

# **12th International Conference on 3D and Advanced Dosimetry 2022**

Journal of Physics: Conference Series Volume 2630

Online  
19 - 22 July 2022

ISBN: 978-1-7138-8215-2  
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.**

This work is licensed under a Creative Commons Attribution 3.0 International Licence.  
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2025)

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](mailto: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: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

|                                                                                                                                                           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Preface                                                                                                                                                   |     |
| Peer Review Statement                                                                                                                                     |     |
| 3D2: Three Decades of Three-Dimensional Dosimetry .....                                                                                                   | 1   |
| <i>L J Schreiner</i>                                                                                                                                      |     |
| Charting the Development of Optical CT and Allied Methods for 3-D Radiation Dosimetry: 2022<br>Update - Mapping the Global Research Community.....        | 8   |
| <i>Simon Doran</i>                                                                                                                                        |     |
| Gel Dosimetry: MRI.....                                                                                                                                   | 17  |
| <i>Yves De Deene</i>                                                                                                                                      |     |
| CT and CBCT Imaging of Gel Dosimeters: A Review of the State of the Art.....                                                                              | 45  |
| <i>A. Jirasek, M. Hilts</i>                                                                                                                               |     |
| MR-Linac Dosimetry: Current Approaches and Challenges .....                                                                                               | 55  |
| <i>Arman Sarfehnia</i>                                                                                                                                    |     |
| 3D Dosimetry of Proton Beams and Influences on Response .....                                                                                             | 61  |
| <i>G. Ibbott, M. Carroll</i>                                                                                                                              |     |
| End-To-End QA in Radiation Therapy Quality Management.....                                                                                                | 70  |
| <i>L J Schreiner</i>                                                                                                                                      |     |
| Evolution of 3D X-Ray Dose Computation Algorithms.....                                                                                                    | 94  |
| <i>J. Battista, J. Chen, S. Sawchuk, G. Hajdok</i>                                                                                                        |     |
| EPID-Based in Vivo Dosimetry – New Developments and Applications .....                                                                                    | 110 |
| <i>B M C McCurdy</i>                                                                                                                                      |     |
| FLASH Radiotherapy and the Associated Dosimetric Challenges.....                                                                                          | 119 |
| <i>S Ceberg, A Mannerberg, E Konradsson, M Blomstedt, M Kügele, M Kadhim, A Edvardsson,<br/>S Å J Bäck, K Petersson, C Jamtheim Gustafsson, C Ceberg</i>  |     |
| Contemporary Applications of Cherenkov Imaging in Radiation Therapy .....                                                                                 | 131 |
| <i>R Zhang, S Decker, D Alexander, R Ashraf, M Rahman, R Hachadorian, G Gill, M Rose, B<br/>Hunt, P J Hoopes, L Jarvis, P Bruza, D Gladstone, B Pogue</i> |     |
| The Role of Standards Laboratories in Reducing Uncertainty in Clinical Dosimetry: A Canadian<br>Perspective.....                                          | 138 |
| <i>J Renaud, B Muir, M McEwen</i>                                                                                                                         |     |
| A Review of Small Animal Dosimetry Techniques: Image-Guided and Spatially Fractionated<br>Therapy.....                                                    | 143 |
| <i>Chris D. Johnstone, Magdalena Bazalova-Carter</i>                                                                                                      |     |
| Optimization of MRI Pulse Sequences and Gadobutrol-Doped Polymer Gel for Real Time 4D<br>Radiation Dosimetry on the MRI-Linac .....                       | 158 |
| <i>Yves De Deene, Daniel Mason</i>                                                                                                                        |     |

|                                                                                                                                                                                                    |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Spatial and Dosimetric Accuracy of 3D Polymer Gel with CBCT Readout - Varian HyperArc®<br>SRS Implementation.....                                                                                  | 164 |
| <i>Tenzin Kunkyab, Michelle Hilts, Andrew Jirasek, Derek Hyde</i>                                                                                                                                  |     |
| A Characterization of Dye Gel Dosimeters for Boron Neutron Capture Therapy - Dose Response to<br>Gamma Rays .....                                                                                  | 169 |
| <i>Ryosuke Narita, Yoshinori Sakurai</i>                                                                                                                                                           |     |
| Preliminary Research on the Dose Response of Polymer Gel Dosimeter with Carbon Beam<br>Irradiation .....                                                                                           | 173 |
| <i>Libing Zhu, Xincheng Xiang, Xiangang Wang</i>                                                                                                                                                   |     |
| End-To-End Quality Assurance for Volumetric Modulated Arc Therapy with Fricke-Xylenol<br>orange-Gelatin Gel Dosimeters and Dual-Wavelength Cone-Beam Optical CT Scanner .....                      | 178 |
| <i>A Rousseau, C Stien, S Dufreneix, G Boissonnat, JM Bordy, V Blideanu</i>                                                                                                                        |     |
| 3D Optically-Stimulated-Luminescence-Based Dosimetry Using LYSO:Ce Scintillators.....                                                                                                              | 183 |
| <i>Mads L. Jensen, Rosana M. Turtos, Ludvig P. Muren, Brian Julsgaard, Peter Balling</i>                                                                                                           |     |
| Modified Optical Computed Tomography Scanner for Low Temperature Scanning .....                                                                                                                    | 187 |
| <i>Nathaniel Woolvett, Kevin Jordan</i>                                                                                                                                                            |     |
| Investigation of the Dose Rate and Linear-Energy-Transfer of the Signal Quenching of<br>Radiochromic Silicone-Based Dosimeters for Different Curing Times and Compositions.....                    | 191 |
| <i>Lia Barbosa Valdetaro, Ludvig Paul Muren, Peter Sandegaard Skyt, Jørgen Breede Baltzer<br/>Petersen, Peter Balling</i>                                                                          |     |
| Proof-Of-Concept of Proton and Photon Measurements for Large-Area 2D Dosimeters Utilising<br>Optically Stimulated Luminescence .....                                                               | 196 |
| <i>Jacob S. Nyemann, Mads L. Jensen, Lia B. Valdetaro, Morten B. Jensen, Rosana M. Turtos,<br/>Brian Julsgaard, Jørgen B. B. Petersen, Ludvig P. Muren, Peter Balling</i>                          |     |
| Optimizing the Transparency of nano-LiF:Cu/silicone Nanocomposites for 3D Optically Stimulated<br>Luminescence Dosimetry .....                                                                     | 200 |
| <i>Camilla L Nielsen, Rosana M Turtos, Brian Julsgaard, Ludvig P Muren, Peter Balling</i>                                                                                                          |     |
| Bare Spherical Gel Dosimeter with Optical Computed Tomography Scanning.....                                                                                                                        | 204 |
| <i>Olivia Moluchi, Matt Mulligan, Kevin Jordan</i>                                                                                                                                                 |     |
| Rheology Modifiers in Fricke – Gelatin Dosimeters.....                                                                                                                                             | 208 |
| <i>Kalin I. Penev, Kibret Mequanint</i>                                                                                                                                                            |     |
| A 3D Printed Patient-Specific Vaginal Mould for Brachytherapy .....                                                                                                                                | 212 |
| <i>R. Wilks, S.B. Crowe, P. Chan, R. Cheuk, T. Kairn</i>                                                                                                                                           |     |
| Loss and Reintroduction of the Radical Initiator into the FlexyDos3D Silicone Dosimeter for 3D<br>Printing.....                                                                                    | 216 |
| <i>M J Wheatley, Y De Deene</i>                                                                                                                                                                    |     |
| Lung Radiotherapy Verification with a 3D Printed Thorax Phantom and an Ionisation Chamber<br>Array.....                                                                                            | 221 |
| <i>T. Kairn, L. Jessen, J. Bodnar, P. H. Charles, S.B. Crowe</i>                                                                                                                                   |     |
| Fading Correction for Calibration of a Novel 2D OSL-Film Dosimeter .....                                                                                                                           | 225 |
| <i>M. Caprioli, L. Delombaerde, M. De Saint-Hubert, L. de Freitas Nascimento, S. S. Galvez<br/>Febles, K. Himschoot, B. van der Heyden, D. Vandenbroucke, R. De Roover, Leblans, W.<br/>Crijns</i> |     |

|                                                                                                                                                              |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Characterisation and Application of Three-Dimensional Silicone-Based Radiochromic Dosimetry<br>in 1.5 T Magnetic Resonance Imaging-Guided Radiotherapy ..... | 229 |
| <i>Morten B Jensen, Peter Balling, Hans L Riis, Anders S Bertelsen, Simon V Jensen, Simon J<br/>Doran, Jørgen B B Petersen, Ludvig P Muren</i>               |     |
| Different Aspects of Plan Complexity in Prostate VMAT Plans .....                                                                                            | 234 |
| <i>E. Terzidis, F. Nordström, J. Götstedt, A. Bäck</i>                                                                                                       |     |
| On the Comparison of Two NIPAM Gel Dosimeters with High Resolution 3D MRI Sequences .....                                                                    | 239 |
| <i>M Cinq-Mars, J-D Jutras, L Beaulieu</i>                                                                                                                   |     |
| Iterative Image Reconstruction Methodology in Optical CT Radiochromic Gel Dosimetry.....                                                                     | 244 |
| <i>S Collins, A Ogilvy, D Huang, W Hare, M Hilts, A Jirasek</i>                                                                                              |     |
| Polymer Gel Dosimetry for Experimental Verification of Conformal Small Animal Irradiation at a<br>Preclinical Research Platform .....                        | 249 |
| <i>E Konradsson, M Blomstedt, C Jamtheim Gustafsson, S Å J Bäck, C Ceberg, S Ceberg</i>                                                                      |     |
| Characterization of a Water-Based Liquid Scintillator for Use in Megavoltage Radiotherapy Beams .....                                                        | 253 |
| <i>D. Bernier-Marceau, É. Cloutier, M. Yeh, G. D Orebi Gann, L. Beaulieu</i>                                                                                 |     |
| Preliminary Commissioning of a Prototype Solid Tank Optical CT Scanner for 3D Radiation<br>Dosimetry .....                                                   | 257 |
| <i>A Ogilvy, S Collins, M Guenter, D Huang, W Hare, M Hilts, A Jirasek</i>                                                                                   |     |
| Investigation of the Dosimetry Characteristics of the GAFCHROMIC® EBT3 Film Response to<br>Alpha Particle Irradiation .....                                  | 262 |
| <i>Mélodie Cyr, Victor D. Martinez, Slobodan Devic, Nada Tomic, David F. Lewis, Shirin A.<br/>Enger</i>                                                      |     |
| Developing a 3D-Printing-Based Method to Create Anthropomorphic Dosimeters for<br>Radiotherapy-Delivery Verification.....                                    | 265 |
| <i>S V Jensen, T B Erichsen, M B Jensen, E Worm, P R Poulsen, J B B Petersen, P Balling, D Q<br/>S Le, L P Muren</i>                                         |     |

## Author Index