

XVII International Conference on the Use of Computers in Radiation Therapy

(ICCR 2013)

Journal of Physics: Conference Series Volume 489

**Melbourne, Australia
6-9 May 2013**

Editors:

Annette Haworth

Tomas Kron

**ISBN: 978-1-63266-714-4
ISSN: 1742-6588**

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© by the Institute of Physics
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

DOSE CALCULATION

012001 Common Platform of Monte Carlo Dose Calculation on Universal Grid Interface with Geant4 Based Particle Therapy Simulation Framework	1
<i>G Iwai, W Takase, T Aso, Y Watase, T Sasaki, T Akagi, T Yamashita, Y Maeda, T Nishio</i>	
012002 Analytical Probabilistic Proton Dose Calculation and Range Uncertainties	6
<i>M Bangert, P Hennig, U Oelfke</i>	
012003 Improvements in the Stopping Power Library LibdEDx and Release of the Web GUI dedx.au.dk	12
<i>J Toftegaard, A Lühr, N Sobolevsky, N Bassler</i>	
012004 SHIELD-HIT12A - A Monte Carlo Particle Transport Program for Ion Therapy Research	17
<i>N Bassler, D C Hansen, A Lühr, B Thomsen, J B Petersen, N Sobolevsky</i>	
012005 Monte Carlo Simulation of the Transit Dosimetric Response of an a-Si Electronic Portal Imaging Device	22
<i>S J Blake, A L McNamara, P Vial, L Holloway, P B Greer, Z Kuncic</i>	
012006 The Influence of Monte Carlo Source Parameters on Detector Design and Dose Perturbation in Small Field Dosimetry	28
<i>P H Charles, S B Crowe, T Kairn, R Knight, B Hill, J Kenny, C M Langton, J V Trapp</i>	
012007 Recommendations for Dose Calculations of Lung Cancer Treatment Plans Treated with Stereotactic Ablative Body Radiotherapy (SABR)	32
<i>S Devpura, M S Siddiqui, D Chen, D Liu, H Li, S Kumar, J Gordon, M Ajlouni, B Movsas, I J Chetty</i>	
012008 In Vivo and Phantom Measurements Versus Eclipse TPS Prediction of Near Surface Dose for SBRT Treatments	36
<i>G A Cho, A Ralston, M M Tin, D Martin, S Pickard, J-H Kim, R Tse</i>	
012009 Automated Segmentation and Dose-volume Analysis with DICOMautomaton	42
<i>H Clark, S Thomas, V Moiseenko, R Lee, B Gill, C Duzenli, J Wu</i>	
012010 GMC ['gimik]: A One-variable Monte Carlo Dose Algorithm for Proton Therapy	46
<i>N Depauw, B Clasie, T Madden, A Rosenfeld, H Kooy</i>	
012011 In Silico Radiobiology: Have We Reached the Limit of Monte Carlo Simulations?	51
<i>Y Gholami, M Toghyani, C Champion, Z Kuncic</i>	
012012 an Improved Monte-carlo Model of the Varian EPID Separating Support Arm and Rear-housing Backscatter	56
<i>M E Monville, Z Kuncic, P B Greer</i>	
012013 A Monte Carlo Tool for Raster-scanning Particle Therapy Dose Computation	61
<i>U Jelen, M Radon, A Santiago, A Wittig, F Ammazzalorso</i>	
012014 Using Narrow Beam Profiles to Quantify Focal Spot Size, for Accurate Monte Carlo Simulations of SRS/SRT Systems	66
<i>T Kairn, S B Crowe, P H Charles, J V Trapp</i>	
012015 In Vivo Verification of Radiation Dose Delivered to Healthy Tissue During Radiotherapy for Breast Cancer	70
<i>P Lonski, M L Taylor, W Hackworth, A Phipps, R D Franich, T Kron</i>	
012016 Fast in Vivo Volume Dose Reconstruction Via Reference Dose Perturbation	75
<i>W Lu, M Chen, X Mo, D Parnell, G Olivera, D Galmarini</i>	
012017 Open-Source Medical Devices (OSMD) Design of a Small Animal Radiotherapy System	80
<i>S Prajapati, T R Mackie, R Jeraj</i>	
012018 Revealing the Underlying Mechanism of Microbeam Radiation Therapy with Low Energy Monte Carlo Simulations	86
<i>A L McNamara, U Oelfke, Z Kuncic</i>	
012019 An Improved Method of Heterogeneity Compensation for the Convolution / Superposition Algorithm	90
<i>R Jacques, T McNutt</i>	
012020 IMRT Treatment Monitor Unit Verification Using Absolute Calibrated BEAMnrc and Geant4 Monte Carlo Simulations	95
<i>B M Oborn, M Williams, M Bailey, M G Carolan</i>	
012021 Formal Quality Control for a Proton Monte Carlo System in Radiation Therapy	100
<i>J Perl</i>	

012022 Accounting for the Effects of Carbon Fibre Treatment Couches in the XiO Treatment Planning System.....	106
<i>M Roche, S M Mahou-Lago, T Crabtree</i>	
012023 Calculation of the Characteristics of Clinical High-energy Photon Beams with EGS5-MPI	111
<i>M Shimizu, Y Morishita, M Kato, T Kurosawa, T Tanaka, N Takata, N Saito</i>	
 <u>IMAGING FOR TREATMENT PLANNING AND MOTION</u>	
012024 Motion Artifact Detection in Four-dimensional Computed Tomography Images	115
<i>G Bouilhol, M Ayadi, R Pinho, S Rit, D Sarrut</i>	
012025 a Comparison of Rigid Registration Methods for Prostate Localization on CBCT and the Dependence on Rectum Distension.....	121
<i>C Boydev, D Pasquier, F Derraz, L Peyrodié, A Taleb-Ahmed, J P Thiran</i>	
012026 In-room Breathing Motion Estimation from Limited Projection Views Using a Sliding Deformation Model.....	127
<i>V Delmon, J Vandemeulebroucke, R Pinho, M V Oliva, D Sarrut, S Rit</i>	
012027 Fast Cine-Magnetic Resonance Imaging Point Tracking for Prostate Cancer Radiation Therapy Planning.....	132
<i>J Dowling, K Dang, C D Fox, S Chandra, S Gill, T Kron, D Pham, F Foroudi</i>	
012028 Contribution of FDOPA PET to Radiotherapy Planning for Advanced Glioma	138
<i>N Dowson, M Fay, P Thomas, R Jeffree, R McDowall, C Winter, A Coulthard, J Smith, Y Gal, P Bourgeat, O Salvado, S Crozier, S Rose</i>	
012029 Fully Automated Shape Model Positioning for Bone Segmentation in Whole-body CT Scans.....	143
<i>A Fränkle, M Sumkauskaite, J Hillengass, T Bäuerle, R Bendl</i>	
012030 Investigation of the Accuracy of Breast Tissue Segmentation Methods for the Purpose of Developing Breast Deformation Models for Use in Adaptive Radiotherapy	147
<i>P Juneja, E J Harris, P M Evans</i>	
012031 Graded-threshold Parametric Response Maps: Towards a Strategy for Adaptive Dose Painting.....	151
<i>A Lausch, N Jensen, J Chen, T Y Lee, M Lock, E Wong</i>	
012032 Effects of Registration Error on Parametric Response Map Analysis: A Simulation Study Using Liver CT-perfusion Images	156
<i>A Lausch, N K G Jensen, J Chen, T Y Lee, M Lock, E Wong</i>	
012033 Audiovisual Biofeedback Improves Image Quality and Reduces Scan Time for Respiratory-gated 3D MRA	161
<i>D Lee, P B Greer, J Arm, P Keall, T Kim</i>	
012034 Fully-Deformable Patient Motion Models from Cone-beam CT for Radiotherapy Applications.....	165
<i>J Martin, J McClelland, C Yip, C Thomas, C Hartill, S Ahmad, I Meir, D Landau, D Hawkes</i>	
012035 Optimized Dynamic Contrast-enhanced Cone-beam CT for Target Visualization During Liver SBRT.....	169
<i>B L Jones, C Altunbas, B Kavanagh, T Schefter, M Miften</i>	
012036 Construction of a Patient Observation System Using KINECT™	173
<i>K Miyaura, Y Kumazaki, C Fukushima, S Kato, H Saitoh</i>	
012037 2D-3D Registration for Brain Radiation Therapy Using a 3D CBCT and a Single Limited Field-of-View 2D kV Radiograph.....	177
<i>R Munbodh, D J Moseley</i>	
012038 A Novel Marker Enhancement Filter (MEF) for Fluoroscopic Images.....	181
<i>O Peshko, T N Davidson, J Modersitzki, T Terlaky, D J Moseley</i>	
012039 Inverse-consistent Rigid Registration of CT and MR for MR-based Planning and Adaptive Prostate Radiation Therapy.....	187
<i>D Rivest-Hénault, N Dowson, P Greer, J Dowling</i>	
012040 Tissue Motion Tracking at the Edges of a Radiation Treatment Field Using Local Optical Flow Analysis	193
<i>P T Teo, S Pistorius</i>	
012041 Establishing Tumour Tracking Accuracy in Free-breathing Respiratory Gated SBRT of Lung Cancer.....	197
<i>C-D Wen, C Wong, T Ackerly, J Ruben, J Millar</i>	
012042 Computational Model to Simulate the Interplay Effect in dynamic IMRT delivery.....	202
<i>S A Yoganathan, K J M Das, S Kumar</i>	

TREATMENT PLANNING AND OPTIMISATION

012043 GPU-accelerated Automatic Identification of Robust Beam Setups for Proton and Carbon-ion Radiotherapy.....	208
<i>F Ammazzalorso, T Bednarz, U Jelen</i>	
012044 Ultra-fast Fluence Optimization for Beam Angle Selection Algorithms	212
<i>M Bangert, P Ziegenhein, U Oelfke</i>	
012045 PyTRiP - A Toolbox and GUI for the Proton/Ion Therapy Planning System TRiP.....	217
<i>J Toftegaard, JB Petersen, N Bassler</i>	
012046 A Case Study of IMRT Planning (Plan B) Subsequent to a Previously Treated Imrt Plan (Plan A).....	221
<i>F Cao, C Leong, J Schroeder, B Lee</i>	
012047 Radiation Treatment Dose Optimisation Using Poisson Tumour Control Probability Parameters.....	226
<i>G A Cho, M A Ebert, L Holloway, Z Kuncic, C Baldoock, D I Thwaites</i>	
012048 Automatic Atlas Based Electron Density and Structure Contouring for MRI-based Prostate Radiation Therapy on the Cloud.....	232
<i>J A Dowling, N Burdett, P B Greer, J Sun, J Parker, P Pichler, P Stanwell, S Chandra, D Rivest-Hénault, S Ghose, O Salvado, J Fripp</i>	
012049 Integration of Second Cancer Risk Calculations in a Radiotherapy Treatment Planning System.....	238
<i>M Hartmann, U Schneider</i>	
012050 GPU-Accelerated Ray-tracing for Real-time Treatment Planning.....	243
<i>H Heinrich, P Ziegenhein, C P Kamerling, H Froening, U Oelfke</i>	
012051 Predicting the Likelihood of QA Failure Using Treatment Plan Accuracy Metrics	249
<i>T Kairn, S B Crowe, J Kenny, R T Knight, J V Trapp</i>	
012052 A 3D Isodose Manipulation Tool for Interactive Dose Shaping.....	254
<i>C P Kamerling, P Ziegenhein, H Heinrich, U Oelfke</i>	
012053 Bayesian Decision Support for Adaptive Lung Treatments.....	260
<i>D McShan, Y Luo, M Schipper, R TenHaken</i>	
012054 Automatic Treatment Planning Implementation Using a Database of Previously Treated Patients	264
<i>J A Moore, K Evans, W Yang, J Herman, T McNutt</i>	
012055 Clinical Implementation of Dose-volume Histogram Predictions for Organs-at-risk in IMRT Planning.....	269
<i>K L Moore, L M Appenzoller, J Tan, J M Michalski, W L Thorstad, S Mutic</i>	
012056 Dose Distribution Transfer from Cyberknife to Varian Treatment Planning System.....	273
<i>W Osewski, K Slosarek, B Karaszewska</i>	
012057 A Comparison of Coordinate Systems for Use in Determining a Radiotherapy Delineation Margin for Whole Breast	276
<i>E M Pogson, L Bell, V Batumalai, E S Koh, G Delaney, P Metcalfe, L Holloway</i>	
012058 Automatic Treatment Planning with Convex Imputing	282
<i>G A Sayre, D Ruan</i>	
012059 Modeling Clinical Radiation Responses in the IMRT Era	286
<i>J L Schwartz, D Murray, R D Stewart, M H Phillips</i>	
012060 Evaluation of Atlas Based Auto-segmentation for Head and Neck Target Volume Delineation in Adaptive/Replan IMRT	291
<i>R Speight, E Karakaya, R Prestwich, M Sen, R Lindsay, R Harding, J Sykes</i>	
012061 Two-dimensional Inverse Planning and Delivery for Precision Preclinical Radiobiological Investigations	295
<i>J M P Stewart, P E Lindsay, D A Jaffray</i>	
012062 Planjury: Probabilistic Plan Evaluation Revisited.....	299
<i>M Witte, J-J Sonke, M van Herk</i>	
012063 PyCMSXiO: An External Interface to Script Treatment Plans for the Elekta® CMS XIO Treatment Planning System.....	305
<i>A Xing, S Arumugam, L Holloway, G Goozee</i>	
012064 Commissioning of SharePlan: The Liverpool Experience.....	310
<i>A Xing, S Deshpande, S Arumugam, A George, L Holloway, G Goozee</i>	
012065 Inverse Planning in the Age of Digital Linacs: Station Parameter Optimized Radiation Therapy (SPORT).....	316
<i>L Xing, R Li</i>	

012066 Interactive Dose Shaping - Efficient Strategies for CPU-based Real-time Treatment Planning.....	322
<i>P Ziegenhein, C P Kamerling, U Oelfke</i>	

VERIFICATION, RISK ASSESSMENT AND IGRT

012067 A Comprehensive EPID-based 3D Validation Technique for TrueBeam-delivered VMAT Plans.....	328
<i>W Ansbacher, I M Gagne, C-L Swift</i>	
012068 A Comprehensive Tool to Analyse Dynamic Log Files from an Elekta-Synergy Accelerator.....	332
<i>S Arumugam, A Xing, C Pagulayan, L Holloway</i>	
012069 A Decision Support Tool to Optimize IMRT QA Workflow in a Multi-vendor Equipment Environment	338
<i>S Arumugam, A Xing, P Vial, L Holloway</i>	
012070 Automatic Image Registration Performance for Two Different CBCT Systems; Variation with Imaging Dose.....	344
<i>J Barber, J R Sykes, L Holloway, D I Thwaites</i>	
012071 Evaluation of the Ability of a 2D Ionisation Chamber Array and an Epid to Detect Systematic Delivery Errors in Imrt Plans.....	348
<i>O Bawazeer, A Gray, S Arumugam, P Vial, D Thwaites, J Descallar, L Holloway</i>	
012072 Impact of Image Noise on Gamma Index Calculation	353
<i>M Chen, X Mo, D Parnell, G Olivera, D Galmarini, W Lu</i>	
012073 Assessing Local Outcomes in Heterogeneous Gliomas	357
<i>N Dowson, P Thomas, Y Gal, M Fay, R L Jeffree, C Winter, A Coulthard, J Smith, P Bourgeat, O Salvado, S Crozier, S Rose</i>	
012074 Constructing a Clinical Decision-making Framework for Image-guided Radiotherapy Using a Bayesian Network	361
<i>C Hargrave, M Moores, T Deegan, A Gibbs, M Poulsen, F Harden, K Mengersen</i>	
012075 An Automatic Dose Verification System for Adaptive Radiotherapy for Helical Tomotherapy	365
<i>X Mo, M Chen, D Parnell, G Olivera, D Galmarini, W Lu</i>	
012076 Segmentation of Cone-beam CT Using a Hidden Markov Random Field with Informative Priors	369
<i>M Moores, C Hargrave, F Harden, K Mengersen</i>	
012077 Deformable Image Registration for Geometrical Evaluation of DIBH Radiotherapy Treatment of Lung Cancer Patients.....	373
<i>W Ottosson, J A L Andersen, S Borrisova, A Mellemgaard, C F Behrens</i>	
012078 Development of A Novel Image Guidance Alternative for Patient Localization using Topographic Images for TomoTherapy	379
<i>X S Qi, B White, D A Low</i>	
012079 The Reconstruction Toolkit (RTK), An Open-Source Cone-Beam CT Reconstruction Toolkit Based on the Insight Toolkit (ITK)	383
<i>S Rit, M V Oliva, S Brousmiche, R Labarbe, D Sarrut, G C Sharp</i>	
012080 Potential Interoperability Problems Facing Multi-Site Radiation Oncology Centers in the Netherlands	387
<i>J Scheurleer, P Koken, R Wessel</i>	
012081 Target Point Correction Optimized Based on the Dose Distribution of Each Fraction in Daily IGRT	392
<i>M Stoll, K Giske, E M Stoiber, M Schwarz, R Bendl</i>	
012082 Improving Accuracy of Markerless Tracking of Lung Tumours in Fluoroscopic Video by Incorporating Diaphragm Motion.....	396
<i>M Schwarz, H Teske, M Stoll, R Bendl</i>	
012083 Towards Adaptive Radiotherapy for Head and Neck Patients: Validation of an In-house Deformable Registration Algorithm.....	400
<i>C Veiga, J McClelland, S Moinuddin, K Ricketts, M Modat, S Ourselin, D D'Souza, G Royle</i>	
012084 Streamlining EPID-based IMRT Quality Assurance: Auto-Analysis and Auto-Report Generation.....	404
<i>A Xing, S Arumugam, S Deshpande, A George, L Holloway, G Goozee, A Gray, P Vial</i>	
012085 Fast Regional Readout CMOS Image Sensor for Dynamic MLC Tracking	410
<i>H Zin, E Harris, J Osmond, P Evans</i>	

TRIALS, REGISTRIES AND MORE

012086 The Use of a Virtual Reality Simulator to Explore and Understand the Impact of Linac Mis-calibrations.....	414
<i>A W Beavis, J W Ward</i>	
012087 An MLE Method for Finding LKB NTCP Model Parameters Using Monte Carlo Uncertainty Estimates	420
<i>M Carolan, B Oborn, K Foo, A Haworth, S Gulliford, M Ebert</i>	
012088 Semi-automated Contour Recognition Using DINCOMautomaton	426
<i>H Clark, J Wu, V Moiseenko, R Lee, B Gill, C Duzenli, S Thomas</i>	
012089 Development of a Multi-Centre Clinical Trial Data Archiving and Analysis Platform for Functional Imaging.....	431
<i>B Driscoll, D Jaffray, C Coolens</i>	
012090 Derivation and Representation of Dose-volume Response from Large Clinical Trial Data Sets: An Example from the RADAR Prostate Radiotherapy Trial	436
<i>M A Ebert, K Foo, A Haworth, S L Gulliford, R Kearvall, A Kennedy, S Richardson, M Krawiec, N Stewart, D J Joseph, J W Denham</i>	
012091 Combining Dosimetry & Toxicity: Analysis of Two UK Phase III Clinical Trials.....	441
<i>S L Gulliford</i>	
012092 Total Centralisation and Optimisation of an Oncology Management Suite Via Citrix®	447
<i>C James, J Frantzis, L Rippis, P Fenton</i>	
012093 An Investigation of the Impact of Variations of DVH Calculation Algorithms on DVH Dependant Radiation Therapy Plan Evaluation Metrics	451
<i>A M Kennedy, J Lane, M A Ebert</i>	
012094 Trust, But Verify – Accuracy of Clinical Commercial Radiation Treatment Planning Systems	456
<i>J Lehmann, J Kenny, J Lye, L Dunn, I Williams</i>	
012095 Browser Based Platform in Maintaining Clinical Activities – Use of The iPads in Head and Neck Clinics.....	460
<i>W Y Yang, J Moore, H Quon, K Evans, A Sharabi, J Herman, A Hacker-Prietz, T McNutt</i>	
012096 Organism-level Models: When Mechanisms and Statistics Fail Us	465
<i>M H Phillips, J Meyer, W P Smith, J K Rockhill</i>	
012097 a Database Paradigm for the Management of DICOM-RT Structure Sets Using a Geographic Information System	471
<i>W Shao, P A Kupelian, J Wang, D A Low, D Ruan</i>	
012098 Has the Use of Computers in Radiation Therapy Improved the Accuracy in Radiation Dose Delivery?.....	476
<i>J V Dyk, J Battista</i>	
012099 Integration of a Clinical Trial Database with a PACS.....	482
<i>M van Herk</i>	
012100 A DICOM Based Radiotherapy Plan Database for Research Collaboration and Reporting	487
<i>J Westberg, S Krogh, C Brink, I R Vogelius</i>	
Author Index	