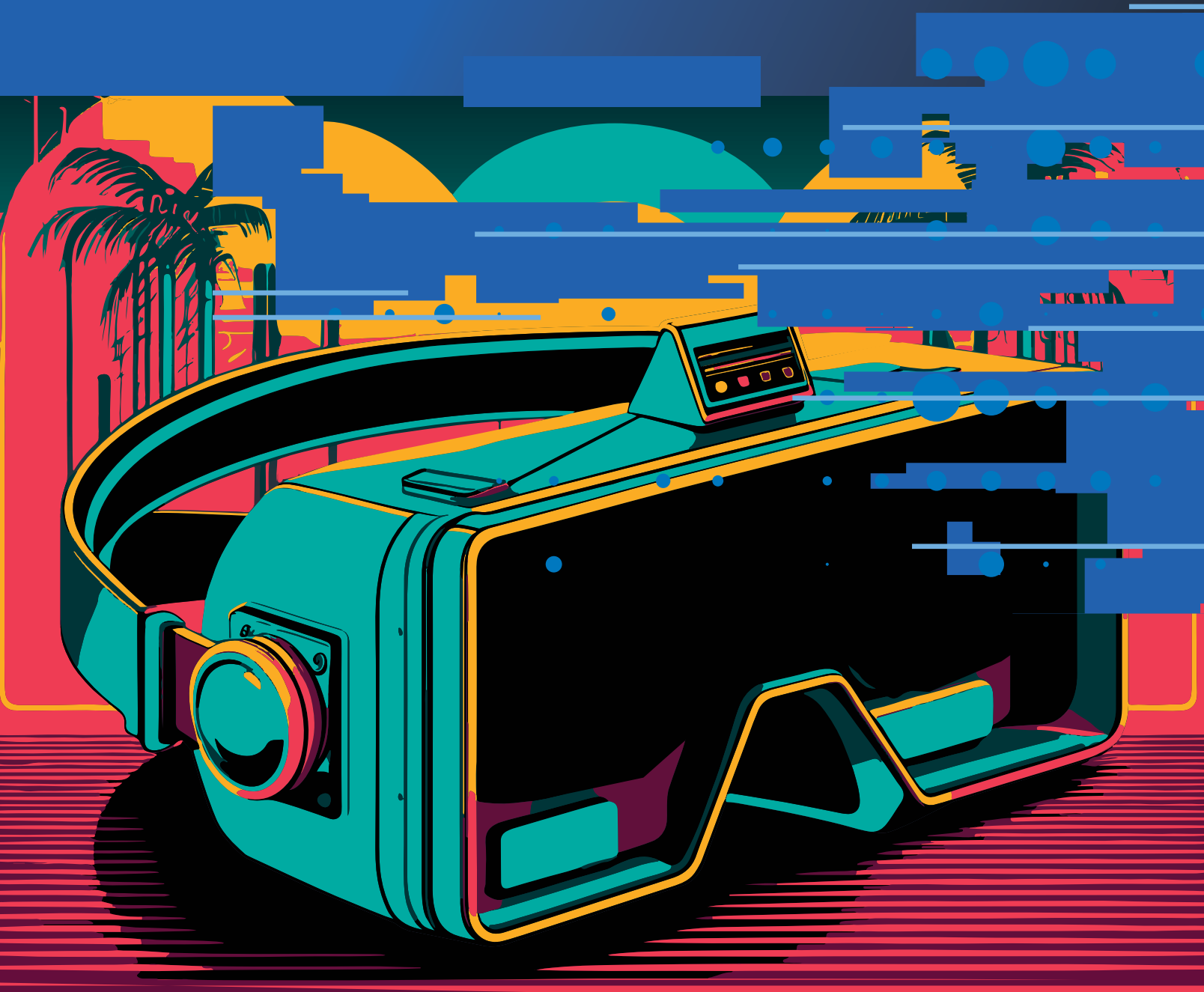
2025 | TECHNICAL PROGRAM
EXHIBITION GUIDE

SPIE.AR|VR|MR

Co-located with **SPIE Photonics West**

THE PREMIER EVENT FOR AR, VR, AND MR HARDWARE DEVELOPMENT

27–29 JANUARY 2025 | THE MOSCONE CENTER
SAN FRANCISCO, CALIFORNIA, USA



SPIE.AR|VR|MR

Conference sessions: **27 January 2025**

Main Stage sessions: **28-29 January 2025**

Exhibition: **28-29 January 2025**

Courses: **25-30 January 2025**

The Moscone Center • San Francisco, California, USA

CO-LOCATED EXHIBITIONS:

BiOS Expo
25–26 January 2025

Quantum West Expo
28–29 January 2025

Photonics West Exhibition
28–30 January 2025

Cutting-Edge Research

Exhibition

Industry Program

Courses

Download the SPIE Conference and Exhibition App

Enhance your SPIE conference experience

Download the mobile app to enrich your meeting experience. View events, exhibitors, and connect with participants all in the palm of your hand. The app is free, easy to use, and loaded with features designed for planning and connecting on the go.

Make the most of your time with these app features:

» Real-time program updates
» Customize your schedule
» Organize your meeting notes
» Add new connections to your contacts
» Plan exhibitor visits
» Navigate the venue
» Bookmark specific research
» Create meeting reports
» And a whole lot more.

Explore the meeting with the SPIE App

It's free.

WiFi

SSID: SPIEFreeWifi

Get the App

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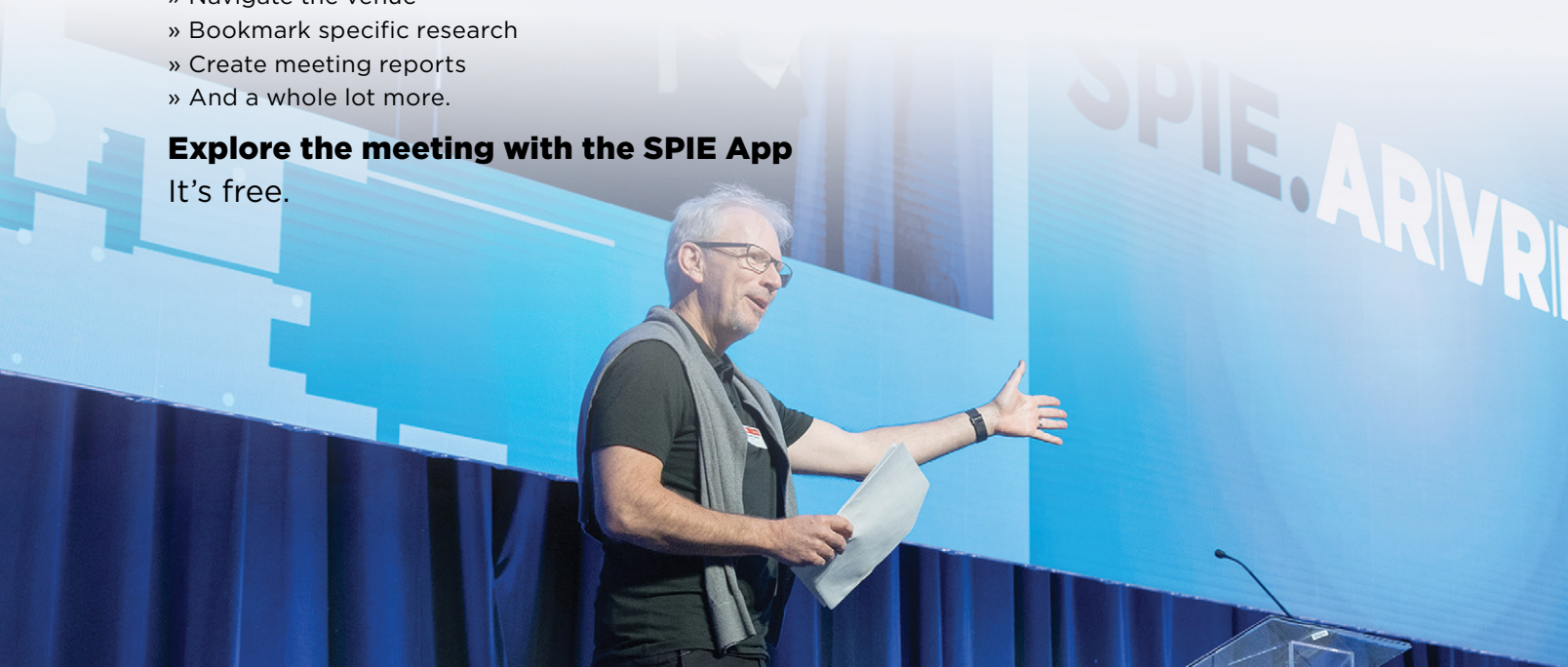
CHROMA



Experience the energy of SPIE AR|VR|MR

Exhibition • 28–29 January—PAGES 26–31

THE MOSCONE CENTER, WEST

TUESDAY 28 JANUARY . . . . . .10:00 AM–5:00 PM

WEDNESDAY 29 JANUARY. . . .10:00 AM–5:00 PM

Visit the companies at the AR | VR | MR exhibition and the job fair. Enjoy in-person conversations, make new connections, and see who is hiring.

SYMPOSIUM CHAIRS

Bernard Kress
Google (USA)

Christophe Peroz
Google (Switzerland)

Grace Lee
Mojo Vision, Inc. (USA)

SYMPOSIUM COMMITTEE

Ryan Ong, Magic Leap, Inc. (USA)

Amy Chunhua Wang, Meta Reality Labs. (USA)

Main Stage Presentations—PAGES 5–9

Join us for plenary presentations, invited speakers, and expert panels from a wide range of leaders in the XR industry. These talks include developing research, exciting reveals, and engaging discussions focused on producing the hardware that will make XR a reality.

Technical Program—PAGES 16–25

Hear the latest research from the leading event for the advancement of augmented, virtual, and mixed reality technologies and hear industry design challenge participants propose solutions to current challenges in AR/VR/MR.

Technical Special Events—PAGES 10–11

Join your peers at the exhibition, explore new professional opportunities at the job fair, and view the historic headset museum.

Courses—PAGES 14–15

Receive live instruction directly from an expert and join a group of your peers with similar goals and challenges. Choose from more than 50 options on topics such as AR/VR, optical system design, biophotonics, quantum, basic optics, and all with a moneyback guarantee!

Courses priced separately.

A paid registration to SPIE AR | VR | MR includes full access to SPIE Photonics West technical program and special events, all co-located exhibitions, job fair, and all industry sessions.

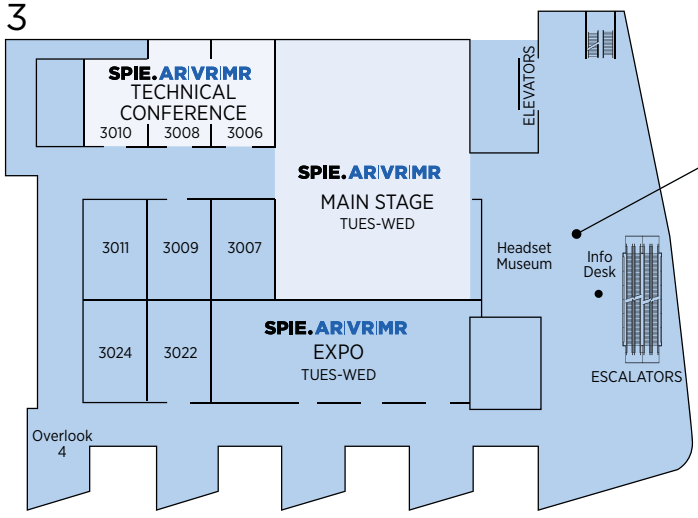
Exhibition only registration includes access to all exhibitions located and co-located at SPIE Photonics West—BiOS Expo, Quantum West Expo, Photonics West Exhibition, and AR | VR | MR Exhibition—plus, job fair, and all industry sessions.

See Photonics West program and exhibition details: **spie.org/pw**

spie.org/avr
#SPIEXR

THE MOSCONE CENTER WEST

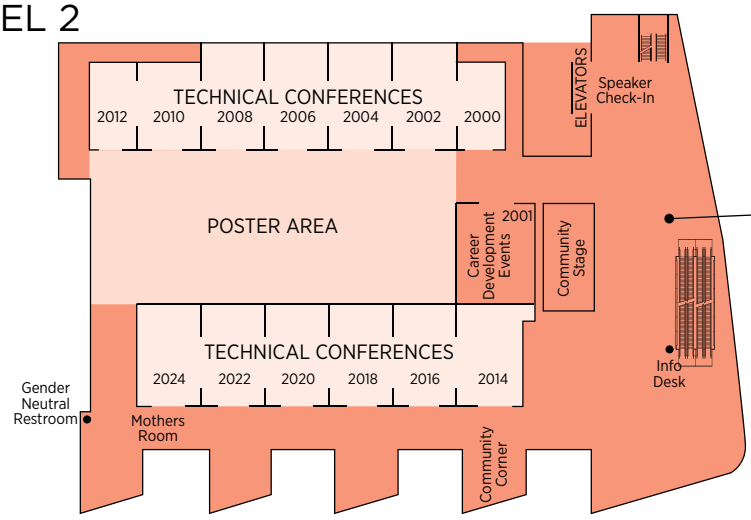
LEVEL 3



SPIE.AR|VR|MR

LEVEL 3 LOBBY:
INFO DESK
AV VR MR POSTERS
EXHIBITOR ASSISTANCE
SPIE LEAD RETRIEVAL & APP DESK

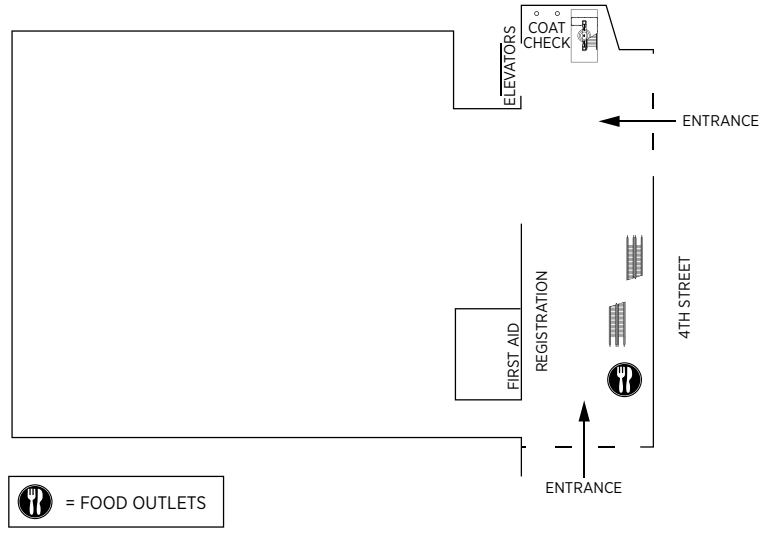
LEVEL 2



SPIE. PHOTONICS WEST

LEVEL 2 LOBBY:
COMMUNITY EVENTS
POSTERS
Sunday, Monday, Tuesday, and Wednesday
RESUME REVIEW
SPIE MEMBER HEADSHOTS

LEVEL 1



Events in Moscone West

SPIE. PHOTONICS WEST

SPIE.AR|VR|MR

POSTER SESSIONS
Sunday, Monday, Tuesday, Wednesday

SPIE MEMBER HEADSHOTS
Tuesday and Wednesday

RESUME REVIEW
Tuesday and Wednesday

COMMUNITY EVENTS
Sunday through Wednesday

See full details and updates at **spie.org/avr** or on the **SPIE App**

Badge pick up and registration hours

Recommended: Speakers use North Lobby to pick up badges.

The Moscone West, Level 1 Lobby

Sunday, 26 January	7:30 AM–5:00 PM
Monday, 27 January	7:30 AM–5:00 PM
Tuesday, 28 January	7:30 AM–5:00 PM
Wednesday, 29 January	7:45 AM–5:00 PM

SPIE Cashier

Location: Moscone West, Level 1 lobby

Open during registration hours

Registration Payments

If you are planning to register on-site, your credit card payment will be processed during registration. If you wish to pay with cash or check, register at the "Need to Register" stations; you will be directed to the Cashier once you have completed registration.

If you have already registered and wish to add a course, workshop, or special event, you may do so at the "Need to Register" stations.

Receipt and Certificate of Participation

Preregistered attendees who need an SPIE-stamped receipt or attendees who need a Certificate of Participation may obtain those at Cashier.

Badge Corrections

Badge corrections can be made at Cashier. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

Speaker Check-In and Preview Station

Locations:
Moscone West, Level 2 Lobby (Sunday-Thursday)

Moscone West, Level 3, outside Room 3006 (Sunday-Monday)

Open during Registration hours

All speakers must stop at Speaker Check-In to upload and preview their slide presentation files at least two hours before their scheduled session or the day before if you present in the first session. Speakers are not able to present using their own devices. All conference rooms are equipped with a laptop, projector, screen, lapel microphone, slide advancer and laser pointer.

SPIE Information Desk

Location: Moscone West, Level 3 Lobby - Open during registration hours

Materials distribution: stop by to pick up conference materials, water bottles, and event swag. SPIE staff will also be available to assist in answering any meeting and exhibition related questions you might have.

Internet Access

Location: Moscone Center, North, South and West

Complimentary wireless internet access is available throughout Moscone Center North, South and West buildings, including the exhibition halls.

SPIE Conference and Exhibition App

Location: Moscone Center, North Lower Lobby (Exhibit Level)

Our SPIE App developer will be onsite and available to answer any questions on its use or navigation and how to get the best user experience. We welcome your feedback.

Search and browse the program, special events, participants, exhibitors, courses, and more. Build your personalized schedule and sync with the online MySchedule tool. Free Conference App available for iPhone and Android phones. Information about restaurants and food options also available on the App. If you have questions, visit the App Desk.

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SPIE Bookstore

Location: Moscone Center, North Lower Lobby (Exhibit Level)

Saturday-Wednesday . . . . . 8:30 AM–5:30 PM

Thursday . . . . . 8:30 AM–4:00 PM

Stop by the SPIE Bookstore to browse the latest SPIE Press Books. While there, get a t-shirt or educational toy to bring home to the family.

Credit and debit cards only will be accepted; no cash.

SPIE Course Materials

Location: Moscone Center, South Lobby

Open during registration hours

Browse course offerings or learn more about SPIE courses available in portable formats such as online and customizable, in-company courses.

SPIE Press Room

Open during registration hours

For registered press only. The Press Room provides meeting space, refreshments, access to exhibitor press releases, and Internet connections. Press are urged to register before the meeting by emailing name, contact information, and name of publication to media@spie.org. Preregistration closes approximately 10 days before the start of the event

SPIE Luggage and Coat Check

Location: Moscone West, Level 1 Lobby

Sunday through Thursday . . . open during registration hours

Complimentary luggage, package, and coat storage are available. Please note posted hours; no late pickup available.

Business Center Office

Location: Moscone Center, South near Hall C, Exhibit Level

Tuesday–Thursday . . . . . 9:00 AM–5:00 PM

The Moscone Business Center provides full service business needs for your convenience. Their services include photocopying, faxing, computer workstations and printing services.

Copy Services

Copy Central
615 Mission St (at 2nd Street)
San Francisco CA 94105
Phone: 415.882.7737

CityCopy Print Center
837 Mission St
San Francisco CA 94103
Phone: 415.757.0673

Child Care Services

Sitters Unlimited
San Francisco Bay Area
408.452.0225
Rachael Osorio
Email: info@bayareasittersunlimited.com
www.bayareasittersunlimited.com

SPIE does not imply an endorsement nor recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

Mothers' Lounge

Location: Moscone Center, North and South Lobbies

The Mothers' Lounge is a lockable room intended for nursing mothers. No storage, running water, or refrigeration is available in this space.

Quiet Room

Location: Moscone Center, Room 115 (Level 1 North Lobby)- Open during registration hours

The Quiet Room is intended for silent meditation, reflection, and prayer. No mobile devices or computer use is allowed, and no food nor beverages are allowed.

Gender Inclusive Restroom

Location: Moscone Center, West Level 2 (Near Room 2024)

Lost and Found

Location: Moscone Center, West Level 1 Lobby, Cashier - Open during registration hours

Found items will be kept at SPIE Cashier in the Registration area during the meeting and available only during registration hours. At the end of the meeting, all found items will be turned over to the Moscone Security Control 415.974.4021.

Food and Beverage Services

Location: Moscone Center, West Level 3 Lobby

Complimentary Coffee
Daily . . . . . 7:00 AM-4:00 PM

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poLight
Shaping the Tunable Optics Future

Food & Refreshments for purchase
Various Moscone Center locations Saturday through Thursday

Location: Moscone Center, various locations

Saturday through Thursday

There are a variety of food and drink options, including hot and cold snacks, espresso, beverages, hot entrees, deli sandwiches, salads, and pastries available for purchase. Credit card payments only.

San Francisco Restaurants and City Information

Location: Moscone Center, South Lobby

The San Francisco Travel Association will have visitor's guides and maps available. The association sells the San Francisco CityPASS, Muni 1-, 3- and 7-Day Pass-ports, cable car tickets, the Explorer Pass, Muni maps and hop-on-hop-off bus tickets. Staff are available to discuss city information including tips on local restaurants, the city's many attractions, sightseeing suggestions and transit information.

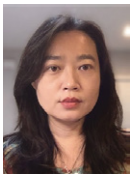
AR|VR|MR MAIN STAGE EVENTS

Main Stage talks offer the latest insights and perspectives on the hardware that will enable the metaverse and augmented reality. Be in the room full of energy and inspiration as leaders in their respective fields take the stage to share their current research and visions of the future.

Chair Welcome + Opening Remarks

28 January 2025 • 8:00 AM - 8:10 AM
Moscone West, Main Stage (Level 3)

Join us for opening remarks from the AR|VR|MR 2025 Symposium chairs.



Grace Lee
Mojo Vision, Inc. (USA)

Bernard Kress
Google (USA)

Christophe Peroz
Google (Switzerland)

Plenary 1: Meta

28 January 2025 • 8:10 AM - 8:50 AM
Moscone West, Main Stage (Level 3)

PLENARY

Accelerating the Augmented Reality Revolution: A Strategic Analysis of Enabling Technologies and Emerging Trends

Jason Hartlove
VP, XDO
Meta

Session 1: Micro LED

28 January 2025 • 8:50 AM - 10:00 AM
Moscone West, Main Stage (Level 3)

FEATURE

8:50 AM - 9:10 AM:

Tiny Displays, Big Impact: Micro-LEDs for AI Glasses

Mike Wiemer
CTO

SNAPSHOT

9:10 AM - 9:20 AM:

Development of the World's Highest PPI Full-Color MicroLED Micro-Display for AR applications

Lynch Wu
Deputy Director
PlayNitride

SNAPSHOT

Mojo Vision

9:20 AM - 9:30 AM:

Development of the World's Highest PPI Full-Color MicroLED Micro-Display for AR applications

Tongtong Zhu
CEO & Founder

Porotech

SNAPSHOT

9:30 AM - 9:40 AM:

Engo, Light AR for Sport

Eric Marcellin-Dibon
CEO Microoled
MICROOLED

FEATURE

9:40 AM - 10:00 AM:

Monolithic RGB Micro-LED Arrays on Silicon with Directional Emission Pave the Way to Cost Effective High Brightness Low Power

Ivan-Christophe Robin
Product Strategy Senior Director
Aledia Marketing & Sales Office

MAIN STAGE EVENTS

Session 2: Display Engines

28 January 2025 • 10:20 AM - 11:10 AM
Moscone West, Main Stage (Level 3)

SNAPSHOT

10:20 AM - 10:30 AM:

Complete immersion Field of View of up to 240x130deg in a compact VR headset, it's architecture and manufacturing technologies

Shimon Grabarnik
Director of Optical Design
Hypervision Ltd.

SNAPSHOT

10:30 AM - 10:40 AM:

Making Vision Better: Improving AR/MR Cameras and Micro Display Systems that Replicate the True Human Eye Experience

Pierre Craen
Chief Technology Officer
poLight ASA

SNAPSHOT

10:40 AM - 10:50 AM:

The light matrix: unlocking everyday AR glasses

Chiara Greganti
Chief Research Officer
vitrealab

SNAPSHOT

10:50 AM - 11:00 AM:

The Power of LCoS in Creating Ultra-Lightweight AR Glasses

Edward Tang
CEO & Founder
Avegant

SNAPSHOT

11:00 AM - 11:10 AM:

Light Field Projector

Homer Chen
Founder
PetaRay

Panel 1: Enabling the Market through Advancing the AR Ecosystem

28 January 2025 • 11:10 AM - 12:00 PM
Moscone West, Main Stage (Level 3)

Join our panelists as they share about how the work the AR Alliance is enabling the AR market.

MODERATOR

Bharath Rajagopalan
Director, Strategic Marketing
STMicroelectronics, Inc

Plenary 2: Snap

28 January 2025 • 1:30 PM - 2:15 PM
Moscone West, Main Stage (Level 3)

1:30 PM - 1:35 PM:

A welcome and brief remarks from the AR|VR|MR chairs

PLENARY

1:35 PM - 2:15 PM:

Building Spectacles: Snap's Vision for See-through, Standalone AR Glasses

Kenny Kubala
Director, Optical Engineering
Snap, Inc

Session 3: Waveguides

28 January 2025 • 2:15 PM - 3:55 PM
Moscone West, Main Stage (Level 3)

FEATURE

2:15 PM - 2:35 PM:

Samarth Bhargava
Senior Director of Photonics Design,
Photonics Platforms Business
Applied Materials

SNAPSHOT

2:35 PM - 2:45 PM:

Manufacturable Performance with Dispelix Waveguide Technology

Juuso Olkkonen
Co-Founder and Chief Scientific Officer
DISPELIX

SNAPSHOT

2:45 PM - 2:55 PM:

Advancements in Plastic Reflective Waveguides for Enhanced AI Integration in AR Smartglasses

Jeonghun Ha
CTO
LetinAR

SNAPSHOT

2:55 PM - 3:05 PM:

DigiLens Holographic Waveguides: Pioneering AR and AI for a Productive Future

Alastair Grant
SVP
DigiLens, Inc

SNAPSHOT

3:05 PM - 3:15 PM:

Advanced Technologies for Super Lightweight Polymer Waveguide and Large FOV Waveguide

Satoshi Shiraga
CEO
Cellid, Inc

SNAPSHOT

3:15 PM - 3:25 PM:

Nano-optics Solutions for AR|VR|MR; Cameras and Waveguides

Theodor Nielsen
CEO and Founder
NIL Technology

FEATURE

3:25 PM - 3:45 PM:

Accelerating the Adoption of AR Smart Glasses with Diffractive Waveguides

Tao Lin
Chair
North Ocean Photonics

Xinye Lou
R&D Director
North Ocean Photonics

SNAPSHOT

3:45 PM - 3:55 PM:

Integration of wafer and plate-based NIL for scalable manufacturing of high-quality AR waveguides

Erhan Ercan
Morphotonics

Session 4: Glasses

28 January 2025 • 4:25 PM - 5:05 PM
Moscone West, Main Stage (Level 3)

SNAPSHOT

4:25 PM - 4:35 PM:

Speaker TBA
Vuzix

SNAPSHOT

4:35 PM - 4:45 PM:

ZEISS XRRX – Breaking the Compromise between Uniform Consumer Electronics and Individual Vision Correction

Frank-Oliver Karutz
CTO
Zeiss Venture tooz technologies

SNAPSHOT

4:45 PM - 4:55 PM:

2D Reflective Waveguide-Based Displays for Large Field-of-View Augmented Reality Glasses

Aviv Frommer
EVP R&D
Lumus Ltd

SNAPSHOT

4:55 PM - 5:05 PM:

Vision Care in the core of AR

Tomas Sluka
CEO
CREAL

Panel 2: Human Vision Science and the Visual Experience in AR/VR

28 January 2025 • 5:05 PM - 5:55 PM
Moscone West, Main Stage (Level 3)

MODERATOR

Björn Vlaskamp
Lead Human Vision Scientist
Google AR

PANELISTS

Laurie M. Wilcox
Professor, Department of Psychology
Centre for Vision Research,
York Univ. Toronto

Alexandra Boehm
Senior Human Vision Scientist
Google AR

Jorge Otero-Millan
Assistant Professor of Optometry
& Vision Science
Univ. of California, Berkeley

T. Scott Murdison
Research Scientist
Meta

Emily Cooper
Associate Professor of
Optometry and Vision Science
Univ. of California, Berkeley Toronto

Optical Design Challenge Awards

29 January 2025 • 8:00 AM - 8:15 AM
Moscone West, Main Stage (Level 3)

Celebrate with us as we announce the winners of the 2025 Student Optical Design Challenge.

AWARDS SPONSORED BY:

Google SYNOPSYS® STMicroelectronics

MAIN STAGE EVENTS

Plenary 3: Google

29 January 2025 • 8:15 AM - 8:55 AM
Moscone West, Main Stage (Level 3)

PLENARY

Android XR: A New Reality Powering Headset and Glasses

Hugo Swart
Senior Director, Head of Ecosystem Strategy and Technology
Google

Session 5: Manufacturing

29 January 2025 • 8:55 AM - 11:10 AM
Moscone West, Main Stage (Level 3)

FEATURE

8:55 AM - 9:15 AM:

Breaking Barriers in MicroLED Technology: Perovskite-Based Colour Conversion

Gerald Dahlmann
Senior Director Marketing – Consumer Electronics
Coherent Corp.

SNAPSHOT

9:15 AM - 9:25 AM:

Breaking Barriers in MicroLED Technology: Perovskite-Based Colour Conversion

Bernard Wenger
Chief Technology Officer
Helio Display Materials

SNAPSHOT

9:25 AM - 9:35 AM:

Applications of Lithography in Nano&Micro-photonics

Kehan Tian
CTO
Goeroptics

SNAPSHOT

9:35 AM - 9:45 AM:

Application of wafer-level Nano-Optics in lightweight AR glasses

Shun Lan
AR Product Manager
Sunny OmniLight Technology

SNAPSHOT

9:45 AM - 9:55 AM:

Direct Nanoimprint as a Platform Technology for All-Inorganic Waveguides

James Watkins
Founder and Chief Scientific Officer
Myrias Optics, Inc.

9:55 AM - 10:10 AM:

Coffee Break

SNAPSHOT

10:10 AM - 10:20 AM:

Scatterometry with nanometer sensitivity for non-destructive quality inspection of gratings and thin films

Jaime Gómez Rivas
Co-Founder
TeraNova B.V.

SNAPSHOT

10:20 AM - 10:30 AM:

Bringing AR to Volume Manufacturing with Optical Lithography

Kelsey Wooley
Director of North America
Eulitha

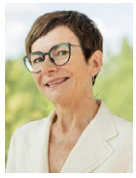
SNAPSHOT

10:30 AM - 10:40 AM:

Enhancing Waveguide Output Uniformity by Advanced Patterning Techniques

Eleonora Storace
R&D Program Manager
imec vzw

SNAPSHOT



10:40 AM - 10:50 AM:

Advanced 3D Patterning Enabling Future Optical Designs

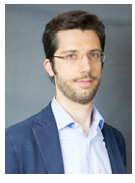
Bríd Connolly
Business Development Manager
Tekscend Photomask

FEATURE

10:50 AM - 11:10 AM:

Sensing the Future: Human-Centric, Sustainable Innovations in AR/VR/MR

Thomas Viart
Product Marketing Engineer, Imaging Sensors, Americas Region
STMicroelectronics



Matteo Fusi
Product Marketing Director, MEMS and Sensors, Americas Region
STMicroelectronics

Panel 3: System Level Design for AR Glasses

29 January 2025 • 11:10 AM - 12:00 PM
Moscone West, Main Stage (Level 3)

MODERATOR

TBA

Plenary 4: Xreal

29 January 2025 • 1:30 PM - 2:15 PM
Moscone West, Main Stage (Level 3)

1:30 PM - 1:35 PM:

A welcome and brief remarks from the AR|VR|MR chairs

PLENARY

1:35 PM - 2:15 PM:

Designing XREAL One Pro: The Next Generation of OST Glasses

Chi Xu
CEO
Xreal

Session 6: Sensors

29 January 2025 • 2:15 PM - 2:35 PM
Moscone West, Main Stage (Level 3)

SNAPSHOT

2:15 PM - 2:25 PM:

Evaluating Image Quality in AR/VR Headsets: A Comprehensive Assessment of Texture Preservation, Color Fidelity, and 3D Reconstruction

Fabien Montagné
Product Marketing
DXOMARK Image Labs

SNAPSHOT

2:25 PM - 2:35 PM:

Lens-embedded Eye Tracking Using Holographic Optical Elements (HOEs)

Katherine Remulla
Optronics Developer
Tobii

Lea Assies
R&D Engineer, Ph.D.
Tobii

Session 7: Materials

29 January 2025 • 2:35 PM - 4:05 PM
Moscone West, Main Stage (Level 3)

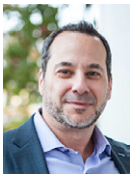
FEATURE

2:35 PM - 2:55 PM:

Diffrar™: Scalable Polymer Optical Waveguide Substrates and Their Practical Applications

Hiromi Tsuboi
Deputy General Manager
Mitsui Chemicals, Inc

SNAPSHOT



2:55 PM - 3:05 PM:

Ultra-stable High Refractive Index Materials Driving Universal Waveguide Performance

Craig Bandes
CEO

SNAPSHOP

3:05 PM - 3:15 PM:

High refractive index materials for nanoimprinting waveguides – challenges and solutions

Mikko Poutanen
Director Nanoimprint and Processes
Inkron Oy

3:15 PM - 3:25 PM:

Coffee Break

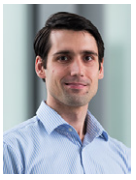
SNAPSHOT

3:25 PM - 3:35 PM:

FlexEnable's Flexible Active Optics for AR/VR

Erin McDowell
Chief Revenue Officer
FlexEnable Technology Limited

SNAPSHOT



3:35 PM - 3:45 PM:

Facilitating Electrical and Mechanical Connection of Mini- & MicroLED in AR/ VR Applications with Functional Adhesives

Tim Cloppenborg
Dr. Ing.
DELO Industrial Adhesives

SNAPSHOT

3:45 PM - 3:55 PM:

Creating the World's Most Advanced Prescription Lens Technology for Augmented Reality Glasses

Joris Biskop
Founder & CEO
AddOptics

SNAPSHOT

3:55 PM - 4:05 PM:

Waveguides – Ready for Take-off? Innovation Pipeline Filled? SCHOTT's View on Reflective and Diffractive Technologies

Rüdiger Sprengard
Head of Augmented Reality
SCHOTT

Panel 4: AI and AR

29 January 2025 • 4:05 PM - 4:55 PM
Moscone West, Main Stage (Level 3)

MODERATOR

Edgar Auslander
Senior Director, Head of Strategic Partnerships AR/MR/AI
Meta

TECHNICAL SPECIAL EVENTS

Dive into cutting-edge research at the poster sessions, immerse yourself in innovation at the headset museum, or witness the next generation of optical design at the Student Optical Design Challenge.

AR | VR | MR Exhibition

Moscone Center, Expo Hall, (Level 3 West)

Tuesday 28 January 2025 . . . . . .10:00 AM–5:00 PM
Wednesday 29 January 2025 . . . . . 10:00 AM–5:00 PM

Meet with the biggest names in consumer electronics and up-and-coming XR companies.

AR | VR | MR Headset Museum

27 January 2025 • 8:00 AM - 5:00 PM
Moscone West, Main Stage Entrance (Level 3)

Don't miss the extensive collection of 100+ headsets from the late 1980s up to today.

AR | VR | MR Poster Session

27 January 2025 • 5:30 PM - 7:00 PM
Moscone West, Lobby, (Level 3)

Conference attendees are invited to attend the AR | VR | MR poster session on Monday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badge.

Poster setup: Monday 12:00 PM - 5:30 PM

Optical Design Challenge

28 January 2025 • 6:00 PM - 7:00 PM
Moscone West, Community Stage (Level 2)

See students apply their creativity and university optics education to challenging, tangible industry specifications for today's immersive display products. A jury, comprised of industry leaders sponsoring the event and leading academic figures in AR, VR, and MR, will review submissions and a three-minute pitch by participants. Multiple prizes will be awarded throughout the competition thanks to generous sponsorships.

Award Ceremony

29 January 2025 • 8:00 AM - 8:15 AM
Moscone West, Main Stage (Level 3)

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Free Professional Headshots

Moscone West, Level 2 Lobby

Free professional headshots for all SPIE Members and Corporate Members. Be ready to show your proof of Membership.

27 January 2025 • 9:30 AM - 4:30 PM
28 January 2025 • 9:30 AM - 4:30 PM
29 January 2025 • 9:30 AM - 4:30 PM

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SPIE.MEMBERSHIP

SPIE is committed to equipping you with tools to advance and enhance your career.

Moscone Center, Hall C, Room 5 (Exhibit Level)

Tuesday 28 January 2025 • 10:00 AM - 5:00 PM

Wednesday 29 January 2025 • 10:00 AM - 5:00 PM

Meet with companies seeking to hire professionals like you. Bring your resume and put your best foot forward to land your dream job.

SPIE Job Fair

Visit the SPIE App or the website for current list of Job Fair exhibitors

https://spie.org/pwjobs SPIE. CAREER CENTER

OPEN TO ALL REGISTRATION TYPES.

Whiskey Tasting at SPIE Booth

South Lower Lobby, Booth 3700 (Exhibit Level)

Sample specialty whiskeys while chatting with colleagues at SPIE Booth #3700.

28 January 2025 . . . . . 2:00 PM - 5:00 PM
29 January 2025 . . . . . 2:00 PM - 5:00 PM
30 January 2025 . . . . . 2:00 PM - 4:00 PM

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Paws for a Break

Moscone South, Lower Lobby (Exhibit Level)

Paws for a break and join some of the most cuddly four-legged animals for a bit of self-care and animal love at the Community Corner.

25 January 2025 . . . . . 3:00 PM - 5:00 PM
26 January 2025 . . . . . 2:00 PM - 4:00 PM
28 January 2025 . . . . . 3:00 PM - 5:00 PM
29 January 2025 . . . . . 3:00 PM - 5:00 PM
30 January 2025 . . . . . 2:00 PM - 4:00 PM

SPIE Member After-Dinner Reception

28 January 2025 • 8:00 PM - 9:30 PM
San Francisco Museum of Modern Art (151 Third St)

SPIE Members are invited to join us for an evening of networking, music, art, and celebration of our global optics and photonics community. Enjoy beer, wine, coffee, desserts, and meaningful conversation in one of the largest modern and contemporary art museums in the United States.

This reception is limited to SPIE Members and Corporate Members only. Please wear your registration badge with your Member ribbon or Corporate Member label and bring a valid ID. If you join as an SPIE Member onsite, bring your registration receipt. Dress is casual or business attire.

SOCIAL AND NETWORKING EVENTS

Enjoy conversations and make important in-person connections. Take the opportunity to discuss challenges and successes with other professionals from around the world.

Women in Optics Meetup

27 January 2025 • 3:00 PM - 4:00 PM
Moscone West, Community Corner (Level 2)

Join other women in the field for informal discussions and networking.

Executive Women's Meetup

27 January 2025 • 6:30 PM - 7:30 PM
InterContinental Hotel, Pacific Terrace Foyer (4th Floor)

Join other women executives in optics, photonics, and photonics-enabled communities to meet up, network, and share experience.

LGBTQ+ Social

28 January 2025 • 6:30 PM - 7:30 PM
Moscone West, Community Corner (Level 2)

Come join us and socialize and network with other LGBTQ+ attendees, students, scientists, and allies in the optics and photonics community.

Closing Reception

29 January 2025 • 5:00 PM - 6:00 PM
Moscone West, Lobby (Level 3)

Join us as we wrap up SPIE AR | VR | MR 2025 in style.

RECEPTION SPONSORED BY:

Google

Black Scientists' Social

29 January 2025 • 5:30 PM - 6:30 PM
Moscone West, Community Corner (Level 2)

Join us as we count down to Black History Month with a Black scientist's social.

PROFESSIONAL DEVELOPMENT EVENTS

Enjoy four powerful days of career development and job skills advancement. Build these focused events and services into your schedule and use the opportunity to make valuable connections.

Evolution and Technology: forces shaping women's roles and opportunities

27 January 2025 • 12:00 PM - 1:00 PM
Moscone West, Community Stage (Level 2)

Join us for lunch and explore how human evolution and technology have shaped women's roles and opportunities, and what the future holds for gender equality.

Presenter: **Jennifer Barton**

As a consequence of human evolution, women bear the disproportionate energetic cost of propagating the species, a fact that shaped women's historical roles. In the last 12,000 years, technology has emerged as force that has both hindered and helped equality of the sexes. This talk will examine how these two forces brought us to the current state of women's opportunities, and what the future might bring.

Celebrating Optics and Photonics in Africa

27 January 2025 • 4:00 PM - 5:00 PM
Moscone West, Community Stage (Level 2)

Join us in celebrating the growth of the optics and photonics ecosystem across Africa, with a special emphasis on education and outreach in sub-Saharan regions. Discover the inspiring efforts of African educators who are empowering students to become the future leaders of the continent's rapidly expanding economies. SPIE is proud to support these initiatives through student chapters, community engagement, and programs for equipment and curriculum development. Learn, share, and explore how you can contribute to advancing optics and photonics worldwide.

Neuro-inclusion in physics

28 January 2025 • 12:00 PM - 1:00 PM
Moscone West, Community Stage (Level 2)

Join us for lunch and an education session focused on neuro-inclusion in STEM.

Presenter: **Daisy Shearer**

In this session, participants will be invited to reflect on their physical workspaces and working practices in the context of neuroinclusion and learn about practical steps that can be taken to embrace a diverse range of neurotypes. You will learn about neurodiversity and the many ways that neurodivergent individuals demonstrate strengths and encounter challenges in the physics workplace. We will then explore ways in which we can break down barriers for neurodivergent people in physics, focusing on cultivating a culture of neuroinclusion in your own working practices and how you can encourage colleagues to follow your lead. By the end of the session, you will have a greater understanding of neurodiversity in the physics context and the tools to develop a personal action plan for creating change at your workplace.

Navigating your Career through Networking: Insights from Women in XR

29 January 2025 • 12:00 PM - 1:00 PM
Moscone West, Community Stage (Level 2)

In today's rapidly evolving technological landscape, building a strong network is essential for career growth and innovation. Join us over lunch for an inspiring session featuring leading women in the field of XR who have leveraged networking to navigate diverse career paths in optics and related technologies. We'll begin with short, impactful presentations on how networking influenced their career journeys, followed by an interactive panel discussion. Engage with panelists and ask your own questions in a Q&A designed to foster meaningful dialogue and share practical advice.

Presenters:

Kelsey Wooley

Chunhua Wang

Lihua Zhao

Heini Haartti-Mäkinen

Chiara Greganti

Pia Harju

Communication for self-advocacy and conflict resolution

30 January 2025 • 12:00 PM - 1:00 PM
Moscone West, Community Stage (Level 2)

Join us for lunch and learn strategies to navigate difficult conversations with confidence and clarity.

Presenter: **Dr. Tara Fortier**

Effective communication is essential for sharing our perspectives, needs, and ideas. However, being truly heard—particularly in moments of conflict—can be a significant challenge. One common obstacle is that our communication can unintentionally trigger defensiveness in others, whether we are asking for a raise, advocating on behalf of others, or presenting new ideas. This workshop will explore strategies to minimize defensiveness, helping you to clarify your position and navigate difficult conversations with greater ease. With practice, these techniques will build your confidence, empowering you to approach challenging discussions with assurance. Strong communication is crucial not only for advocacy and leadership but also for effective management and all interpersonal relationships.

COURSES

Created by experts, SPIE courses are designed to expand professional knowledge and skills. Take what you learn in class and apply it directly to your work.

SPIE Members and Student Members receive discounts on courses.

SATURDAY 25 January	SUNDAY 26 January	MONDAY 27 January	TUESDAY 28 January	WEDNESDAY 29 January	THURSDAY 30 January
AR | VR | MR					
SC1125 **Design, Modeling and Fabrication Techniques for Micro-Optics: Applications to Display, Imaging, Sensing and Metrology** *(Kress)*	SC1218 **Optical Technologies and Architectures for Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) Head-Mounted Displays (HMDs)** *(Kress)*	SC1317 **Waveguides for Mixed Reality: Principles and Applications** *(Georgiou)*			SC1096 **Head-Mounted Display Requirements and Designs for Augmented Reality Applications** (Browne, Melzer)
	SC1310 **Optical Metrology for AR/VR/MR** *(Zhou)*	SC1338 **Display Engines for Mixed Reality: Optical Design & Technology** *(Georgiou)*			

Head-Mounted Display Requirements and Designs for Augmented Reality Applications

Thursday, 30 January 2025 • 8:30 AM - 5:30 PM
SC1096 | Level: Introductory
Member: $865 | Non-member: $1,010
Student member: $504

There has never been a more exciting time for augmented reality (AR). The advent of high resolution microdisplays, the invention of new optical designs like waveguide and freeform eyepieces, and the significant advances in optical manufacturing techniques mean that augmented reality head mounted displays can be produced now that were not possible five years ago. Key to the development and adoption of these systems is the understanding of the fundamental requirements, derived from a human factors-centric approach to AR system design. The authors, with a combined experience of over 50 years in the design of AR systems, will identify the key performance parameters necessary to understand the specification, design and selection of AR systems and help students understand how to separate the hype from reality in evaluating new AR displays. This course will evaluate the performance of various AR systems and give students the basic tools necessary to understand the important parameters in augmented reality displays, whether they are designing them or purchasing them. This is an introductory class and assumes no background in head mounted displays or optical design.

INSTRUCTORS
Michael P. Browne - Vision Products LLC (USA)
James E. Melzer - Independent Consultant (USA)

Design, Modeling and Fabrication Techniques for Micro-Optics: Applications to Display, Imaging, Sensing and Metrology

Saturday, 25 January 2025 • 1:30 PM - 5:30 PM
SC1125 | Level: Intermediate
Member: $525 | Non-member: $605
Student member: $342

This course provides an overview of the various design and fabrication techniques available to the optical engineer for micro / nano optics, diffractive optics and holographic optics. Emphasis is put on DFM (Design For Manufacturing) for wafer scale fabrication, Diamond Turning Machining (DTM) and holographic origination. The course shows how design techniques can be tailored to address specific fabrication techniques' requirements and production equipment constraints. The course also addresses various current application fields as in display, imaging, sensing and metrology. It is built around 4 sections:

(1) design, (2) modeling, (3) fabrication/mass production and (4) application fields.

INSTRUCTOR
Bernard C. Kress - Google (USA)

Optical Technologies and Architectures for Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) Head-Mounted Displays (HMDs)

Sunday, 26 January 2025 • 1:30 PM - 5:30 PM
SC1218 | Level: Intermediate
Member: $525 | Non-member: $605
Student member: $342

The course provides an extensive overview of the current product offerings as well as the various optical architectures. The features and limitations of current optical technologies addressing such specifications are reviewed. In order to design next generation head worn systems, one needs to fully understand the specifics and limitations of the human visual system, and design the optics and the optical architecture around such. Challenges for next generation systems are reviewed, where immersion and comfort need to be addressed along with consumer level costs requirements. The course reviews market analysts' expectations, projected over the next 5 to 10 years, and lists the main actors (major product design companies, start-ups and optical building block vendors, and current investment rounds in such). Demonstration of some of the state of the art AR, MR and VR headsets will be offered to attendees at the end of the course.

INSTRUCTOR
Bernard C. Kress - Google (USA)

Optical Metrology for AR/VR/MR

Sunday, 26 January 2025 • 8:30 AM - 12:30 PM
SC1310 | Level: Intermediate
Member: $525 | Non-member: $605 |
Student member: $342

This course explains basic principles and applications of optical metrology for AR/VR/MR. A primary goal of the course is to reveal the logic of optical methodologies as being critical to the design verification and production yield improvement for this revolutionary consumer electronics product. The class will explore current AR/VR development challenges and how cutting-edge optical metrology technologies are used to boost this fast-growing industry. Out of this course the audience will be able to comfortably describe the fundamental demands of optical metrology for this industry and confidently define a solution path for a particular application.

INSTRUCTOR
Will Zhou - MLOPTIC Corp. (China)

MONEY-BACK GUARANTEE

We are confident that once you experience an SPIE course for yourself you will look to us for your future education needs. However, if for any reason you are dissatisfied, we will gladly refund your money. We just ask that you tell us what you did not like; suggestions for improvement are always welcome.

Digital badges and certificates

SPIE awards digital badges and certificates to participants who attend courses and complete the evaluation and quiz. Digital credentials are always accessible, easily shareable, printable at any time, and verified. For more information visit spie.org/digital-badges

SPIE reserves the right to cancel a course due to insufficient advance registration.

Waveguides for Mixed Reality: Principles and Applications

Monday, 27 January 2025 • 1:30 PM - 5:30 PM
SC1317 | Level: Intermediate
Member: $525 | Non-member: $605
Student member: $342

The future Mixed Reality headset will undoubtedly use waveguides to achieve a spectacle form factor and, if required, optical see-through. Mixed Reality waveguides were unheard of ten years ago, but now they receive billions of dollars in investment. Therefore, while there is a plethora of marketing information online, there is limited information on their theory of operation. This course presents the operating principles of diffractive and reflective waveguides and gives examples of their use in existing MR products. The gratings theory is described for diffractive waveguides, emphasizing the k-space representation. The different grating technologies are then presented, including Volume Bragg Gratings (VBGs), Surface Relief Gratings (SRGs), and Polarization Gratings. Reflective waveguides are described, including their manufacturing methods, advantages over diffractive waveguides, and shortcomings. Finally, the operation of a few existing waveguide-based headsets is described.

INSTRUCTOR
Andreas Georgiou - Reality Optics (United Kingdom)

Display Engines for Mixed Reality: Optical Design & Technology

Monday, 27 January 2025 • 8:30 AM - 12:30 PM
SC1338 | Level: Intermediate
Member: $525 | Non-member: $605
Student member: $342

Mixed Reality hardware encompasses a wide range of devices to fit specific applications. Characteristics like the optical see-through, field of view, eye box size, and resolution determine each headset's optical design and technology. The display engine is the heart of the optical system as it forms the image and creates an exit pupil for the eye box or the waveguide. This course looks at the two fundamental aspects of display engines: (a) the optical design and (b) the modulator technology forming the image pixels. The first part of the course concentrates on occlusive architectures (VR) with optical designs based on hybrid Fresnel lenses, Catadioptric optics (a.k.a. pancakes) and segmented optics. It continues to describe the basic operation of LCDs and OLED display panels. The second part of the course describes the display engines for optical-see-through architectures (AR), with or without an exit pupil expansion waveguide. The operating principles of Laser Beam Scanners (LBS), Liquid Crystal on Silicon (LCoS), and Digital Micromirrors (DMD) are described, and how they are integrated into the optical system is presented.

INSTRUCTOR
Andreas Georgiou - Reality Optics (United Kingdom)

Co-located courses available at Photonics West. See the SPIE Conference App for a full list of courses offered.

TECHNICAL PRESENTATIONS

CONFERENCE 13414

27 JANUARY 2025

MOSCONE WEST, ROOMS 3006, 3008, AND 3010 (LEVEL 3)

Technical conference has concurrent sessions in three rooms

Optical Architectures for Displays and Sensing in Augmented, Virtual, and Mixed Reality (AR, VR, MR) VI

CONFERENCE CHAIRS

Naamah Argaman, Meta (USA)
Hong Hua, College of Optical Sciences, The Univ. of Arizona (USA)
Daniel K. Nikolov, Univ. of Rochester (USA)

PROGRAM COMMITTEE

Kaan Akşit, Univ. College London (United Kingdom)
Dwith Chenna, Advanced Micro Devices, Inc. (USA)
Michael P. Browne, Vision Products LLC (USA)
Ozan Cakmakci, Google (USA)
Henry Choy, Mojo Vision Inc. (USA)
Kevin R. Curtis, Magic Leap, Inc. (USA)
Weichuan Gao, Facebook Technologies, LLC (USA)
Andreas Georgiou, Microsoft Research Cambridge (United Kingdom)
Yi-Hsin Lin, National Yang Ming Chiao Tung Univ. (Taiwan)
Hiroshi Mukawa, Sony Group Corp. (Japan)
Bharathwaj Appan Narasimhan, Samsung Display America Lab (USA)
Yifan (Evan) Peng, The Univ. of Hong Kong (Hong Kong, China)
Jannick P. Rolland, The Institute of Optics (USA)
Zhujun Shi, Meta (USA)
Yuzuru Takashima, Wyant College of Optical Sciences (USA)
Guanjun Tan, Apple Inc. (USA)
Guohua Wei, Meta (USA)
Gordon Wetzstein, Stanford Univ. (USA)
Miaomiao Xu, Meta (USA)

MOSCONE WEST, ROOM 3006 (LEVEL 3)	
8:00 AM - 9:40 AM	**SESSION 1: MATERIAL AND COMPONENTS FOR XR TECHNOLOGY** Session Chairs: **Zhujun Shi, Meta** (USA), **Yi-Hsin Lin,** National Yang Ming Chiao Tung Univ. (Taiwan)
Session 1 runs concurrently with Sessions 5 and 9	
8:00 AM - 8:20 AM	13414-1: **High refractive index and low-birefringence polymers for AR/VR/MR applications** Kris Inoue, Noriyuki Kato, Katsushi Nishimori, Mitsubishi Gas Chemical Co., Inc. (Japan); Tatsuya Suga, Munenori Shiratake, Mitsubishi Gas Chemical Co. (Japan)
8:20 AM - 8:40 AM	13414-2: **Nano-imprint lithography of metal oxides: materials and nano-fabrication methods for AR/VR** Elias Daher, Marco Abbarchi, Badre Kerzabi, David Grosso, Solnil (France)
8:40 AM - 9:00 AM	13414-3: **Addressing sunlight reactivity in high-refractive-index nano-imprint lithography (NIL) resins** AMartin Newcomb, Chau Ha, Koji Maekawa, Addison Clear Wave Coatings Inc. (USA); Patrick Schuster, Thomas Achleitner, EV Group E. Thallner GmbH (Austria)
9:00 AM - 9:20 AM	13414-4: **Vertically aligned guest host liquid crystals for pixelated dimmers on flexible films in augmented reality applications** Charlotte Harrison, FlexEnable Technology Ltd. (United Kingdom)
9:20 AM - 9:40 AM	13414-5: **Top-down fabrication of InGaN-based nano light-emitting diodes** Yu-Chieh Chiu, Can Bayram, Univ. of Illinois (USA)
9:40 AM - 10:10 AM	Coffee Break

MOSCONE WEST, ROOM 3008 (LEVEL 3)	
8:00 AM - 9:40 AM	**SESSION 5: XR SYSTEM ARCHITECTURES** Session Chair: **Hong Hua,** Wyant College of Optical Sciences (USA)
Session 5 runs concurrently with Sessions 1 and 9	
8:00 AM - 8:20 AM	13414-23: **High-efficiency light-field synthesis by laser beam scanning** John Semmen, Hosna Tajvidi Safa, Shin-Tson Wu, CREOL, The College of Optics and Photonics, Univ. of Central Florida (USA)
8:20 AM - 8:40 AM	13414-24: **Directed LCD backlighting for much higher VR display contrast and clarity through a pancake lens while using much less power** Shawn L. Kelly, Panamorph Inc. (USA)
8:40 AM - 9:00 AM	13414-25: **Design and demonstration of a varifocal occlusion capable optical see-through head-mounted display** Alisha Whitehead, Hong Hua, The Univ. of Arizona (USA)
9:00 AM - 9:20 AM	13414-27: **Large-view-volume cylindrical volumetric displays with anisotropic screen** Hyeonbin Im, Hosung Jeon, Minwoo Jung, Kyungpook National Univ. (Republic of Korea); Joonku Hahn, Kyungpook National Univ (Republic of Korea)
9:20 AM - 9:40 AM	13414-28: **e-Tint lenses in augmented reality** Pedro Coutino Soto, Ludmila Sukhomlinova, Tamas Kosa, Bahman Taheri, AlphaMicron, Inc. (USA)
9:40 AM - 10:10 AM	Coffee Break

MOSCONE WEST, ROOM 3010 (LEVEL 3)	
8:00 AM - 10:00 AM	**SESSION 9: EYE TRACKING, HEAD TRACKING, AND DEPTH** Session Chair: **Gordon Wetzstein,** Stanford Univ. (USA)
Session 9 runs concurrently with Sessions 1 and 5	
8:00 AM - 8:20 AM	13414-44: **Bi-focal polarization sensitive metalens for Rrapid BRDF estimation** Pratusha B. Prasad, Omid Hemmatyar, Tyler Thomas, Yajie Zhao, Institute for Creative Technologies, The Univ. of Southern California (USA)
8:20 AM - 8:40 AM	13414-45: **vHOE gratings for eye tracking module integration in waveguides** Olivia Ding, Sunny Omnilight Technology Co., Ltd. (China); Joey Meng, Yuan Chen, Sunny Omnilight Technology Co. (China)
8:40 AM - 9:00 AM	13414-46: **Eye position prediction using adaptive and scaled motion information for low-crosstalk 3D display** Kwanghyun Won, Jin-Sung Lee, Youngho Oh, Yooncheol Shin, Cheolseong Park, Kangwon Jeon, Geonsu Yoon, Woong-Il Choi, Jaesung Lee, Sunil Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea)
9:00 AM - 9:20 AM	13414-47: **Recent advances in deflectometric eye tracking: a novel concept for fast and accurate gaze estimation** Jiazhang Wang, Jiwon Choi, The Univ. of Arizona (USA); Tianfu Wang, ETH Zurich (Switzerland); Florian Willomitzer, The Univ. of Arizona (USA)
9:20 AM - 9:40 AM	13414-49: **High-precision 6 DOF head-tracking using deep-learning-based ellipse detection** Kemal Alperen Çetiner, Erkan Yavuz, ASELSAN A.S. (Turkey)
9:40 AM - 10:00 AM	13414-50: **An iToF/triangulation depth sensor for mixed reality applications** John P. Godbaz, Ling Zhu, Vishali Mogallapu, Mahdieh Poostchi, Jay Gullapalli, Jerry Li, Minseok Oh, Jonathan Santos, Annapurna Karicherla, Swati Mehta, Lucas Morales, Travis Perry, Kyle Rendon, Brock Roland, Reid Sutherland, Microsoft Corp. (USA)
10:00 AM - 11:00 AM	Coffee/Keynote Break

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TECHNICAL PRESENTATIONS

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MOSCONE WEST, ROOM 3006 (LEVEL 3)	
10:10 AM - 12:10 PM	**SESSION 2: METROLOGY AND INSPECTION I** Session Chair: **Michael P. Browne,** Vision Products LLC (USA)
Session 2 runs concurrently with Sessions 6 and 10	
10:10 AM - 10:30 AM	13414-6: **Automated analysis tool for computing contrast transfer function of AR and VR head mounted displays** Ashraf M. Bader, Chumin Zhao, U.S. Food and Drug Administration (USA); Matthew Johnson, Univ. of Maryland (USA); Ryan Beams, U.S. Food and Drug Administration (USA)
10:30 AM - 10:50 AM	13414-7: **Minimizing stray light and crosstalk in wafer-level image quality measurements** Joonas Pylväinen, Jon Palsinajärvi, OptoFidelity Oy (Finland)
10:50 AM - 11:10 AM	13414-8: **Process control metrology solutions for extended reality (XR) beam combiners** Leslie L. Deck, Jan Liesener, Richard Pultar, Mackenzie Massey, Erin McDonnell, Zygo Corporation (USA)
11:10 AM - 11:30 AM	13414-9: **Optical metrology for boresight and image quality of AR Projectors** Roosa Mäkitalo, Mikael Jokinen, Tapio Viitanen, Thomas Kerst, OptoFidelity Oy (Finland)
11:30 AM - 11:50 AM	13414-10: **A compact modulation transfer function colorimeter module** Pengfei Wu, Sean Huentelman, Lucy Chu, Will Zhou, MLOPTIC Corp. (USA)
11:50 AM - 12:10 PM	13414-11: **Modeling stress birefringence and STOP analysis for injection molded polymer AR/VR systems** João Mendes-Lopes, Ansys Iberia S.L. (Spain); Stefano Guazzotti, ANSYS UK Ltd. (United Kingdom); Michael Cheng, Ansys Japan K.K. (Japan); Matthias Schlich, ANSYS Germany GmbH (Germany); Esteban Carbajal, Ansys, Inc. (USA); Chih-Hao Chen, Ansys, Inc. (Taiwan); Yuan-Jung Chang, Hsien-Sen Chiu, Yen-Chih Chen, CoreTech System Co., Ltd. (Taiwan)
12:10 PM - 1:40 PM	Lunch Break

MOSCONE WEST, ROOM 3008 (LEVEL 3)	
10:10 AM - 11:30 AM	**SESSION 6: COMBINER COMPONENTS, MATERIALS, AND PROCESSES** Session Chair: **Andreas Georgiou,** Reality Optics (United Kingdom)
Session 6 runs concurrently with Sessions 2 and 10	
10:10 AM - 10:50 AM	13414-33 • Keynote Presentation **The evolution of display materials and processes for full augmented reality** Nihar Mohanty, Heeyoon Lee, Chulwoo Oh, Pasqual Rivera, Matt Colburn, Barry Silverstein, Meta (USA)
10:50 AM - 11:10 AM	13414-29: **Design of a full color single-plate waveguide combiner with high FOV** Oksana Shramkova, Florian Maudet, Amrit Shaw, imec (Belgium)
11:10 AM - 11:30 AM	13414-31: **Active augmented reality waveguide combiner driven by electrowetting actuation** Chuan Luo, Yuzuru Takashima, Wyant College of Optical Sciences, The Univ. of Arizona (USA)
11:30 AM - 1:00 PM	Lunch Break

MOSCONE WEST, ROOM 3010 (LEVEL 3)	
11:00 AM - 12:20 PM	**SESSION 10: TRANSPARENT CMOS, µLEDS, AND OLEDS** Session Chair: **Naamah Argaman,** Meta (USA)
Session 10 runs concurrently with Sessions 2 and 6	
11:00 AM - 11:20 AM	13414-51: **45% semi-transparent CMOS backplane for advanced near-to-eye micro-displays** Uwe Vogel, Philipp Wartenberg, Bernd Richter, Stephan Brenner, Judith Baumgarten, Simone Lenk, Karsten Fehse, Dirk Schlebusch, Michael Törker, Andreas Fritscher, Johannes Zeltner, Christian Schmidt, Martin Rolle, Steffen Damnik, Mario Metzner, Josephine Muetze, Florian Schuster, Fraunhofer-Institut für Photonische Mikrosysteme IPMS (Germany)
11:20 AM - 11:40 AM	13414-52: **Ultrahigh definition and color-crosstalk-addressing AR/VR/MR displays using innovative micro-LED technology** Chih-Yuan Tsai, Yen-Chia Cheng, Hao-Sung Chiu, Ting-Chun Lee, Yu-Han Kung, Chen-Hsun Wu, Ching-Fuh Lin, Tzu-Yi Yang, Chi-Shiang Chen, National Taiwan Univ. (Taiwan)
11:40 AM - 12:00 PM	13414-53: **Angular emission and quantum-dot color conversion efficiency optimization for micro-LED AR displays using ray-tracing simulations** Shu-Lin Chen, Liang Zhang, Shuming Zhang, Runan Zhang, Ze Yuan, Yongjiang Lab. (China)
12:00 PM - 12:20 PM	13414-54: **Multiple stacked monochrome OLEDs for high-brightness micro-display applications** Johannes Zeltner, Michael Törker, Simone Lenk, Karsten Fehse, Bernd Richter, Philipp Wartenberg, Uwe Vogel, Mario Metzner, Fraunhofer-Institut für Photonische Mikrosysteme IPMS (Germany)
12:20 PM - 1:50 PM	Lunch Break

See full details and updates at **spie.org/avr** or on the **SPIE App**

CO-LOCATED EXHIBITIONS:

BiOS Expo
25–26 January 2025

Quantum West Expo
28–29 January 2025

Photonics West Exhibition
28–30 January 2025

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MOSCONE WEST, ROOM 3006 (LEVEL 3)	
1:40 PM - 2:40 PM	**SESSION 3: METROLOGY AND INSPECTION II** Session Chair: **Daniel K. Nikolov,** Univ. of Rochester (USA)
Sessions 3 runs concurrently with Sessions 7 and 11	
1:40 PM - 2:00 PM	13414-12: **Surface roughness of waveguide sidewalls measured by AFM** Marta Kocun, Oxford Instruments Asylum Research, Inc. (USA); Ren Zhong, Oxford Instruments Plasma Technology Ltd. (United Kingdom)
2:00 PM - 2:20 PM	13414-13: **Optimal measurement system for VR pancake optics** Laurent Fabre, Yura Katagiri, Photonic Lattice Inc. (Japan); Taku Koizumi, Taisuke Sato, Yoshihiko Inoue, Photonic Lattice, Inc. (Japan)
2:20 PM - 2:40 PM	13414-14: **Modified conoscopes for XR display inspection** Stephen K. Eckhardt, Matt Johantgen, Eckhardt Optics LLC (USA)
2:40 PM - 3:10 PM	Coffee Break

MOSCONE WEST, ROOM 3008 (LEVEL 3)	
1:00 PM - 3:00 PM	**SESSION 7: QUALITY, PERCEPTION, AND UTILITY** Session Chair: **Kaan Akşit,** Univ. College London (United Kingdom)
Sessions 7 runs concurrently with Sessions 3 and 11	
1:00 PM - 1:20 PM	13414-34: **MTF degradation of folded optic virtual reality and augmented reality systems due to lens/film surface quality and form error** Justin M. Foley, Bing Hao, Matt Dachel, William Gray, David J. W. Aastuen, 3M Co. (USA); Desmond Liu, 3M China (China); Susan L. Kent, 3M Co. (USA)
1:20 PM - 1:40 PM	13414-35: **Addressing the quality challenges of prescription lensing for AR/MR devices** Eric C. Eisenberg, Erin Brown, Radiant Vision Systems, LLC (USA)
1:40 PM - 2:00 PM	13414-36: **Towards zero-th order free (full field-of-view (FoV)) computer-generated holography (CGH)** Alessandro Cerioni, Marco Astarita, Paolo Pozzi, Andrea Bassi, Gianluca Valentini, Giulio Cerullo, Politecnico di Milano (Italy); Anna Cesaratto, Tommaso Ongarello, Luxottica S.r.l. (Italy)
2:00 PM - 2:20 PM	13414-37: **The usability of hyperstereo in stereoscopic imagery** Eric S. Seemiller, Eleanor O'Keefe, KBR, Inc. (USA); Marc Winterbottom, Steven Hadley, Air Force Research Lab. (USA)
2:20 PM - 2:40 PM	13414-95: **XR for productivity specifications** Oded Noam, Sightful, Inc. (Israel)
2:40 PM - 3:00 PM	13414-76: **Metasurface in-coupler for enhancing waveguide display efficiency and image quality** Pei Xiong, Jeremy Goodsell, Daniel Nikolov, Jannick Rolland, Nick A. Vamivakas, Univ. of Rochester (USA)
3:00 PM - 3:30 PM	Coffee Break

MOSCONE WEST, ROOM 3010 (LEVEL 3)	
1:50 PM - 3:30 PM	**SESSION 11: LCOS AND LBS** Session Chair: **Bharathwaj A. Narasimhan,** SAMSUNG Semiconductor, Inc. (USA)
Session 11 runs concurrently with Sessions 3 and 7	
1:50 PM - 2:10 PM	13414-55: **Addressing crosstalk in spatial-multiplexing light field displays using polarization** Wei-Shan Weng, Ao Yi Sim, National Taiwan Univ. (Taiwan); Chi-Feng Lee, PetaRay (Taiwan); Homer H. Chen, National Taiwan Univ. (Taiwan), PetaRay (Taiwan)
2:10 PM - 2:30 PM	13414-57: **Advances in MEMS-based laser scanning displays for AR glasses** Daniel Greif, Brian Wheelwright, Jacques Gollier, Zach Kehs, Meta (USA)
2:30 PM - 2:50 PM	13414-59: **Compact laser light engine enabled by visible photonic integrated circuits** Zhujun Shi, Guohua Wei, Risheng Cheng, Steven A. Hickman, Min Chul Shin, Peter Topalian, Lei Wang, Barry Silverstein, Yun Wang, Giuseppe Calafiore, Meta (USA)
2:50 PM - 3:10 PM	13414-58: **Laser to photonic integrated circuit coupling to enable consumer AR display engines** Steven A. Hickman, Guohua Wei, Risheng Cheng, Lei Wang, Dusan Coso, Oguzhan Avci, Meta (USA)
3:10 PM - 3:30 PM	13414-60: **Software-defined laser beam scanner display for high-volume augmented reality applications** Louahab Noui, Jörg Reitterer, TriLite Technologies GmbH (Austria)
3:30 PM - 4:00 PM	Coffee Break

See full details and updates at **spie.org/avr** or on the **SPIE App**

Optical Design Challenge

28 January 2025 • 6:00 PM - 7:00 PM
Moscone West, Community Stage (Level 2)

See students apply their creativity and university optics education to challenging, tangible industry specifications for today's immersive display products. A jury, comprised of industry leaders sponsoring the event and leading academic figures in AR, VR, and MR, will review submissions and a three-minute pitch by participants. Multiple prizes will be awarded throughout the competition thanks to generous sponsorships.

Award Ceremony

29 January 2025 • 8:00 AM - 8:15 AM
Moscone West, Main Stage (Level 3)

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MOSCONE WEST, ROOM 3006 (LEVEL 3)	
3:10 PM - 5:30 PM	**SESSION 4: DIFFRACTIVE WAVEGUIDES FABRICATION** Session Chair: **Hiroshi Mukawa,** Sony Semiconductor Solutions Corp. (Japan)
Session 4 will run concurrently with Sessions 8 and 12	
3:10 PM - 3:30 PM	13414-16: **Scalable AR waveguide production via integrated inkjet printing and large-area nanoimprinting techniques** Vijay Ramya Kolli, SUSS MicroTec Solutions GmbH & Co. KG (Germany), Morphotonics B.V. (Netherlands); Mariana V. Ballottin, Erhan Ercan, Jan Matthijs ter Meulen, Morphotonics B.V. (Netherlands); Joost Hermans, Fabian Kloiber, Oliver Bienek, SUSS MicroTec Solutions GmbH & Co. KG (Germany)
3:30 PM - 3:50 PM	13414-17: **Scalable mask-based patterning for polarization volume hologram (PVH) waveguide fabrication in wearable AR applications** Chulwoo Oh, Jihwan Kim, Kory Green, Shuojia Shi, Meta (USA)
3:50 PM - 4:10 PM	13414-18: **Key learnings from metalens pre-production runs covering the visible to near IR range utilizing NIL** Bradley R. Williams, Daniel Bacon-Brown, Matthew C. George, Jade I. Cockrell, Adam K. Korb, Jamie C. Stocks, MOXTEK, Inc. (USA)
4:10 PM - 4:30 PM	13414-19: **Manufacturing aware metalenses** Lawrence S. Melvin, Synopsys, Inc. (USA); Maryvonne Chalony, Synopsys, Inc. (France); Andrew M. C. Dawes, Synopsys, Inc. (USA); Bradley R. Williams, Matthew C. George, Daniel Bacon-Brown, MOXTEK, Inc. (USA); Marc Verschuuren, SCIL Nanoimprint Solutions (Netherlands)
4:30 PM - 4:50 PM	13414-20: **Inkjet coating combined with nanoimprinting for complex 3D patterns with nonlinear height increase and low residual layer** Thomas Achleitner, Johanna Rimböck, Lisa Vsetecka, Patrick Schuster, EV Group E. Thallner GmbH (Austria); Bríd Connolly, Martin Sczyrba, Andreas Frangen, Toppan Photomasks Germany GmbH (Germany)
4:50 PM - 5:10 PM	13414-21: **High-refractive index holographic materials for AR waveguide fabrication** Alejo Lifschitz, Meta (USA)
5:10 PM - 5:30 PM	13414-22: **Photoprinting of surface relief gratings in reconfigurable thin films for waveguide combiner** Alex Berdin, Arri Priimägi, Tampere Univ. (Finland)

MOSCONE WEST, ROOM 3008 (LEVEL 3)	
3:30 PM - 5:10 PM	**SESSION 8: COMBINER OPTICAL DESIGN AND SIMULATION** Session Chair: **Jannick P. Rolland,** Univ. of Rochester (USA)
Session 8 will run concurrently with Sessions 4 and 12	
3:30 PM - 3:50 PM	13414-38: **Breaking the efficiency and uniformity tradeoff in waveguide-based AR displays with polarization volume gratings** Yuqiang Ding, CREOL, The College of Optics and Photonics, Univ. of Central Florida (USA); Yuchen Gu, Southeast Univ. (China); Qian Yang, Zhiyong Yang, CREOL, The College of Optics and Photonics, Univ. of Central Florida (USA); Yuge Huang, Meta (USA); Yishi Weng, Yuning Zhang, Southeast Univ. (China); Shin-Tson Wu, CREOL, The College of Optics and Photonics, Univ. of Central Florida (USA)
3:50 PM - 4:10 PM	13414-40: **Enhancing augmented reality experience: Minimizing p-polarized light reflectance in birdbath Optics for AR glasses** Desmond Liu, 3M China (China); Bing Hao, 3M Co. (USA); David Rosen, Adam Haag, 3M Displays (USA); David J. W. Aastuen, Matt Dachel, Susan L. Kent, 3M Co. (USA); Justin M. Foley, William Gray, 3M Displays (USA)
4:10 PM - 4:30 PM	13414-41: **First-order waveguide design for AR** AYitian Ding, William Cassarly, Synopsys, Inc. (USA)
4:30 PM - 4:50 PM	13414-42: **A comparative study of global optimization algorithms in diffractive waveguide design** Mikko Vänttinen, Juuso Olkkonen, Dispelix Oy (Finland)
4:50 PM - 5:10 PM	13414-43: **Effective Mueller matrix analysis in AR systems using Ansys Zemax OpticStudio** Yihua Hsiao, Ansys Japan K.K. (Japan); Ling Zhang, Yuan Chen, Ansys (China); Takashi Matsumoto, Ansys Japan K.K. (Japan); Angel Morales, Ansys, Inc. (United States); Takashi Ishikawa, Ansys Japan K.K. (Japan)

MOSCONE WEST, ROOM 3010 (LEVEL 3)	
4:00 PM - 4:40 PM	**SESSION 12: SLM PROJECTORS** Session Chair: **Guohua Wei,** Meta (USA)
Session 12 will run concurrently with Sessions 4 and 8	
4:00 PM - 4:20 PM	13414-61: **From concept to market: Advancing SLM-based display engines for AR/VR** Hendrik Zachmann, Theresa Kunz, Sven Sassning, Mathias Schulz, Jabil Optics Germany GmbH (Germany)
4:20 PM - 4:40 PM	13414-62: **One-micron pixel metasurface spatial light modulators for advanced AR projection modules** Deepak Sharma, Rasna M. Veetil, Xinan Liang, Xuewu Xu, Hadi Shamkhi, Ramón Paniagua Domínguez, Arseniy I. Kuznetsov, A*STAR Institute of Materials Research and Engineering (Singapore)

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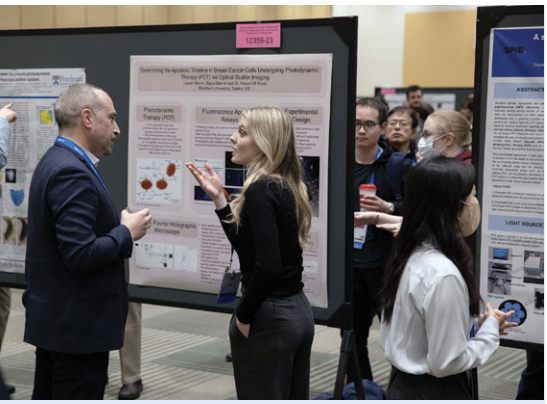

AR | VR | MR Poster Session

27 January 2025 • 5:30 PM - 7:00 PM
Moscone West, Lobby, (Level 3)

Conference attendees are invited to attend the AR | VR | MR poster session on Monday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badge to the poster session.

Poster setup:
Monday 12:00 PM - 5:30 PM

Poster authors: View poster presentation guidelines and set-up instructions:
https://spie.org/avr/poster-presentation-guidelines

LOCATION: MOSCONE WEST, LOBBY (LEVEL 3)
5:30 PM - 7:00 PM • POSTERS
13414-64: **Integration of wafer and plate-based NIL for scalable manufacturing of high-quality AR waveguides,** Brian Bilenberg, Ankit Bisht, Vladimir Miljkovic, NIL Technology ApS (Denmark); Frederik Bachhuber, SCHOTT AG (Germany); Christian Hellmann, LightTrans International GmbH (Germany); Leo Peltomaa, OptoFidelity Oy (Finland); Murat Deveci, OptoFidelity Inc. (United States); Pekka Laiho, OptoFidelity Oy (Finland); Neil Pschirer, Serpil Gonen Williams, Jeff Anderson, Pixelligent Technologies LLC (United States); Erhan Ercan, Andrea Scheidegger, Mariana V. Ballottin, Morphotonics B.V. (Netherlands)
13414-65: **Impact of wafer wedge and layout on AR waveguide image quality,** Joonas Pylväinen, OptoFidelity Oy (Finland)
13414-66: **Advanced 3D analysis of polarized stray light in pancake systems,** Jonathan Heinz, Airy Optics, Inc. (United States); Kyle Hawkins, Airy Optics Inc. (United States)
13414-67: **Content-adaptive targeting scheme for holographic displays,** Ziyang Chen, Univ. College London (United Kingdom); Dongyeon Kim, Rafal Mantiuk, Univ. of Cambridge (United Kingdom); Kaan Akşit, Univ. College London (United Kingdom)
13414-68: **Near-to-eye display based on nonlinear wave mixing in a QPM material,** Peter G. R. Smith, Goronwy L. Tawy, Corin B. E. Gawith, Rex H. Bannerman, James C. Gates, Glenn Churchill, Univ. of Southampton (United Kingdom)
13414-69: **Facilitating electrical and mechanical connection of mini- and microLED in AR/VR applications with functional adhesives,** Tim Cloppenborg, DELO Industrie Klebstoffe GmbH & Co. KGaA (Germany)
13414-70: **Technical challenges of high index substrates for wide field-of-view AR,** Barry Silverstein, Matt Colburn, Meta (United States)
13414-71: **PVH waveguides for commercial smart glasses,** Xinyue Zhang, Mengfei Wang, Nicholas J. Diorio, Lu Lu, Chulwoo Oh, Erin Clark, Taha Masood, Matthew Colburn, Barry Silverstein, Meta (United States)
13414-72: **Methods and applications of polarization management in augmented reality displays,** Ali Altaqui, Meta (United States)
13414-73: **Diffractive AR waveguide made by injection molding,** Tetsuya Zenko, Norifumi Kanai, Toshimitsu Takaoka, Dai Okamoto, Kazuya Yamamoto, Masanori Endo, Kenji Tanibe, Makoto Okada, Nalux Co., Ltd. (Japan)
13414-74: **Advanced technologies for super lightweight polymer waveguide and large FOV waveguide,** Satoshi Shiraga, Keisuke Sakai, Cellid, Inc. (Japan)
13414-75: **Wireframe holography as a new method for augmented reality projection,** Marco Astarita , Alessandro Cerioni, Andrea Bassi, Politecnico di Milano (Italy); Anna Cesaratto, Tommaso Ongarello, EssilorLuxottica Smart Eyewear Lab., Luxottica S.r.l. (Italy); Giulio Cerullo, Gianluca Valentini, Paolo Pozzi, Politecnico di Milano (Italy)
13414-77: **Filler-less and NIL-compatible ultra-high refractive index optical polymers for photonic applications,** Keiko Munechika, Carlos Pina-Hernandez, Kaito Yamada, Adam Legacy, HighRI Optics, Inc. (United States)
13414-79: **Latency and tracking performance measurements in head-mounted displays,** Murat Deveci, OptoFidelity Inc. (United States); Tommi Björk, Pekka Laiho, OptoFidelity Oy (Finland)
13414-80: **Additive full-wafer fabrication of all-inorganic metalenses, waveguides, and diffractive optics for visible and IR applications via direct nanoimprint lithography,** Dae Eon Jung, Univ. of Massachusetts Amherst (United States); Vincent J. Einck, Myrias Optics, Inc. (United States); Babak Mirzapourbeinekalaye, Alex Dawicki, Lucas D. Verrastro, Amir Arbabi, James J. Watkins, Univ. of Massachusetts Amherst (United States)
13414-81: **Simulation tool for holographic-based augmented reality eyewear,** Andrés Márquez Ruiz, José C. García-Vázquez, Juan C. Bravo, Jorge Francés, Cristian Neipp, Sergi Gallego, Sonali Chakraborty, Manuel Ortuño, Manuel G. Ramírez, Inmaculada Pascual, Augusto Beléndez, Univ. de Alicante (Spain)
13414-82: **Real-time LBS pixel timing synchronization,** Matan Naftali, Adi Baram, Gady Yearim, Ran Gabai, Meni Yehiel, Gil Cahana, Maradin Ltd. (Israel)
13414-83: **Large field-of-view in LBS systems,** Matan Naftali, Adi Baram, Ran Gabai, Meni Yehiel, Gil Cahana, Maradin Ltd. (Israel)
13414-84: **Small and scalable laser source for AR glasses by flip chip of bare laser diode in silicon nitride PIC technology,** Douwe H. Geuzebroek, Brilliance B.V. (Netherlands); Raimond Frentrop, Ronald Dekker, LioniX International BV (Netherlands); Edwin Drost, Brilliance B.V. (Netherlands); Floris Falke, LioniX International BV (Netherlands); Anneirudth Sundararajan, Anne Leenstra, PHIX Photonics Assembly (Netherlands)
13414-85: **Dimensional stability in UV imprint resins of working stamp for producing augmented reality waveguides: from a master mold to final products,** Taigo Akasaki, Takeshi Osaki, Risa Tanaka, Toyo Gosei Co., Ltd. (Japan)

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13414-86: **Expanding perception: repurposed passthrough VR goggles for UV-NIR visualization in optical research,** Zhongmin Zhu, Brianna S. Hajek, Ivan Ren, Haocheng Yang, Univ. of Illinois (United States); Viktor Gruev, Carle Illinois College of Medicine, Univ. of Illinois (United States), Beckman Institute for Advanced Science and Technology (United States)

13414-87: **Enhancing search-and-rescue operations using real-time face detection with holographic waveguide-based augmented reality system,** Rajveer Kaur, Shivalika Goyal, Amit Laddi, Raj Kumar, CSIR - Central Scientific Instruments Organisation (India), Academy of Scientific and Innovative Research (AcSIR) (India)

13414-88: **Aspheric and freeform metrology solutions for production control of virtual reality head-mounted displays,** Richard Pultar, Thomas Dresel, Clayton Kingsley, Mackenzie Massey, Erin McDonnell, Zygo Corporation (United States)

13414-89: **Demonstration of unified metalens workflow through design and manufacture of example eye-tracking meta-optic,** Daniel Bacon-Brown, MOXTEK, Inc. (United States); Thibault Leportier, Ansys, Inc. (United States); Bradley R. Williams, Matthew C. George, MOXTEK, Inc. (United States); Sanjay Gangadhara, Dylan McGuire, Ansys, Inc. (United States)

13414-91: **Inspection solutions for transparent substrate materials for enabling AR and smart glass display technology,** Tithi Desai, Raja Muthinti, Meta (United States)

13414-92: **Critical dimension metrology for diffractive waveguides with liquid crystal polymer gratings,** Ali Altaqui, Xinyue Zhang, Mengfei Wang, Nick Diorio, Lu Lu, Michael Escuti, Chulwoo Oh, Meta (United States)

13414-93: **Optimized displays for emerging emissive applications: balancing cost and performance,** Reza Chaji, VueReal Inc. (Canada)

13414-94: **Grating-coupled AR waveguides made by contact-mode lithography at Inprentus,** Peter Abbamonte, Univ. of Illinois (United States)

13414-96: **Gain design flexibility for AR/VR glasses by optimization of the laser cutting process,** Sandra Hoehm, Hassan Ali, Elisabeth Rosier, Corning Laser Technologies GmbH (Germany)

13414-97: **Applications of lithography in nano- and micro-photonics,** Kehan Tian, Goertek Optical Technology Co., Ltd. (China)

13414-98: **A rapid optical-based weight measuring system for mobile vehicle,** Jing Yuan, Guangxian Dong, Lifang Wang, Ying Wu, Weixin Wu, Chongqing Institute of Metrology and Quality Inspection (China)

13414-99: **Self-aligned double-sided grating diffractive waveguide with enhanced efficiency,** Lingyi Wang, Yuxuan Zhao, Lijiang Zeng, Tsinghua Univ. (China)

13414-100: **Waveguide couplers based on holograms recorded in high environmentally compatible photopolymer comparison with other materials,** Sergi Gallego Rico, Joan Sirvent-Verdú, Juan Carlos Bravo Francés, Emilio J. Mena, José Carlos García-Vázquez, Jesús Fernández, Andrés Márquez Ruiz, Manuel Mora, Univ. de Alicante (Spain)

13414-101: **The next generation of DPI eye trackers for lightweight XR,** Boris Greenberg, VoxelSensors (Belgium)

13414-102: **The role of optical coatings and trimming innovations for AR/VR/MR,** Daniel de Sá Pereira, Bühler Alzenau GmbH (Germany)

13414-103: **Full-color chip-to-free-space nanophotonic scanning waveguide display at 68 Million spots/(s-mm^2),** Y. Henry Wen, Matthew Zimmermann, Matthew Saha, Kevin Palm, Andrew Greenspon, Mark Dong, Genevieve Clark, The MITRE Corp. (United States); Andrew Leenheer, Sandia National Labs. (United States); Gerald Gilbert, The MITRE Corp. (United States); Matt Eichenfield, The Univ. of Arizona (United States), Sandia National Labs. (United States); Dirk Englund, Massachusetts Institute of Technology (United States)

13414-104: **SCIL: Advanced precision in slanted gratings, overlay alignment, and high refractive index imprint materials,** Jeroen Visser, Marc Verschuuren, SCIL Nanoimprint Solutions (Netherlands)

13414-105: **Contact lens with moiré labels for precise eye tracking,** Ilya P. Radko, Ilya M. Fradkin, Roman V. Kirtaev, Mikhail S. Mironov, Dmitriy V. Grudinin, Alexander A. Marchenko, Marina M. Chugunova, Valentin R. Solovey, Alexander V. Syuy, Alexey V. Arsenin, Valentyn S. Volkov, XPANCEO Research on Natural Science LLC (United Arab Emirates)

13414-106: **Reducing eye glow in augmented reality waveguide through topological metagrating design,** You Chia Chang, Chuan-En Lin, Hsueh-Li Liu, Wen-Teng Liang, Ya-Chun Huang, Peichen Yu, National Yang Ming Chiao Tung Univ. (Taiwan)

13414-107: **Metalens integrated Maxwellian view display for augmented reality glasses,** Wen-Teng Liang, I-Hsuan Chuang, Hsueh-li Liu, Ya-Chun Huang, You-Chia Chang, Peichen Yu, National Yang Ming Chiao Tung Univ. (Taiwan)

13414-108: **Expanding field-of-view for XR technology: 120-140 degrees,** Edward Strul, EyeJets (Israel)

13414-109: **Antireflective coatings for plastic optics with high angular tolerance based on nanostructuring technology AR-plas2,** Astrid Bingel, Friedrich Rickelt, Ulrike Schulz, Sven Schröder, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

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The Moscone West Center | San Francisco, California, USA

Conference sessions: 27 January 2025
Main Stage sessions: 28-29 January 2025
Exhibition: 28-29 January 2025
Courses: 25-30 January 2025

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28 January 2025 . . 10:00 AM–5:00 PM
29 January 2025 . . .10:00 AM–5:00 PM
Moscone Center, Level 3 West

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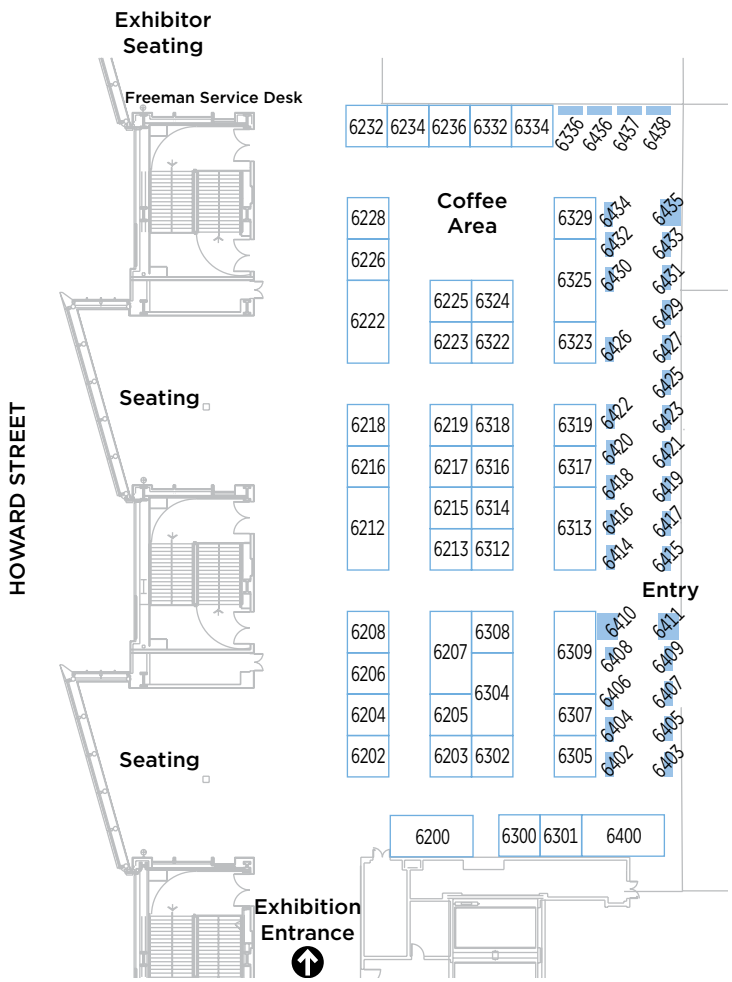

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Obsidian Sensors, Inc.
Octave Photonics LLC
OEwaves, Inc.
Officina Stellare S.p.A.
OFS
Ohara Corp.
OHTAMA Co., Ltd.
Omega Optical, LLC
Omicron Laserage Laserprodukte GmbH
Openwater
Optec S.p.A.
Opterro, Inc.
Optical Engines, Inc.
Optical Perspectives Group, LLC
Optical Support, Inc.
Optical Systems Design, LLC
Opticho Inc., Ltd.
Opticology, Inc.
OptiColor, Inc.
Optics Technology, Inc.
Optics Valley
OptiGrate – IPG Photonics
Optikos Corp.
Optikron GmbH
Optimax Systems, Inc.
OptiPro Systems, LLC
OptiPulse, Inc.
Optiwave Systems Inc.
Opto Diode Corp.
Opto-Alignment Technology, Inc.
Optogama UAB
Optogration Inc.
Opto-Line International, Inc.
OPTOMAN
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Optonique
Optoprofiler LLC
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OptoTech Optikmaschinen GmbH
optX Imaging Systems
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Oxford Instruments
Oxxius SA
OZ Optics Ltd.
Pacific Laser Equipment
Pacific Lasertec, LLC
Pantec Biosolutions AG
Park Optics
Pavilion Integration Corp.
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Perkins Precision Developments, LLC
PFG Precision Optics, Inc.
PHASICS Corp.
PHASICS S.A.
PHIX Photonics Assembly
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Schneider Optics, Inc.
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SCHOTT North America, Inc.
SCI Engineered Materials
scia Systems GmbH
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Sensofar-Tech, S.L.
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Shanghai PreciLasers Technology Co., Ltd.
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Shenzhen Xinghan Laser Technology Co., Ltd.
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Teledyne Imaging Sensors
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Teledyne Lumenera
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Teledyne Princeton Instruments
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TruTag Technologies, Inc.
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Turning Point Lasers Corporation
TwinStar Optics, Coatings & Crystals, Inc.
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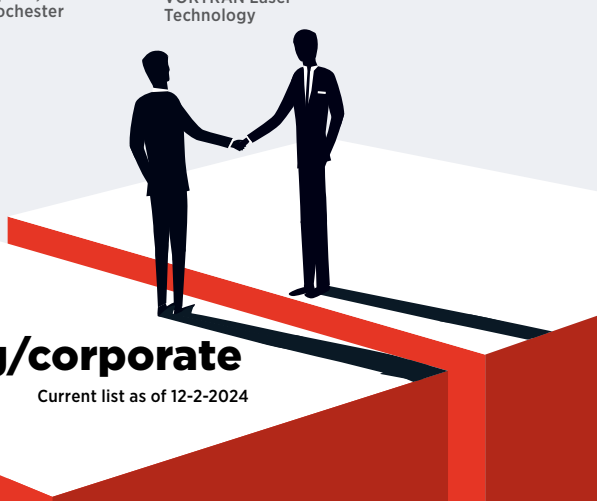

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Current list as of 12-2-2024

Acceptance of policies and registration conditions

The following policies and conditions apply to all SPIE events, both online and in person. As a condition of registration, you will be required to acknowledge and accept the SPIE policies and conditions contained herein.

SPIE has established a confidential reporting system for all SPIE event participants to raise concerns about possible unethical or inappropriate behavior within our community. When at an SPIE event, you may contact any SPIE staff with concerns. If you feel that you are in immediate danger, please dial the local emergency number for police intervention.

Agreement to hold harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Be well agreement

You acknowledge that attending an event involves some risk of exposure to illness. You voluntarily assume this risk and agree not to hold SPIE or its affiliates liable for any illness you may contract. You also agree not to attend the event if you feel ill or have reason to suspect you may have a communicable illness.

SPIE will provide hand sanitizer locations and disposable face masks upon request.

Anti-harassment policy

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated. This policy applies to all locations and situations where SPIE business is conducted and to all SPIE-sponsored activities and events.

Read complete policy:
https://spie.org/about-spie/the-society/policies-and-reporting

SPIE Conferences app messaging policy

The SPIE Conferences app supports attendee-to-attendee messaging to facilitate professional networking among meeting participants. This feature should not be used to push high-volume solicitations, and messaging will be disabled for attendees who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use via the app reporting feature. SPIE will also monitor for high-volume patterns suggesting improper use.

SPIE Conferences app connect feature

The connect feature in the SPIE Conferences app is a personal networking tool that allows individuals to share their contact information with other attendees via their phones while using the SPIE app. This tool should not be used for systematic scanning of badges for managing sales leads. Inappropriate use is a violation of event policy.

SPIE Conferences app lead retrieval feature

The lead retrieval feature in the SPIE Conferences app is a lead generation tool that allows attendees to share their contact information with SPIE exhibitors. Exhibitor representatives using the lead retrieval app may scan attendee badges in the exhibition or supporting company events after receiving permission from an attendee. It should not be used in the technical conference area. The lead retrieval feature will be disabled for exhibitor representatives who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use by notifying staff or contacting support via the help link in the app.

Attendee registration and admission policies

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry of or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Capture and use of a person's image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness, including incidental capture of any individuals in your household or workplace, by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE purpose. By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify, and hold harmless SPIE from and against any claims, damages, or liability arising from or related to the use of the images, recordings, or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion, or use in composite form that may occur or be produced in taking, processing, reduction, or production of the finished product, its publication or distribution.

Code of conduct

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

Read complete code:
https://spie.org/about-spie/the-society/policies-and-reporting

Event and course cancellation by SPIE

If for some unforeseen reason, SPIE should have to cancel a course or an entire event, processed registration fees for the canceled activity will be refunded to registrants. Registrants will be responsible for the cancellation of travel arrangements or housing reservations and the applicable fees.

Family-friendly policy

CONFERENCE EVENTS: all conference technical and networking events require a badge for admission. Registered attendees may bring children with them if they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

EXHIBITION HALL: everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

Identification requirement

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials. Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

For online events, SPIE requires individuals to register with their legal identity.

Laser-pointer safety policy

SPIE events are subject to the applicable laser safety rules and regulations of the host location. SPIE supplies industry-standard Class 2 presentation laser pointers for all conference and other meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers. The use of a personal laser pointer represents the user's acceptance of liability for any damage or injuries to the presenter or others.

No smoking policy

Attendees will observe all non-smoking regulations that are publicly posted by the facilities used by the event.

Online commenting policy

SPIE moderates all comments posted in an online event. We encourage robust discussion, the exchange of scientific ideas, and the sharing of multiple, diverse perspectives. We expect the discussion to be consistent with the norms of scholarly research community interactions at events. Online event participants should report any comments or content that falls short of those community norms. We will remove comments, content, or people that are considered inappropriate by SPIE standards or that:

- are defamatory, libelous, obscene, indecent, abusive, or threatening to others
- infringe the copyright, trademark, or other rights of a third party
- upload viruses or are a cybersecurity hazard
- are off-topic or inappropriately commercial in nature
- are in violation of any applicable laws or regulations

Payment policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks, and wire transfers. Onsite registrations can also be paid with cash.

Recording policy

CONFERENCES AND POSTER SESSIONS: audio and video recordings are prohibited without prior written consent of SPIE and the presenter. Consent forms are available at Speaker Check-in, SPIE Registration, or the Chair Services Desk. Individuals not complying with this policy will be asked to surrender their recording media and leave the conference room. Refusal to comply with such requests is grounds for expulsion from the event. Please see the SPIE code of conduct.

COURSES: audio and video recordings are prohibited without explicit permission from SPIE and the instructor. Individuals not complying with this policy will be asked to surrender their recording media and leave the classroom. Refusal to comply with such requests is grounds for expulsion from the event.

EXHIBITION: attendees may not record interviews on the exhibition floor nor record or photograph exhibitor booth displays and/or products without explicit permission from SPIE and on-site company representatives. Consent forms are available at Exhibitor Assistance. Individuals not complying with this policy will be asked to surrender their recording media and leave the exhibition hall. Refusal to comply with such requests is grounds for expulsion from the event.

Unauthorized solicitation

Unauthorized solicitation in the exhibition hall is prohibited. Any non-exhibiting organization observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Unsecured items

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless internet service

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other kinds of computer damage.

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Tel: +44 29 2089 4747 • info@spieeurope.org • www.SPIE.org

NOTES

SPIE.

SPIE is the international society for optics and photonics. We bring engineers, scientists, students, and business professionals together to advance light-based science and technology. Over the past five years, we have invested more than $25 million in the international optics community through our advocacy and support, including scholarships, educational resources, travel grants, endowed gifts, and public-policy development.

GOLD OPEN ACCESS

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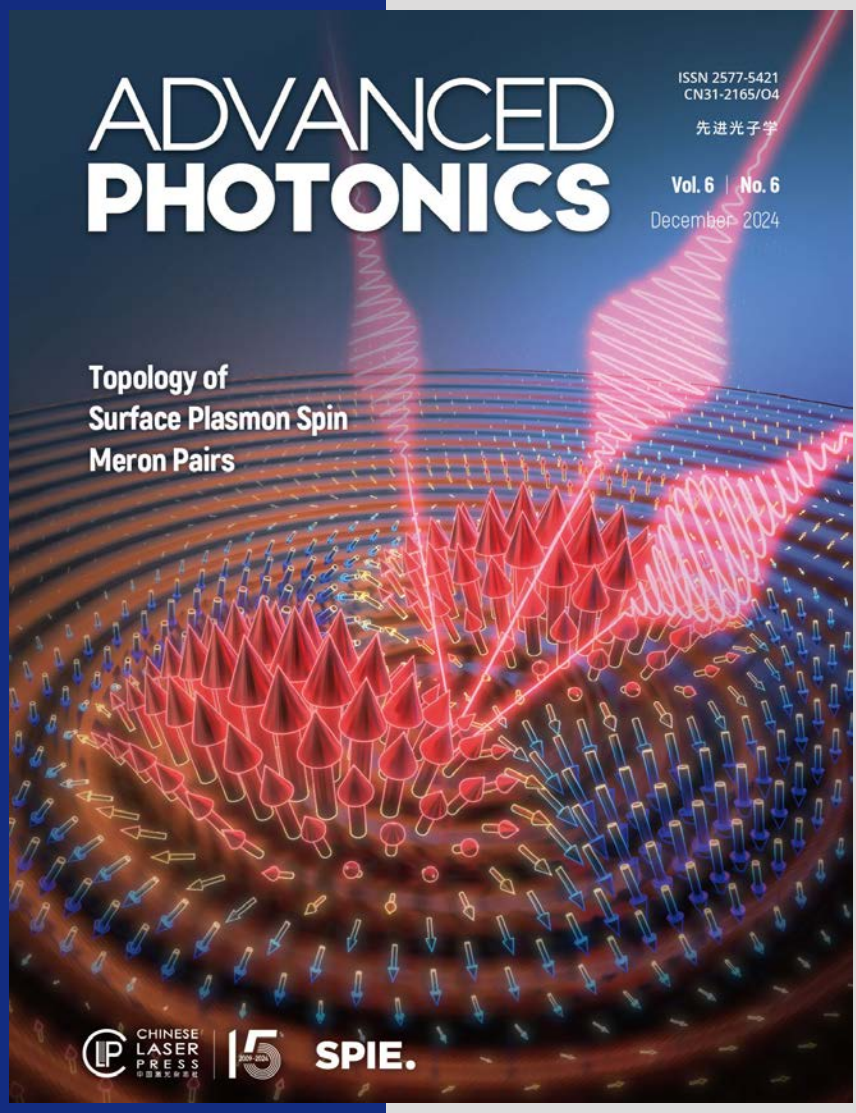
Advanced Photonics is a highly selective, open access, international journal publishing innovative research in all areas of optics and photonics, including fundamental and applied research.



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CO-PUBLISHED BY:
CHINESE LASER PRESS 中国激光杂志社
SPIE.

6 Issues/Year; Online from Vol. 1 (2019); ISSN: 2577-5421
Articles are published on **SPIEDigitalLibrary.org** and **www.researching.cn/ap**