

PROCEEDINGS OF SPIE

# ***Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XXV***

**Peter R. Herman  
Roberto Osellame  
Adela Ben-Yakar**  
*Editors*

**26–29 January 2025  
San Francisco, California, United States**

*Sponsored by*  
SPIE

*Cosponsored by*  
Amplitude Laser Group (France)  
TRUMPF Inc. (United States)

*Published by*  
SPIE

**Volume 13353**

Proceedings of SPIE 0277-786X, V. 13353

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

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers 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 these proceedings:

Author(s), "Title of Paper," in *Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XXV*, edited by Peter R. Herman, Roberto Osellame, Adela Ben-Yakar, Proc. of SPIE 13353, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510684546

ISBN: 9781510684553 (electronic)

Published by

**SPIE**

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

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](http://SPIE.org)

Copyright © 2025 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at [copyright.com](http://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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

**SPIE. DIGITAL  
LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

# Contents

v *Conference Committee*

---

## BIOMEDICAL APPLICATIONS FOR ULTRAFAST LASER SYSTEMS I

---

- 13353 02 **Laboratory-scale production of tunable, narrow-bandwidth x-rays in the clinical energy regime (Best Student Presentation Award)** [13353-2]

---

## ULTRAFAST LASER-MATTER INTERACTION

---

- 13353 03 **Functionalizing glasses femtosecond by laser for high temperature applications: trends, limits, and opportunities (Invited Paper)** [13353-8]
- 13353 04 **Study of gas effects on laser material processing in controlled environments** [13353-11]
- 13353 05 **Stable 710kW average-power of infrared-red light stacked in an optical enhancement cavity of finesse 45,000** [13353-12]

---

## NOVEL ULTRAFAST LASER PROCESSING AND CHARACTERIZATION TECHNIQUES

---

- 13353 06 **Fringe-averaged collinear frequency-resolved optical gating: in situ characterization of ultrashort pulses in nonlinear microscopy** [13353-20]
- 13353 07 **Sensitive and accurate interferometric pulse characterization via two-photon absorption in Fabry-Pérot laser diodes** [13353-21]

---

## ULTRAFAST LASER MICRO/NANO-MACHINING

---

- 13353 08 **Ultrafast laser micromachining using wavelengths from ~0.2 $\mu$ m to ~2 $\mu$ m (Invited Paper)** [13353-22]
- 13353 09 **Overcoming challenges in transparent material assembly: advances of ultra short pulse laser welding** [13353-24]
- 13353 0A **Laser-induced breakdown spectroscopy for real-time 3D material composition mapping** [13353-25]
- 13353 0B **High-resolution 3D volumetric imaging using laser-enabled delayering techniques** [13353-26]

---

#### NOVEL ULTRAFAST LASER SOURCES II

---

- 13353 0C **Single-diode-pumped, self-starting 1-GHz Kerr-lens-modelocked Ti:sapphire laser producing 48-fs pulses** [13353-32]

---

#### DIRECT WRITING, POLYMERIZATION, AND 3D MICROSTRUCTURING OF INTEGRATED MICROSYSTEMS

---

- 13353 0D **Reconfigurable integrated photonic device to test Born's rule** [13353-36]

---

#### SPATIO-TEMPORAL BEAM SHAPING

---

- 13353 0E **A physics-informed machine learning model towards coherent and three-dimensional femtosecond laser beam shaping (AI/ML Best Paper Award in LASE)** [13353-40]
- 13353 0F **Advanced pulse shaping for photoinjector lasers** [13353-41]

---

#### POSTER SESSION

---

- 13353 0G **Use of noise-like pulses in fiber optic interferometric devices to improve sensitivity of vibration sensor** [13353-44]
- 13353 0H **Fs-Erbium-ring fiber laser as a simple training tool for enhancing laser engineering education** [13353-45]