

# PROCEEDINGS OF SPIE

## ***Fifth International Conference on Applied Photonics and Electronics (INCAPE 2025)***

**Nurul Izza Mohd Nor**  
**Nurjuliana Juhari**  
**Hasnizah Aris**  
**Shazlina Johari**  
**Muammar Mohamad Isa**  
*Editors*

**6 October 2025**  
**Penang, Malaysia**

*Organized by*  
Universiti Malaysia Perlis (Malaysia)

*Co-organized by*  
Center of Excellence for Micro System Technology (Malaysia)

*Sponsored by*  
iSmartUrus Sd Bhd (Malaysia)

*Supported by*  
Penang Convention & Exhibition Bureau (Malaysia)  
Penang State EXCO Office for Tourism and Creative Economy (Malaysia)

*Published by*  
SPIE

**Volume 14059**

Proceedings of SPIE 0277-786X, V. 14059

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 *Fifth International Conference on Applied Photonics and Electronics (INCAPE 2025)*, edited by Nurul Izza Mohd Nor, Nurjuliana Juhari, Hasnizah Aris, Shazlina Johari, Muammar Mohamad Isa, Proc. of SPIE 14059, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9798902320753

ISBN: 9798902320760 (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 © 2026 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*

## FIFTH INTERNATIONAL CONFERENCE ON APPLIED PHOTONICS AND ELECTRONICS (INCAPE 2025)

---

- 14059 02 **Design of high gain folded cascode operational amplifier using 130 nm CMOS technology** [14059-7]
- 14059 03 **Rain attenuation analysis for millimeter-wave radar foreign object debris detection at an active runway in tropical regions** [14059-9]
- 14059 04 **Disturb coupling faults coverage assessment by 13N march AZ algorithm for memory BIST** [14059-13]
- 14059 05 **Hybrid BIST and test point insertion for testability improvement** [14059-15]
- 14059 06 **Concurrent dual-band CMOS low noise amplifier with forward body bias for gain enhancement in WLAN front-ends** [14059-19]
- 14059 07 **Comparative study on the structural and morphological properties of ZnO thin films prepared by different deposition techniques** [14059-1]
- 14059 08 **Design and analysis of film bulk acoustic wave resonator with potential for gas sensing applications** [14059-3]
- 14059 09 **Simulation and analysis of film bulk acoustic wave resonator with different materials in gigahertz frequency ranges** [14059-4]
- 14059 0A **Analysis of salinity-induced turbulence effect on underwater optical wireless communication channel performance** [14059-10]
- 14059 0B **A symmetrical planar spiral coil-based wireless power transfer system with embedded split-ring resonator** [14059-12]
- 14059 0C **Enhanced performance of DSSCs via layered co-sensitization using anthocyanin dyes from *Oxalis Triangularis* and Mulberry** [14059-16]
- 14059 0D **Effect of acidified solvents on Roselle anthocyanin as light-harvesting material for DSSCs** [14059-21]
- 14059 0E **Dielectric resonator-based tunable impedance matching networks for microwave amplifiers: a comparative review** [14059-22]
- 14059 0F **Wideband 90° hybrid coupler design on RO5880 and RO4003C substrates for six-port reflectometer applications** [14059-23]

- 14059 OG **Design CPW wearable antenna with different substrate materials of felt, jeans, and polyester for WBANs applications** [14059-24]
- 14059 OH **Review on modeling of normally Off GaN HEMTs for high-power and high-temperature applications** [14059-25]
- 14059 OI **Impact of HfO<sub>2</sub> on the electrical performance of AlGaIn/GaN MOS-HEMTs** [14059-27]
- 14059 OJ **Degradation and stability analysis of crude natural dyes from *Piper Betle* and *Clitoria Ternatea* using UV-Vis spectroscopy** [14059-28]
- 14059 OK **Natural language understanding-based chatbot for Faraid inheritance calculation** [14059-17]
- 14059 OL **Performance evaluation of secondary optical elements for light concentrators in daylighting applications** [14059-8]
- 14059 OM **Collision detection module of compact photon array using deep submicron technology node** [14059-11]
- 14059 ON **Performance analysis of fiber Bragg grating sensors in low-frequency vibration applications** [14059-14]
- 14059 OO **Performance evaluation of a nonlinear loop-based multiwavelength laser incorporating SOA for tunable WDM applications** [14059-18]
- 14059 OP **Comparative study of multiwavelength Brillouin fiber laser for single and double nonlinear amplifying optical loop mirror** [14059-26]
- 14059 OQ **Optical fiber sensor for nondestructive detection of glucose adulteration in honey** [14059-29]