The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:


ISSN 0277-786X
ISBN 9780819473103

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

Copyright © 2008, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is $18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/08/$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIEDigitalLibrary.org

**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.
- The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.
Contents

v Conference Committee
vii Introduction

SESSION 1 TRACKING AND IMAGING

7090 03 Application of stereo laser tracking methods for quantifying flight dynamics-II [7090-02]
T. J. Miller, E. F. Romero, Sandia National Labs. (United States); H. W. Schreier, Correlated
Solutions, Inc. (United States); M. T. Valley, Sandia National Labs. (United States)

7090 04 Laser applications in the littoral: search lidar and ship identification [7090-03]
TNO Defence, Security and Safety (Netherlands); P. W. Pace, Defense Research and
Development Canada (Canada)

7090 05 Infrared background analysis of bay environments [7090-04]
P. B. W. Schwering, TNO Defence, Security and Safety (Netherlands); W. H. Gunter, Institute
for Marine Technology (South Africa); D. F. Bezuidenhout, CSIR DPSS (South Africa);
A. M. J. van Eijk, TNO Defence, Security and Safety (Netherlands)

7090 06 Image enhancement by local information fusion with pre-processing and composed
metric [7090-05]
M. Aubailly, Univ. of Maryland, College Park (United States); M. A. Vorontsov, Univ. of
Maryland, College Park (United States) and Army Research Lab. (United States);
G. W. Carhart, Army Research Lab. (United States); M. T. Valley, Sandia National Labs.
(United States)

SESSION 2 BEAM PROPAGATION AND WAVEFRONT CONTROL I

7090 08 Development of adaptive fiber collimators for conformal fiber-based beam projection
systems [7090-07]
L. A. Beresnev, U.S. Army Research Lab. (United States); T. Weyrauch, Univ. of Maryland,
College Park (United States); M. A. Vorontsov, U.S. Army Research Lab. (United States) and
Univ. of Maryland, College Park (United States); L. Liu, Univ. of Maryland, College Park
(United States); G. W. Carhart, U.S. Army Research Lab. (United States)

SESSION 3 BEAM PROPAGATION AND WAVEFRONT CONTROL II

7090 0D Femtosecond laser pulse filament robustness in aerosol layer [7090-12]
E. P. Silaeva, V. P. Kandidov, Lomonosov Moscow State Univ. (Russia)
SESSION 4 OPTICAL TURBULENCE CHARACTERIZATION AND LASER BEAM POINTING: JOINT SESSION WITH CONFERENCE 7091

7090 0G Experiment to obtain optical turbulence information along a 2.33 km free-space laser propagation path from measurements of scintillation and focal spot displacement [7090-16]
A. Tunick, U.S. Army Research Lab. (United States)

SESSION 5 TRANSMISSION AND ENVIRONMENT

7090 0I Validation of a worldwide physics-based, high spectral resolution atmospheric characterization and propagation package for UV to RF wavelengths [7090-18]
S. T. Fiorino, R. J. Bartell, M. J. Krizó, K. P. Moore, S. J. Cusumano, Air Force Institute of Technology (United States)

7090 0J Comparison of atmospheric laser propagation between the NIR and MWIR [7090-19]
F. Hanson, P. Poirier, D. Haddock, D. Kichura, M. Lasher, SPAWAR Systems Ctr. (United States)

7090 0K Turbulence effects on laser propagation in a marine environment [7090-20]
S. Hammel, D. Kichura, SPAWAR Systems Ctr. (United States)

7090 0L Transmissometer versus sun photometer measurements of the aerosol optical properties [7090-21]

7090 0M Lidar measurements of temperature turbulence in the atmosphere [7090-23]
Q. Zheng, Michigan Aerospace Corp. (United States); J. Ryan, Univ. of New Hampshire (United States); P. Hays, Michigan Aerospace Corp. (United States)

7090 0O Measurements of the absorption and scattering coefficients of aerosol particles in suburb of Nanjing (China) [7090-25]
Y. Yin, Y. Chen, W. Wang, J. Yan, L. Qian, Y. Tong, Z. Lin, LAPE, Nanjing Univ. of Information Science and Technology (China)

7090 0P Microphysical properties of tropical anvil cirrus observed during ACTIVE: a statistical analysis [7090-26]
L. Jin, Y. Yin, Nanjing Univ. of Information Science and Technology (China); G. Vaughan, G. Allen, P. Connolly, Univ. of Manchester (United Kingdom); A. Heymsfield, A. Bansemer, NCAR (United States)

Author Index
Conference Committee

Conference Chairs

Stephen M. Hammel, Space and Naval Warfare Systems Center, San Diego (United States)
Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands)
Mikhail A. Vorontsov, Army Research Laboratory (United States)

Program Committee

Matthew M. Bold, Defense Strategies and Systems, Inc. (United States)
Frank D. Eaton, Air Force Research Laboratory (United States)
Charles Higgs, MIT Lincoln Laboratory (United States)
Vladimir B. Markov, MetroLaser, Inc. (United States)
Vincent Michau, ONERA (France)
Jennifer C. Ricklin, Defense Advanced Research Projects Agency (United States)
Jim F. Riker, Air Force Research Laboratory (United States)
Michael C. Roggemann, Michigan Technological University (United States)
Don D. Seeley, High Energy Laser Joint Technology Office (United States)
Alexander M. Sergeev, Russian Academy of Sciences, Applied Physics Institute (Russia)
Michael T. Valley, Sandia National Laboratories (United States)
Thomas Weyrauch, University of Maryland, College Park (United States)

Session Chairs

1  Tracking and Imaging
   Stephen M. Hammel, Space and Naval Warfare Systems Center, San Diego (United States)

2  Beam Propagation and Wavefront Control I
   Mikhail A. Vorontsov, Army Research Laboratory (United States)

3  Beam Propagation and Wavefront Control II
   Thomas Weyrauch, University of Maryland, College Park (United States)
4 Optical Turbulence Characterization and Laser Beam Pointing: Joint Session with Conference 7091
Matthew M. Bold, Defense Strategies and Systems, Inc. (United States)

5 Transmission and Environment
Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands)
Introduction

This 2008 conference marks the second year for a broadened set of atmospheric optics themes to include target-in-the-loop propagation. The conference remains dedicated to the analysis of atmospheric effects on optical propagation, and the remarks from the first year of the re-constituted atmospheric propagation conference continue to be relevant for the papers presented in 2008:

“The effects of the atmosphere on optical propagation can often be the limiting performance factor in many optical system applications. The increasing sophistication and complexity of many modern ultraviolet, visible and infrared systems require an increasingly accurate and comprehensive description of the propagation environment for system design and optimization.”

The effects of the atmosphere on longer optical propagation paths remain a first-order term in any system performance analysis. In spite of a large and sophisticated body of analysis of the atmospheric characterization, it is important to continue to develop new and more refined approaches. The papers presented in the first several sessions described novel approaches to problems in tracking, imaging, and beam control through the atmosphere.

Free-space laser communications remain an important application of the analysis and mitigation techniques for atmospheric beam degradation. This year we included a joint session with the Free-Space Laser Communications conference containing four papers that addressed problems in optical turbulence characterization and laser beam pointing.

The applications for a thorough understanding of the atmospheric propagation environment are not limited to free-space optical communications. Interest in high-energy laser devices for a number of defensive uses has stimulated interest in both high-fidelity models and experiment. Several papers demonstrated that modeling and analysis can now provide detailed predictions of optical propagation within inhomogeneous environments.

We are actively committed to providing a fresh perspective and approach in next year’s conference, and we solicit either individual papers or group submissions on particular problems for which the conference topic set is relevant.

Stephen M. Hammel
Alexander M. J. van Eijk
Mikhail A. Vorontsov