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# ***Physics of Medical Imaging***

**Ehsan Samei**

**Jiang Hsieh**

*Editors*

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W. C. Barber, DxRay, Inc. (United States); E. Nygard, DxRay Inc. (United States) and Interon AS (Norway); J. S. Iwanczyk, DxRay, Inc. (United States); M. Zhang, E. C. Frey, B. M. W. Tsui, The Johns Hopkins Univ. (United States); J. C. Wessel, Interon AS (Norway); N. Malakhov, DxRay Inc. (United States) and Interon AS (Norway); G. Wawrzyniak, Interon AS (Norway); N. E. Hartsough, T. Gandhi, DxRay, Inc. (United States); K. Taguchi, The Johns Hopkins Univ. (United States)
- 7258 25 **Photon-counting CT with silicon detectors: feasibility for pediatric imaging** [7258-76]  
M. Yveborg, C. Xu, E. Fredenberg, M. Danielsson, Royal Institute of Technology (Sweden)

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**SESSION 15 CT RECONSTRUCTION**

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- 7258 26 **Performance comparison between compressed sensing and statistical iterative reconstruction algorithms** [7258-77]  
J. Tang, B. Nett, G.-H. Chen, Univ. of Wisconsin, Madison (United States)
- 7258 27 **Boundary reconstruction in limited-angle x-ray phase-contrast tomography** [7258-78]  
M. A. Anastasio, Illinois Institute of Technology (United States); E. Y. Sidky, X. Pan, The Univ. of Chicago (United States); C.-Y. Chou, National Taiwan Univ. (Taiwan)
- 7258 28 **A dual formulation of a penalized maximum likelihood x-ray CT reconstruction problem** [7258-79]  
J. Xu, K. Taguchi, The Johns Hopkins Univ. (United States); G. T. Gullberg, Lawrence Berkeley National Lab. (United States); B. M. W. Tsui, The Johns Hopkins Univ. (United States)
- 7258 29 **Noise properties of iterative reconstruction techniques in low-dose CT scans** [7258-80]  
S. Do, M. K. Kalra, Massachusetts General Hospital (United States) and Harvard Medical School (United States); Z. Liang, Univ. of California, Los Angeles (United States); W. C. Karl, Boston Univ. (United States); T. J. Brady, H. Pien, Massachusetts General Hospital (United States) and Harvard Medical School (United States)
- 7258 2A **Interactive GPU-accelerated image reconstruction in cone-beam CT** [7258-81]  
L. Hillebrand, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); R. M. Lapp, VAMP GmbH (Germany); Y. Kyriakou, W. A. Kalender, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)
- 7258 2B **GPU-accelerated SART reconstruction using the CUDA programming environment** [7258-82]  
B. Keck, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany) and Siemens Healthcare, (Germany); H. Hofmann, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany); H. Scherl, M. Kowarschik, Siemens Healthcare, (Germany); J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

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**POSTER SESSION: ALGORITHMS**

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- 7258 2C **Effect of detector time delay and its correction in multiple source computed tomography** [7258-83]  
A. Thran, P. Forthmann, R. Proksa, Philips Research (Germany)

- 7258 2D **Noise correlation in CBCT projection data and its application for noise reduction in low-dose CBCT** [7258-84]  
J. Wang, Stanford Univ. School of Medicine (United States); A. Chai, Stanford Univ. School of Medicine (United States) and Stanford Univ. (United States); L. Xing, Stanford Univ. School of Medicine (United States)
- 7258 2E **Geometric calibration of detectors with discrete irregularities for computed tomography (Honorable Mention Poster Award)** [7258-85]  
K. M. Holt, Varian Medical Systems, Inc. (United States)
- 7258 2F **Simultaneous activity and attenuation reconstruction in PET: applying partially known attenuation** [7258-86]  
S. S. Furuie, Univ São Paulo (Brazil)
- 7258 2H **Real-time compression of raw computed tomography data: technology, architecture, and benefits** [7258-88]  
A. Wegener, Samplify Systems (United States); N. Chandra, GE Healthcare (United States); Y. Ling, Samplify Systems (United States); R. Senzig, GE Healthcare (United States); R. Herfkens, Stanford Univ. School of Medicine (United States)
- 7258 2I **Perfusion from angiogram and a priori (PAP) with temporal regularization** [7258-89]  
K. Taguchi, J.-F. H. Geschwind, The Johns Hopkins Univ. School of Medicine (United States)
- 7258 2J **Bronchial wall region extraction algorithm using multi-slice CT images** [7258-90]  
K. Akashi, S. Saita, M. Kubo, Y. Kawata, N. Niki, Univ. of Tokushima (Japan); Y. Nakano, Shiga Univ. School of Medicine (Japan); A. Niimi, H. Matsumoto, T. Oguma, Kyoto Univ. Graduate School of Medicine (Japan); Y. Takiguchi, N. Kawata, N. Tanabe, Chiba Univ. Graduate School of Medicine (Japan); H. Ohmatsu, National Cancer Ctr. Hospital East (Japan); K. Eguchi, Teikyo Univ. School of Medicine (Japan); M. Kaneko, National Cancer Ctr. (Japan); N. Moriyama, National Cancer Ctr. Research Ctr. for Cancer Prevention and Screening (Japan)
- 7258 2K **Volumetric soft tissue brain imaging on xCAT, a mobile flat-panel x-ray CT system** [7258-91]  
W. Zbijewski, Xoran Technologies, Inc. (United States); J. W. Stayman, Xoran Technologies, Inc. (United States) and Michigan Tech Research Institute (United States)
- 7258 2L **Image reconstruction for a stationary digital breast tomosynthesis system** [7258-92]  
R. Rajaram, G. Yang, The Univ. of North Carolina at Chapel Hill (United States); E. Quan, B. Frederick, D. S. Lalush, North Carolina State Univ. (United States) and The Univ. of North Carolina at Chapel Hill (United States); O. Z. Zhou, The Univ. of North Carolina at Chapel Hill (United States)
- 7258 2M **Local correction of non-periodic motion in computed tomography** [7258-93]  
C. Schretter, Otto-von-Guericke-Univ. Magdeburg (Germany) and Philips Research Europe (Germany); C. Neukirchen, Philips Research Europe (Germany); G. Rose, Otto-von-Guericke-Univ. Magdeburg (Germany); M. Bertram, Philips Research Europe (Germany)
- 7258 2N **Toward region of interest computer tomography** [7258-94]  
S. Schafer, P. B. Noël, A. M. Walczak, K. R. Hoffmann, Univ. at Buffalo (United States) and Toshiba Stroke Research Ctr., Univ. at Buffalo (United States)

- 7258 2O **Wavelet based de-noising methods for local SPECT reconstruction with nonuniform attenuation** [7258-95]  
L. Wang, J. Wen, J. Yang, Y. Chen, Beijing Institute of Technology (China); Z. Liang, Stony Brook Univ. (United States)
- 7258 2P **A noise decomposition method for image quality analysis of medical radiography detectors** [7258-96]  
S. Al Tahli, I. Maack, A. Koch, C. Herrmann, Philips Medical Systems DMC GmbH (Germany)
- 7258 2Q **Evaluating low pass filters on SPECT reconstructed cardiac orientation estimation** [7258-97]  
S. Dwivedi, Philips Healthcare (India)

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#### POSTER SESSION: APPLICATIONS

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- 7258 2R **Systematic scanner variability of patient CT attenuation measurements** [7258-98]  
P. F. Judy, R. D. Nawfel, S. G. Silverman, Brigham and Women's Hospital (United States) and Harvard Medical School (United States)
- 7258 2S **An experimental cone-beam micro-CT system for small animal imaging** [7258-99]  
S. Zhu, J. Tian, G. Yan, C. Qin, J. Liu, Institute of Automation (China)
- 7258 2T **4D micro-CT-based perfusion imaging in small animals (Cum Laude Poster Award)** [7258-100]  
C. T. Badea, S. M. Johnston, M. Lin, L. W. Hedlund, G. A. Johnson, Duke Univ. Medical Ctr. (United States)
- 7258 2U **Attenuation and image noise level based online z-axis tube current modulation for CT scans independent with localizer radiograph: simulation study and results** [7258-101]  
Y. Tian, M. Chen, J. Kong, Siemens Shanghai Medical Equipment Ltd. (China)
- 7258 2V **CBCT/CBDT equipped with the x-ray projection system for image-guided proton therapy** [7258-102]  
M. K. Cho, Pusan National Univ. (Korea, Republic of); J. S. Kim, National Cancer Ctr. (Korea, Republic of); Y.-B. Cho, Princess Margaret Hospital (Canada); H. Youn, Pusan National Univ. (Korea, Republic of); S. Y. Park, National Cancer Ctr. (Korea, Republic of); S. Cho, The Univ. of Chicago (United States); H. K. Kim, Pusan National Univ. (Korea, Republic of)
- 7258 2W **Clinical micro-CT for dental imaging** [7258-103]  
H. Youn, M. K. Cho, C.-S. Shon, Pusan National Univ. (Korea, Republic of); B. H. Cho, Pusan National Univ. School of Dentistry (Korea, Republic of); C. H. Kim, Vatech Co., Ltd. (Korea, Republic of); H. K. Kim, Pusan National Univ. (Korea, Republic of)

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#### POSTER SESSION: BREAST IMAGING

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- 7258 2Y **Preliminary feasibility of dedicated breast CT with an inverse geometry** [7258-106]  
T. Gilat Schmidt, Marquette Univ. (United States)
- 7258 2Z **Study of signal-to-noise ratio in digital mammography** [7258-107]  
Y. Kato, N. Fujita, Graduate School of Medical Sciences, Nagoya Univ. (Japan); Y. Kodera, School of Health Sciences, Nagoya Univ. (Japan)

- 7258 30 **Imaging technique optimization of tungsten anode FFDM system** [7258-108]  
B. Chen, A. P. Smith, Z. Jing, E. Ingal, Hologic, Inc. (United States)
- 7258 31 **Digital breast tomosynthesis (DBT) versus full field digital mammography (FFDM): comparison of a system performance using a contrast detail phantom** [7258-109]  
A. Nitrosi, G. Borasi, M. Bertolini, A. Botti, D. Tassoni, Arcispedale S. Maria Nuova (Italy); S. Strocchi, Azienda Ospedale di Circolo e Fondazione Macchi (Italy)

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#### POSTER SESSION: CARDIAC IMAGING

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- 7258 32 **Cardiac imaging with multi-sector data acquisition in volumetric CT: variation of effective temporal resolution and its potential clinical consequences** [7258-110]  
X. Tang, J. Hsieh, B. H. Taha, M. L. Vass, J. L. Seamans, D. R. Okerlund, GE Healthcare (United States)
- 7258 33 **Advanced processing for motion-compensated reconstruction in cardiac cone-beam CT (Honorable Mention Poster Award)** [7258-111]  
U. van Stevendaal, P. Forthmann, T. Köhler, J. von Berg, C. Lorenz, M. Grass, Philips Research Labs. Hamburg (Germany)
- 7258 34 **A second pass gated reconstruction scheme with conjugate weights** [7258-112]  
K. Erhard, M. Grass, Philips Research (Germany)
- 7258 35 **A cardiac phantom study on quantitative correction of coronary calcium score on multi-detector, dual source, and electron beam tomography for velocity, calcification density, and acquisition time** [7258-113]  
M. J. W. Greuter, J. M. Groen, L. J. Nicolai, H. Dijkstra, M. Oudkerk, Univ. Medical Ctr. Groningen (Netherlands)
- 7258 36 **Diagnostic quality of time-averaged ECG-gated CT data** [7258-114]  
A. Klein, Institute of Technical Medicine, Univ. Twente (Netherlands); L. J. Oostveen, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); M. J. W. Greuter, Univ. Medical Ctr. Groningen (Netherlands); Y. Hoogeveen, L. J. Schultze Kool, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); C. H. Slump, Institute of Technical Medicine, Univ. Twente (Netherlands); W. K. J. Renema, Radboud Univ. Nijmegen Medical Ctr. (Netherlands)

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#### POSTER SESSION: CT CORRECTIONS

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- 7258 37 **An online cross-scatter correction algorithm for dual-source CT: effects on CT number accuracy and noise** [7258-115]  
C. D. Eusemann, A. Apel, B. Schmidt, Siemens Healthcare (Germany); A. I. Walz-Flannigan, M. C. Jacobsen, Mayo Clinic (United States); K. Stierstorfer, T. G. Flohr, Siemens Healthcare (Germany); C. H. McCollough, Mayo Clinic (United States)
- 7258 38 **Iterative scatter correction for x-ray cone-beam CT with semi-transparent beam stop array** [7258-117]  
H. Yan, X. Mou, S. Tang, X. Chen, Xi'an Jiaotong Univ. (China)
- 7258 39 **Analytical scatter estimation for cone-beam computed tomography** [7258-118]  
H. R. Ingleby, I. A. Elbakri, D. W. Rickey, S. Pistorius, CancerCare Manitoba (Canada)

- 7258 3A **High-contrast artifact reduction in cone beam computed tomography by using geometric techniques** [7258-119]  
P. B. Noël, Univ. at Buffalo (United States) and Toshiba Stroke Research Ctr., Univ. at Buffalo (United States); J. Xu, Toshiba Stroke Research Ctr., Univ. at Buffalo (United States); K. R. Hoffmann, Univ. at Buffalo (United States) and Toshiba Stroke Research Ctr., Univ. at Buffalo (United States); J. J. Corso, Univ. at Buffalo (United States); S. Schafer, A. M. Walczak, Toshiba Stroke Research Ctr., Univ. at Buffalo (United States)
- 7258 3B **Real time implementation of distortion corrections for a tiled EMCCD-based solid state x-ray image intensifier (SSXII)** [7258-120]  
C. Keleshis, K. R. Hoffmann, J. Lee, H. Hamwi, W. Wang, C. N. Ionita, D. R. Bednarek, A. Verevkin, S. Rudin, Toshiba Stroke Research Ctr., Univ. at Buffalo (United States)
- 7258 3C **Measurement-based scatter correction for cone-beam CT in radiation therapy** [7258-122]  
L. Zhu, L. Xing, Stanford Univ. (United States)
- 7258 3D **Three-dimensional metal artifact reduction method for dental conebeam CT scanners** [7258-123]  
K. Kobayashi, A. Katsumata, Yamatake Corp. (Japan); K. Ito, T. Aoki, Tohoku Univ. (Japan)
- 7258 3E **Reduction of artifacts due to multiple metallic objects in computed tomography** [7258-124]  
K. Y. Jeong, J. B. Ra, Korea Advanced Institute of Science and Technology (Korea, Republic of)
- 7258 3F **Reduction of aliasing artifacts in tomographic images** [7258-125]  
O. Tischenko, Helmholtz Zentrum München GmbH (Germany); Y. Xu, Univ. of Oregon (United States); T. Goetzfried, L. Bogner, Univ. of Regensburg (Germany); C. Hoeschen, Helmholtz Zentrum München GmbH (Germany)
- 7258 3G **Attenuation compensation in mesh-domain OSEM SPECT reconstruction** [7258-126]  
L. Vogelsang, Y. Lu, Syracuse Univ. (United States); B. Yu, China Three Gorges Univ. (China); A. Krol, Upstate Medical Univ., SUNY (United States) and Syracuse Univ. (United States); Y. Xu, X. Hu, Syracuse Univ. (United States); D. Feiglin, Upstate Medical Univ., SUNY (United States) and Syracuse Univ. (United States); E. Lipson, Syracuse Univ. (United States) and Upstate Medical Univ., SUNY (United States)
- 7258 3H **How many x-ray photons can be scattered from a SPECT/CT room to an adjacent gamma camera?** [7258-127]  
Z. Cao, Medical College of Georgia (United States)

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#### POSTER SESSION: DETECTORS

- 7258 3I **Feasibility study of CMOS detectors for mammography** [7258-40]  
J. C. Han, S. Yun, C. H. Lim, Pusan National Univ. (Korea, Republic of); T. W. Kim, Vatech Co., Ltd. (Korea, Republic of); H. K. Kim, Pusan National Univ. (Korea, Republic of)
- 7258 3J **Flat detector ghost image reduction by UV irradiation** [7258-128]  
R. M. Snoeren, H. Steinhauser, L. Alving, H. Stouten, Philips Healthcare (Netherlands); P. H. N. de With, Univ. of Technology Eindhoven (Netherlands)



- 7258 3K **A counting and integrating pixel readout chip for amorphous selenium direct radiation detectors for medical imaging applications (Honorable Mention Poster Award)** [7258-129]  
A. H. Goldan, B. Hadji, K. S. Karim, Univ. of Waterloo (Canada); G. DeCrescenzo, J. A. Rowlands, Thunder Bay Regional Research Institute, Lakehead Univ. (Canada); O. Tousignant, L. Laperrière, Anrad Corp. (Canada)
- 7258 3L **Quasi-monochromatic x-ray filter with thin film multilayer for a large area radiation field** [7258-130]  
Y. Park, S. Han, J. Chae, C. Kim, Hanwha L&C Research Ctr. (Korea, Republic of); K. S. Chon, Wonkwang Univ. (Korea, Republic of); H.-K. Lee, College of Medicine, The Catholic Univ. of Korea (Korea, Republic of); D. S. Han, Monoray Co., Ltd (Korea, Republic of)
- 7258 3M **Advanced a-Se film with high sensitivity and heat resistance for x-ray detectors (Honorable Mention Poster Award)** [7258-131]  
K. Ogusu, O. Nakane, Y. Igasaki, Y. Okamura, S. Yamada, T. Hirai, Hamamatsu Photonics K.K. (Japan)
- 7258 3N **Pixel-structured scintillators for digital x-ray imaging (Honorable Mention Poster Award)** [7258-133]  
S. M. Yun, C. H. Lim, Pusan National Univ. (Korea, Republic of); T. W. Kim, Vatech Co., Ltd. (Korea, Republic of); H. K. Kim, Pusan National Univ. (Korea, Republic of)
- 7258 3O **Optimized operation and offset corrections for a battery-powered wireless digital x-ray detector** [7258-135]  
K. Töpfer, J. Dehority, Carestream Health, Inc. (United States)
- 7258 3P **Betacam: a commercial approach to  $\beta$ -autoradiography** [7258-136]  
J. Cabello, Univ. of Surrey (United Kingdom); A. Holland, K. Holland, XCAM Ltd. (United Kingdom); A. Bailey, I. Kitchen, K. Wells, Univ. of Surrey (United Kingdom)
- 7258 3Q **Characterization of bias induced metastability of amorphous silicon thin film transistor based passive pixel sensor switch and its impact on biomedical x-ray imaging application** [7258-137]  
A. Sultana, N. Safavian, M. H. Izadi, K. S. Karim, Univ. of Waterloo (Canada); J. A. Rowlands, Univ. of Waterloo (Canada) and Thunder Bay Regional Research Institute, Lakehead Univ. (Canada)

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#### POSTER SESSION: DUAL ENERGY

- 7258 3R **Dual energy with dual source CT and kVp switching with single source CT: a comparison of dual energy performance** [7258-138]  
M. Grasruck, S. Kappler, M. Reinwand, K. Stierstorfer, Siemens AG (Germany)
- 7258 3S **Image-based dual energy CT improvements using Gram-Schmidt method** [7258-139]  
K.-K. Park, Arizona State Univ. (United States); W. Pavlicek, T. Boltz, R. Paden, A. Hara, Mayo Clinic (United States); M. Akay, Arizona State Univ. (United States)
- 7258 3T **Dual energy CT via fast kVp switching spectrum estimation** [7258-140]  
D. Xu, D. A. Langan, X. Wu, J. D. Pack, T. M. Benson, J. E. Tkaczky, A. M. Schmitz, GE Global Research (United States)

- 7258 3U **Dual-energy contrast enhanced digital mammography: theoretical and experimental study of optimal monoenergetic beam parameters using synchrotron radiation** [7258-141]  
S. Puong, R. Iordache, X. Bouchevreau, S. Muller, GE Healthcare France (France)
- 7258 3V **Pre-reconstruction three-material decomposition in dual-energy CT** [7258-142]  
L. Yu, X. Liu, C. H. McCollough, Mayo Clinic (United States)
- 7258 3W **Enhanced discrimination of calcified and soft arterial plaques using computed tomography with a multi-energy-window photon counting x-ray detector** [7258-143]  
X. Wang, J. Xu, K. Taguchi, The Johns Hopkins Univ. (United States); B. E. Patt, D. J. Wagenaar, Gamma Medica-Ideas, Inc. (United States); E. C. Frey, The Johns Hopkins Univ. (United States)

### Part Three

- 7258 3X **Impact of scattered radiation on spectral CT** [7258-144]  
J. Wiegert, K. J. Engel, C. Herrmann, Philips Research (Germany)
- 7258 3Y **Empirical projection-based basis-component decomposition method** [7258-145]  
B. Brendel, E. Roessl, J.-P. Schlomka, R. Proksa, Philips Research (Germany)
- 7258 3Z **Linearity between CT number and iodine concentration and application to improving accuracy of CT number in slow kV-switching dual energy CT** [7258-146]  
Y. Zou, M. D. Silver, Toshiba Medical Research Institute USA (United States)
- 7258 40 **Scatter correction algorithm without extra exposure for dual-energy digital mammography** [7258-147]  
X. Chen, X. Mou, H. Yan, Xi'an Jiaotong Univ. (China); H. Yu, Virginia Polytechnic Institute and State Univ. (United States); L. Zhang, The Hong Kong Polytechnic Univ. (Hong Kong, China)
- 7258 41 **A material decomposition method for dual energy micro-CT** [7258-148]  
S. M. Johnston, G. A. Johnson, C. T. Badea, Duke Univ. Medical Ctr. (United States)
- 7258 42 **Dual-energy performance of dual kVp in comparison to dual-layer and quantum-counting CT system concepts** [7258-149]  
S. Kappler, M. Grasruck, D. Niederlöhner, M. Strassburg, S. Wirth, Siemens AG (Germany)
- 7258 43 **Fast kVp switching CT imaging of a dynamic cardiac phantom** [7258-150]  
J. D. Pack, D. A. Langan, X. Wu, D. Xu, T. M. Benson, A. M. Schmitz, J. E. Tkaczyk, GE Global Research (United States); W. Pavlicek, T. F. Boltz II, R. Payden, Mayo Clinic Scottsdale (United States); J. Leverentz, P. Licato, GE Healthcare (United States)
- 7258 44 **Advanced material separation technique based on dual energy CT scanning** [7258-151]  
A. A. Zamyatin, A. Natarajan, Y. Zou, Toshiba Medical Research Institute USA (United States)
- 7258 45 **Monochromatic CT image representation via fast switching dual kVp** [7258-152]  
X. Wu, D. A. Langan, D. Xu, T. M. Benson, J. D. Pack, A. M. Schmitz, E. J. Tkaczyk, GE Global Research (United States); J. Leverentz, P. Licato, GE Healthcare (United States)

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**POSTER SESSION: NEW TOPICS**

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- 7258 46 **Development of a high-speed CT imaging system using EMCCD camera** [7258-153]  
S. C. Thacker, Radiation Monitoring Devices, Inc. (United States); K. Yang, N. Packard, Univ. of California, Davis Medical Ctr. (United States); V. Gaysinskiy, Radiation Monitoring Devices, Inc. (United States); G. Burkett, Univ. of California, Davis Medical Ctr. (United States); S. Miller, Radiation Monitoring Devices, Inc. (United States); J. M. Boone, Univ. of California, Davis Medical Ctr. (United States); V. Nagarkar, Radiation Monitoring Devices, Inc. (United States)
- 7258 47 **Stationary micro-CT scanner using a distributed multi-beam field emission x-ray source: a feasibility study** [7258-154]  
R. Peng, J. Zhang, X. Calderon-Colon, S. Wang, S. Sultana, S. Chang, J. P. Lu, The Univ. of North Carolina at Chapel Hill (United States); O. Zhou, The Univ. of North Carolina at Chapel Hill (United States) and Lineberger Comprehensive Cancer Ctr. (United States)
- 7258 48 **Liquid lens confocal microscopy with advanced signal processing for higher resolution 3D imaging** [7258-155]  
N. A. Riza, M. A. Sheikh, College of Optics & Photonics, Univ. of Central Florida (United States)
- 7258 4A **A novel method to reduce data acquisition time in differential phase contrast: computed tomography using compressed sensing** [7258-157]  
Z. Qi, J. Zambelli, N. Bevins, G.-H. Chen, Univ. of Wisconsin, Madison (United States)
- 7258 4B **Investigation of quantitative polychromatic x-ray phase-contrast tomography for tissue characterization** [7258-158]  
C.-Y. Chou, National Taiwan Univ. (Taiwan); A. M. Zysk, M. A. Anastasio, Illinois Institute of Technology (United States)
- 7258 4C **MEG beamforming: magnetic source imaging** [7258-159]  
T. Lei, T. P. L. Roberts, Children's Hospital of Philadelphia (United States) and Univ. of Pennsylvania (United States)
- 7258 4D **Dose efficiency consideration for volume-of-interest breast imaging using x-ray differential phase-contrast CT** [7258-161]  
W. Cai, R. Ning, Univ. of Rochester (United States)
- 7258 4E **Analysis of the spectrum in phase-contrast mammography** [7258-163]  
A. M. Zysk, Q. Xu, L. de Sisternes, J. G. Brankov, M. N. Wernick, M. A. Anastasio, Illinois Institute of Technology (United States)
- 7258 4G **Three-dimensional photoacoustic tomography of finger joint: from phantom experiment to in vivo study** [7258-165]  
Y. Sun, H. Jiang, Univ. of Florida (United States)

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**POSTER SESSION: OPTICAL AND MR**

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- 7258 4H **Marginal adaptation analysis performed with en face optical coherence tomography in fixed partial dentures** [7258-166]  
C. Sinescu, M. L. Negrutiu, S. Antonie, Univ. of Medicine and Pharmacy Victor Babes Timisoara (Romania); G. Dobre, A. Bradu, M. Hughes, Univ. of Kent (United Kingdom); M. Rominu, Univ. of Medicine and Pharmacy Victor Babes Timisoara (Romania); A. Gh. Podoleanu, Univ. of Kent (United Kingdom)
- 7258 4I **Resolution improvement of the molecular imaging technique based on magnetic nanoparticles** [7258-167]  
Y. Ishihara, Y. Kusayama, Nagaoka Univ. of Technology (Japan)
- 7258 4J **Method for optic nerve intensity characterization in mice from Mn<sup>2+</sup> enhanced MR images** [7258-168]  
D. Xiao, The Australian E-Health Research Ctr., ICTC, CSIRO (Australia); J. Ribic, The Univ. of Melbourne (Australia) and Univ. of Oslo (Norway); H. Butzkueven, K. Fang, T. J. Kilpatrick, G. F. Egan, The Univ. of Melbourne (Australia); O. Salvado, The Australian E-Health Research Ctr., ICTC, CSIRO(Australia)
- 7258 4K **Effect of masticatory load on cracks deflection/penetration investigated with en face optical coherence tomography in ceramic fixed partial dentures** [7258-169]  
C. Sinescu, M. L. Negrutiu, Univ. of Medicine and Pharmacy Victor Babes Timisoara (Romania); L. Marsavina, R. Negru, M. Hluscu, C. Caplescu, Politehnica Univ. Timisoara (Romania); A. Bradu, M. Hughes, Univ. of Kent (United Kingdom); M. Rominu, Univ. of Medicine and Pharmacy Victor Babes Timisoara (Romania); A. Gh. Podoleanu, Univ. of Kent (United Kingdom)
- 7258 4L **Effect of subdicing on the dispersion and resonance behavior of elastic guided waves in 1D array ultrasound transducers** [7258-170]  
D. H. Cortes, West Virginia Univ. (United States); S. K. Datta, Univ. of Colorado at Boulder (United States); O. M. Mukdadi, West Virginia Univ. (United States)
- 7258 4M **Image quality and signal distribution in 1.5-T and 3-T MRI in mild traumatic brain injury patients** [7258-171]  
M. Rossi, Tampere Univ. Hospital (Finland); P. Dastidar, Tampere Univ. Hospital (Finland) and Tampere Medical School (Finland); P. Ryymin, A. Ylinen, J. Öhman, Tampere Univ. Hospital (Finland); S. Soimakallio, Tampere Univ. Hospital (Finland) and Tampere Medical School (Finland); H. Eskola, Tampere Univ. Hospital (Finland) and Tampere Univ. of Technology (Finland)
- 7258 4N **Optical coherence tomography and confocal microscopy investigations of dental structures and restoration materials** [7258-172]  
M. L. Negrutiu, C. Sinescu, M. Rominu, Univ. of Medicine and Pharmacy Victor Babes Timisoara (Romania); M. Hughes, G. Dobre, A. Gh. Podoleanu, Univ. of Kent (United Kingdom)
- 7258 4O **A new linear least squares method for T1 estimation from SPGR signals with multiple TRs** [7258-173]  
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**In Memoriam**  
**Robert F. Wagner**  
**1938–2008**



**A founding scientist and prolific contributor  
to modern medical imaging science and SPIE**

Robert F. "Bob" Wagner was a tremendous innovator in the field of medical imaging and image assessment methodologies. He was a key figure in the creation of the SPIE Medical Imaging symposium. An SPIE Fellow since 1988, Bob was active on the program committee of the Physics of Medical Imaging conference at the Medical Imaging symposium, and author of numerous technical papers published by SPIE.

"The medical imaging community has lost one of its founding fathers and most highly regarded members," said Kyle Myers, director of the Division of Imaging and Applied Mathematics at the Center for Devices and Radiological Health (CDRH), U.S. Food and Drug Administration (FDA). "Bob's career was dedicated to the development of consensus measurement methods for the assessment of medical imaging systems, quantitative medical imaging and tissue characterization, and computer-aided diagnosis. He earned an international reputation in these areas and applied his expertise to a wide range of regulatory issues central to the FDA's mission. He enlightened the scientific community within the agency as well as the international scientific community through the many invited presentations and tutorials he gave in and outside of the FDA, his numerous publications, his many professional society activities, and his assistance in regulatory decision making."

At this 2009 Medical Imaging symposium, a joint keynote session hosted by the CAD and Image Perception conferences honored Bob's many contributions from the early 1970s to the present through a series of presentations by some of his closest collaborators.

David Brown (CDRH/FDA) recalled Bob's early years in the field, relating that after graduate and post-graduate work on the physics of nuclear interactions with radiation, Bob was hired by the Bureau of Radiological Health [a precursor to CDRH] to assess the dose reduction potential of radiographic intensifying screens made with phosphors developed in the color TV industry. Within three months he published a review of the relevant imaging literature from the medical, defense, consumer, and scientific communities, together with a charter for a laboratory program. Soon after, Bob introduced digital noise analysis to radiography, and showed that the new technology offered a 1.6- to 2.5-fold exposure reduction without compromising imaging performance. He then launched a program of inter-laboratory comparison of measurements on radiographic film samples that were circulated among fifteen commercial, government, and academic laboratories worldwide. In the process he became the prime mover for work toward consensus methodology for quantitative imaging performance measurements.

Mike Insana (Univ. of Illinois at Urbana-Champaign) shared memories of his years as Bob's post-doctoral student, working with Bob on the statistical characterization of ultrasound images. He described Bob as an exemplary mentor who shared his passion and joy for science.

Myers agreed, "Bob's greatest legacy may be the many young scientists he nurtured, who either worked directly under his tutelage at the FDA or otherwise benefitted from his unflinching patience and unselfish ease of availability."

Harry Barrett (Univ. of Arizona) began his presentation by relating noise-equivalent quanta (NEQ)—a concept central to Bob's unified approach to objective image performance assessment—to historical information-theoretic methods for evaluation of imaging systems. Barrett went on to describe the many ways in which NEQ was extended to address problems beyond the simple signal-known-exactly, background-known-exactly (SEK/BKE) task.

Ken Hanson (Los Alamos National Lab.) described his years of collaboration with Bob. He said they worked together, first in the area of noise characterization of radiographic and CT images and later on the evaluation of images confounded by artifacts. In this latter work, Bob and Ken pioneered the application of a decision theoretic approach to the assessment of image reconstruction algorithms, demonstrating that the common mean-square-error metric did not predict visual task performance as measured by detectability.

Bob's contemporary work, as described by Myers, "involved the consideration of the random effects associated with multiple readers of medical images and the logical extension of this work to the problem of the evaluation of multiple competing classifiers in statistical pattern recognition. Bob tackled problems of increasing complexity over the course of his career, relying throughout on the application of a unified, decision theoretic framework. In the process he brought about consensus on the importance of a task-based approach to the objective assessment of imaging systems."

During more than forty years of professional life, Bob Wagner made numerous contributions to the field of medical imaging that significantly impacted academia, industry, and the FDA. His brilliant mind, incredible intuition, passion for science, sense of humor, charm, and warm friendship will be greatly missed.