Christian Hofmann, Thorsten M. Buzug	<i>Metal Artifact Reduction for 3D Cone-Beam CT by Non-Local Prior Image Integration</i>	396

**Coffee Break****Oral Session : Artifact and Noise Reduction****Time : Wednesday, 16:40 – 18:20****Chairs : Emil Y. Sidky and Stanislav Žabić**

<b>Time</b>	<b>Author</b>	<b>Title</b>	<b>Page</b>
16:40 – 17:00	Grace J. Gang, Tom Russ, Yiqun Q. Ma, Christian Toennes, Clifford R. Weiss, Jeffrey H. Siewerdsen, Lothar R. Schad, J. Webster Stayman	<i>Metal-Tolerant Noncircular Orbit Design and Implementation on Robotic C-Arm Systems</i>	400
17:00 – 17:20	Linxi Shi, N. Robert Bennett, Amy Shiroma, Mingshan Sun, Jin Zhang, Richard E. Colbeth, Josh Star-Lack, Minghui Lu, Adam Wang	<i>Single-Pass Metal Artifact Correction using a Dual Layer Flat Panel Detector</i>	404
17:20 – 17:40	Masakazu Matsuura, Jian Zhou, Hiroki Taguchi, Naruomi Akino, Zhou Yu	<i>Deep Learning Low Dose CT Image Denoising using Synthetic Training Data</i>	408
17:40 – 18:00	Julien Erath, Tim Vöth, Joscha Maier, Eric Fournié, Karl Stierstorfer, Martin Petersilka, Marc Kachelrieß	<i>Deep Learning-Based Cross-Scatter Correction for Clinical CT</i>	412
18:00 – 18:20	Philipp Roser, Annette Birkhold, Alexander Preuhs, Christopher Syben, Norbert Strobel, Markus Korwarschik, Rebecca Fahrig, Andreas K. Maier	<i>Deep Scatter Splines: Learning-Based Medical X-Ray Scatter Estimation Using B-splines</i>	416

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## Thursday, August 6

### Oral Session : Photon Counting

Time : Thursday, 10:00 – 11:40

Chairs : Mats Danielsson and Taly Gilat-Schmidt

Time	Author	Title	Page
10:00 – 10:40	Thomas Flohr	<i>Basic short course: Photon Counting</i>	
10:40 – 11:00	Katsuyuki Taguchi	<i>The Number of Energy Windows for Photon Counting Detectors: Is More Actually More?</i>	422
11:00 – 11:20	Mengzhou Li, David S. Rundle, Ge Wang	<i>X-Ray Photon-Counting Data Correction via Deep Learning</i>	426
11:20 – 11:40	Stefan J. van der Sar, Stefan E. Brunner, Dennis R. Schaart	<i>First Steps towards SiPM-Based Scintillation Detectors for Photon-counting CT</i>	430

### Coffee Break

### Oral Session : Breast CT

Time : Thursday, 12:00 – 13:40

Chairs : John Boone and Ioannis Sechopoulos

Time	Author	Title	Page
12:00 – 12:20	John Boone, Ioannis Sechopoulos	<i>Introduction: Breast CT</i>	
12:20 – 12:40	Yunhuan Yang, Chengyijue Fang, Lei Zhu	<i>Sparse-View Cone-Beam Breast CT via Conditional Generative Adversarial Network Constrained by Image Edges</i>	434
12:40 – 13:00	Koen Michielsen, Nikita Moriakov, Jonas Teuwen, Ioannis Sechopoulos	<i>Deep Learning-Based Initialization of Iterative Reconstruction for Breast Tomosynthesis</i>	438
13:00 – 13:20	Antonio Sarno, Giovanni Mettivier, Francesca di Franco, Antonio Varallo, Andrew M. Hernandez, Kristina Bliznakova, John Boone, Paolo Russo	<i>A Dataset of Patient Derived Digital Breast Phantoms for in Silico Computed Tomography Dedicated to the Breast</i>	442
13:20 – 13:40	Stefano van Gogh, Michał Rawlik, Zhentian Wang, Marco Stampanoni	<i>Investigating Deep Learning-Based Grating Interferometry Breast Computed Tomography Image Denoising</i>	446

### Lunch Break

**Poster Session : Poster Session 3**  
**Time : Thursday, 14:40 – 16:20**

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<b>Poster Session 3a (Chair: Wenli Wang and Jerome Liang)</b>			
15:00 – 16:20	Daniil Kazantsev, Nicola Wadeson	<i>Tomographic Model-Based Reconstruction (ToMoBAR) Software for High Resolution Synchrotron X-Ray Tomography</i>	450
15:00 – 16:20	Marion Savanier, Cyril Riddell, Yves Trouset, Emilie Chouzenoux, Jean-Christophe Pesquet	<i>A Matched CBCT Projector-Backprojector Based on the Convolution of B-splines</i>	454
15:00 – 16:20	Eckhard Wehrse, Stefania Petra, Laura Klein, Lukas Rotkopf, Christian Herbert Ziener, Marc Kachelrieß, Heinz-Peter Schlemmer, Stefan Sawall	<i>Structured Regularization for Material Decomposition of Photon Counting CT Data using Collaborative Total Variation</i>	458
15:00 – 16:20	Obaidullah Rahman, Ken Sauer, Connor J. Evans, Ryan K. Roeder	<i>Direct Iterative Reconstruction of Multiple Basis Material Images in Photon-Counting Spectral CT</i>	462
15:00 – 16:20	Wenyang Wang, Grace J. Gang, Matthew Tivnan, J. Webster Stayman	<i>Perturbation Response of Model-Based Material Decomposition with Edge-Preserving Penalties</i>	466
<b>Poster Session 3b (Chair: Hiroyuki Kudo and Stefan Sawall)</b>			
15:00 – 16:20	David Weller, Maik Stille, Philipp Koch, Mark Dreier, Alfred Mertins, Thorsten M. Buzug	<i>Convolutional Neural Network based Iterative Metal Artifact Reduction</i>	470
15:00 – 16:20	Alessandro Piol, Patricia M. Berdon, Manuel Desco, Monica Abella	<i>Prior Information for CT Reconstruction from Thermal Data</i>	474
15:00 – 16:20	David Tellenbach, Tobias Lasser	<i>elsa - An Elegant Framework for Precision Learning in Tomographic Reconstruction</i>	478
15:00 – 16:20	Maximilian Wattenberg, Lasse Hansen, Philipp Klein, Mattias P. Heinrich, Maik Stille, Thorsten M. Buzug	<i>Reconstruction of Blood Vessel Paths from Sparse Cone Beam Projection Images using Neural Networks and Ray-Tracing</i>	482
15:00 – 16:20	M. Nauwynck, Shabab Bazrafkan, A. H. van Heteren, Jan De Beenhouwer, Jan Sijbers	<i>Ring Artifact Reduction in Sinogram Space Using Deep Learning</i>	486

**Poster Session 3c (Chair: Kirsten Boedeker and Zhye Yin)**

15:00 – 16:20	Daouda Diakite, Maxime Martelli, Nicolas Gac	<i>An OpenCL Pipeline Implementation on Intel FPGA for 3D Backprojection</i>	490
15:00 – 16:20	Daniel Hadhazi, Gabor Horvath	<i>PGM Based TV L0 Regularized Linear Tomosynthesis Reconstruction</i>	494
15:00 – 16:20	Michael H. Schmitt	<i>Iterative Reconstruction-Based Increase of Operating Pitch in Aviation Security CT</i>	498
15:00 – 16:20	Lina Felsner, Tobias Würfl, Christopher Syben, Philipp Roser, Alexander Preuhs, Andreas K. Maier, Christian Riess	<i>Reconstruction of Voxels with Position- and Angle-Dependent Weightings</i>	502
15:00 – 16:20	Maria Magnusson, Gudrun Alm Carlsson, Michael Sandborg, Asa Carlsson Tedgren, Alexandr Malusek	<i>Investigation of Base Materials for Accurate Dual-Energy Computed Tomography. Comparison between the Alvarez-Macovski method and DIRA</i>	506

**Poster Session 3d (Chair: Jingyan Xu and Peter B. Noël)**

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15:00 – 16:20	J. Graetz Dittmann, D. Müller, A. Balles, T. Tuohimaa, T. Donath, C. Fella	<i>ntCT: Submicrometer Laboratory X-Ray Microtomography down to 0.2<math>\mu</math>m Resolution</i>	514
15:00 – 16:20	Van Nguyen, Jan De Beenhouwer, Shabab Bazrafkan, A-T. Hoang, Sam Van Wassenbergh, Jan Sijbers	<i>BeadNet: a Network for Automated Spherical Marker Detection in Radiographs for geometry Calibration</i>	518
15:00 – 16:20	Emil Y. Sidky, Emily R. Paul, Taly Gilat-Schmidt, Xiaochuan Pan	<i>Spectral Calibration and Non-Linear Intensity Correction of Photon-Counting Detectors for Spectral CT</i>	522
15:00 – 16:20	Aurélien Coussat, Simon Rit, Rolf Clackdoyle, Michel Defrise, Laurent Desbat, Jean Michel Létang	<i>ROI CT Reconstruction Combining Analytic Inversion of the Finite Hilbert Transform and SVD</i>	526

**Poster Session 3e (Chair: Lifeng Yu and Günter Lauritsch)**

15:00 – 16:20	Hung Nguyen, Laurent Desbat, Rolf Clackdoyle	<i>Automatic Geometric Calibration in 3D Cone-Beam Geometry with Sources on a Line</i>	530
15:00 – 16:20	Zheng Zhang, Buxin Chen, Dan Xia, Emil Y. Sidky, Xiaochuan Pan	<i>A Preliminary Study on the Inversion of DXT from Limited-Angular-Range Data</i>	534
15:00 – 16:20	Hyunuk Jung, Chenyang Shen, Xun Jia	<i>Simultaneous Image Reconstruction and Element Decomposition for Iodine Contrast Agent Visualization in Multi-energy Cone Beam CT</i>	538
15:00 – 16:20	Buxin Chen, Emil Y. Sidky, Zheng Zhang, Dan Xia, Xiaochuan Pan	<i>A Preconditioning Scheme for Accelerating A Non-Convex Primal-Dual Reconstruction Algorithm in Multispectral CT</i>	542
15:00 – 16:20	Priyanka Ray, Parikshit Moitra, Yicheng Zhang, Tor Jensen, Scott Santeler, Dipanjan Pan	<i>Radiopaque Temporary Embolic Agent for Direct Visualization During Surgical Procedure and Follow up Treatments</i>	546

**Poster Session 3f (Chair: Yuxiang Xing and Elias Eulig)**

15:00 – 16:20	Xiaokun Huang, You Zhang, Jing Wang	<i>U-net Based Automatic CBCT-Based Liver Tumor Localization using Biomechanical Modeling</i>	550
15:00 – 16:20	Fatemeh Ostadhossein, Indu Tripathi, Lily Benig, Denae LoBato, Mahdieh Moghiseh, Chiara Lowe, Aamir Raja, Anthony Butler, Raj Panta, Marzieh Anjomrouz, Alex Chernoglazov, Dipanjan Pan	<i>Gram Scale Synthesis of Hafnia Nanodots for Detection of Bone Microcracks using Photon Counting CT Imaging</i>	554
15:00 – 16:20	Stephen Z. Liu, Qian Cao, Jeffrey H. Siewerd- sen, J. Webster Stayman, Wojciech Zbijewski	<i>Three-Material Dual Energy Decomposition Using a Constrained Model-Based Algorithm</i>	558
15:00 – 16:20	Andriy Andreyev, Arkadiusz Sitek, Christoph Graf vom Hagen	<i>Cone Beam CT Image Reconstruction by Origin Ensemble Algorithm</i>	562
15:00 – 16:20	Zhicong Yu, Amit Jain, Chuanyong Bai, Daniel Gagnon	<i>A Constrained Curve-Fitting Method for Scatter Estimation for Helical Cone-Beam CT</i>	566

**Poster Session 3g (Chair: Johan Nuyts and Carlo Amato)**

15:00 – 16:20	Alexander Meaney, Jussi Toivanen, Samuli Siltanen, Ville Kolehmainen	<i>Joint Reconstruction and Image Space Material Decomposition in Sparse View Spectral CT</i>	570
15:00 – 16:20	Hewei Gao, Tao Zhang, N. Robert Bennett, Adam Wang	<i>Scatter Correction for X-Ray CT Using Spectral Modulator with Flying Focal Spot</i>	574
15:00 – 16:20	Jingwen Zhuang, Yaguang Lu, Mei Bai	<i>A phantom Study on Exploring the Accuracy of the Weighted CT Dose Index for Multi-detector CT</i>	578
15:00 – 16:20	Ludwig Ritschl, Marcel Beister, Magdalena Herbst, Steffen Kappler	<i>Isotropic Ultra-High Resolution CBCT Extremity Imaging Using a Robotic Radiography System</i>	582
15:00 – 16:20	Robert Cierniak, Piotr Pluta	<i>Fast Statistical Reconstruction Algorithm for a CT Scanner with Flying Focal Spot</i>	586
15:00 – 16:20	Paolo Gnudi, Bernd Schweizer, Marc Kachelrieß, Yannick Berker	<i>Denoising of X-Ray Projections and Computed Tomography Images using Convolutional Neural Networks without Clean Data</i>	590

**Coffee Break**

**Oral Session : Security and Phase Contrast CT**

**Time : Thursday, 16:40 – 18:20**

**Chairs : Guang-Hong Chen and Peter B. Noël**

<b>Time</b>	<b>Author</b>	<b>Title</b>	<b>Page</b>
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17:00 – 17:20	Wei Fang, Liang Li, Zhiqiang Chen, Chunguang Zong	<i>First Commercial Dual Energy MeV CT for Container Imaging: Experimental Results</i>	598
17:20 – 17:40	Sunho Lim, Donghyeon Lee, Hwanhui Jo, Seungryong Cho	<i>A New Empirical Dual-Energy Calibration (EDEC) Method for Material Decomposition in X-Ray Cargo Inspection</i>	602
17:40 – 18:00	Marius Reichardt, Jasper Frohn, Amara Khan, Frauke Alves, Tim Salditt	<i>X-Ray Phase-Contrast Tomography of Heart Tissue</i>	608
18:00 – 18:20	Grant T. Gullberg, Weijie Tao, Sally J. Kim, Yongjin Sung, Qiu Huang, Youngho Seo, Michael Fuller	<i>Tensor Tomography of Dark Field Scatter Using Single-Exposure Moiré Fringe Analysis of X-Ray Bi-Prism Interferometry</i>	612



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## Friday, August 7

### Oral Session: Observer

**Time** : Friday, 12:00 – 13:40

**Chairs** : Günter Lauritsch and Ge Wang

Time	Author	Title	Page
12:00 – 12:40	Frederic Noo	<i>Basic short course: Observer</i>	
12:40 – 13:00	Emil Y. Sidky, Weimin Zhou, Greg Ongie, Juan P. Cruz-Bastida, Ingrid S. Reiser, Mark A. Anastasio, Xiaochuan Pan	<i>Developing Signal Detectability as an Image Quality Metric for use with Non-Linear Image Reconstruction</i>	618
13:00 – 13:20	Irene Hernandez-Giron, Johan Michiel den Harder, Geert J. Streekstra, Wouter J. H. Veldkamp	<i>Objective Assessment of Clinical Image Quality in Thorax CT: Nodule Detectability in a 3D Printed Anthropomorphic Phantom by a 3D Model Observer</i>	622
13:20 – 13:40	Byeongjoon Kim, Minah Han, Jongduk Baek	<i>Training Strategies of a Convolutional Neural Network-Based Anthropomorphic Model Observer for Signal-Known-Exactly and Background-Known-Statistically Detection Tasks</i>	626

### Lunch Break

### Oral Session: Novel CT Technologies

**Time** : Friday, 14:40 – 16:20

**Chairs** : Thomas Flohr and Cyril Riddell

14:40 – 15:00	J. Webster Stayman, Matthew Tivnan, Grace J. Gang, Wenying Wang, Nadav Shapira, Peter B. Noël	<i>Grating-Based Spectral CT using Small Angle X-Ray Beam Deflections</i>	630
15:00 – 15:20	P. Wu, N. Sheth, T. Wang, A. Sisniega, A. Uneri, R. Han, R. Vijayan, P. Vagdargi, Björn W. Kreher, H. Kunze, G. Kleinszig, Sebastian Vogt, Jeffrey H. Siewerdsen	<i>C-Arm Non-Circular Orbits: Geometric Calibration, Image Quality, Avoidance of Metal Artifacts</i>	634
15:20 – 15:40	Matthew Tivnan, Wenying Wang, J. Webster Stayman	<i>Multi-Contrast CT Imaging with a Prototype Spatial-Spectral Filter</i>	638
15:40 – 16:00	Jannis Dickmann, Christina Sarosiek, George Coutrakon, Simon Rit, Nick Detrich, Victor Rykalin, Mark Pankuch, Robert P. Johnson, Reinhard W. Schulte, Katia Parodi, Guillaume Landry, George Dedes	<i>Dynamic Fluence Modulation using Proton CT for Low-dose Imaging in Particle Therapy</i>	642
16:00 – 16:20	Johan Nuyts, J. Webster Stayman	<i>Preview: Fully3D 2021 + CT Meeting 2022</i>	