

Design and Performance Validation of Phantoms Used in Conjunction with Optical Measurement of Tissue VI

**Robert J. Nordstrom
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Editors

**1–2 February 2014
San Francisco, California, United States**

Sponsored and Published by
SPIE

Volume 8945

Proceedings of SPIE, 1605-7422, V. 8945

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Design and Performance Validation of Phantoms Used in Conjunction with Optical Measurement of Tissue VI,
edited by Robert J. Nordstrom, Jean-Pierre Bouchard, David W. Allen, Proc. of SPIE Vol. 8945, 894501
© 2014 SPIE · CCC code: 1605-7422/14/\$18 · doi: 10.1117/12.2052749

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Author(s), "Title of Paper," in *Design and Performance Validation of Phantoms Used in Conjunction with Optical Measurement of Tissue VI*, edited by Robert J. Nordstrom, Jean-Pierre Bouchard, David W. Allen, Proceedings of SPIE Vol. 8945 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 1605-7422

ISBN: 9780819498588

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

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Printed in the United States of America.

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Introduction

This was the sixth conference on this topic at the annual SPIE Photonics West BiOS Symposium. Over the years, this conference has grown to serve as a platform to feature the development and use of phantoms for optical medical imaging. Phantoms are key to the development and acceptance of optical medical imaging devices. As the diversity of optical medical imaging modalities continues to grow, so does the range of phantom development. Some of the modalities included are photoacoustic imaging, optical coherence tomography, Vis/NIR spectroscopy, and fluorescence imaging. Some of the tissue subjects of interest included skin, brain, bladder, cochlea, and retina. The methods of producing the phantoms continues to be a central theme. This year, 3D printing has begun to emerge as a novel solution to producing phantoms with spatial features. The talks in this conference clearly reflect this diversity and may also be indicative of the interests and direction of the optical medical imaging community at large. A special joint session was organized with the Design and Quality for Biomedical Technologies VI conference in order to provide continuity between phantom development and performance evaluation. It is encouraging to note the conference continues to draw international interest. Approximately half of the papers submitted were from countries other than the United States.

As the development of optical medical imaging devices evolves, so will the need for phantom development. It is expected that phantom development will evolve from producing a single phantom for testing proof of concepts, to producing phantoms that play a key role in the validation and verification process. The validation process using phantoms allows for the determination of how well an instrument performs with respect to the design parameters, while verification assures the instrument works properly in actual use. Currently, phantoms are the products of those who design, build, and test optical medical imaging devices in order to satisfy their own research needs. This activity is often out of necessity due to the uniqueness of the instrument and few, if any, commercial sources of phantoms.

While the phantom produced out of necessity may fulfill the needs for one instrument design, it may not be suitable for comparison with instruments produced by other organizations. There is a clear need for standardizing phantoms in order for the community to make meaningful comparisons. Therefore, it is anticipated that phantoms will evolve as standards with measureable quantities tied to national metrology labs. This progression will help facilitate the move from largely qualitative measurements to quantitative measurements with some knowledge of the measurement uncertainty.

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