Special Session III

Special Session Basic Information:

专栏题目 **Session Title**	中文：基于数字模型的光电器件失效机理分析与可靠性评价 英文：Digital Model-Based Failure Mechanism Analysis and Reliability Evaluation of Optoelectronic Devices

专栏介绍和征稿主题
Introduction and topics

中文：激光器、探测器、调制器等代表性光电器件快速发展，广泛应用于星链通信、数据中心、人工智能和新型显示等战略新兴产业，其稳定性和可靠性直接决定着整个系统的可靠运行和使用寿命，对国民经济和公共安全具有重要影响。随着应用环境的复杂化和功能要求的提升，光电器件面临着更为严峻的可靠性挑战，失效机理分析与可靠性评价已成为光电器件推广应用中的关键技术。数字孪生、多物理场仿真和智能算法的应用，使得可以在虚拟环境中预测器件性能劣化趋势。这些数字化技术将为光电器件可靠性相关研究带来变革。本会场将展示从物理机制到工程应用的相关最新研究成果，推动光电器件由“事后试验评价”向“事前模型预测”的可靠性工作范式转型。参会者将深入探讨数字化工具如何赋能可靠性设计、测试与运维，为高可靠光电子系统提供理论支撑与解决方案。

英文： Optoelectronic devices, such as lasers, detectors, and modulators, are developing rapidly and are extensively deployed in emerging industries such as Starlink communications, data centers, artificial intelligence (AI), and next-generation display technologies. Suffering from severe application environments, optoelectronic devices face increasingly reliability challenges to satisfy escalating functional demands. Thus, failure mechanism analysis and reliability assessment have emerged as pivotal techniques for widespread adoption of optoelectronic devices. The integration of digital twin, multi-physics simulation, and intelligent algorithms enables the evaluation of performance degradation in digital environments, heralding a transformative tend in reliability-related research. This session will present cutting-edge research including fundamental physical mechanisms and practical engineering applications, driving a procedure transition in reliability practices from "post-hoc test-based evaluation" to "pre-emptive model-based prediction." Participants will communicate in depth how digital tools enhance reliability design, testing, and lifecycle management, providing both theoretical and practical solutions for high-reliability optoelectronic devices.

Special Session Chair(s):

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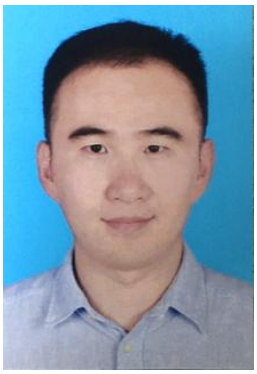
Organizer’s Brief Biography

中文：牛皓，高级工程师，2020 年在哈尔滨工业大学获电气工程专业博士学位，曾于 2016 年 9 月-2017 年 10 月在丹麦奥尔堡大学能源系联合培养博士生。目前就职于工业和信息化部电子第五研究所电子元器件可靠性物理及其应用技术重点实验室。主要研究方向为元器件可靠性数字化试验、退化建模、可靠性评估。

英文：Hao Niu received the Ph.D. degree in electrical engineering in 2020 from Harbin Institute of Technology, China. He was also a guest Ph.D. student with Department of Energy Technology, Aalborg University, from September 2016 to October 2017. He currently works at State Key Laboratory of Science and Technology on Reliability of Electronic Component, China Electronic Product Reliability and Environmental Testing Research Institute from 2021, as a senior engineer. His research interests include digital reliability assessment, degradation modeling and reliability evaluation for electronic devices and system.



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Organizer's Brief Biography

中文：李树旺，高级工程师，2017 年在中国科学技术大学光学专业博士学位。目前就职于工业和信息化部电子第五研究所电子元器件可靠性物理及其应用技术重点实验室。主要研究方向为光纤传感器件失效分析、加速寿命试验、数字化建模、可靠性评估。

英文：Shuwang Li received the Ph.D. degree in Optics in 2017 from University of Science and Technology of China. He currently works at State Key Laboratory of Science and Technology on Reliability of Electronic Component, China Electronic Product Reliability and Environmental Testing Research Institute from 2017, as a senior engineer. His research interests include failure analysis, accelerated testing, digital modeling, and reliability assessment of optical fiber sensor device

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中文：廖文渊，高级工程师，2020 年在中科院半导体所获微电子学与固体电子学专业博士学位，目前就职于工业和信息化部电子第五研究所电子元器件可靠性物理及其应用技术重点实验室。主要研究方向为半导体激光器、铌酸锂调制器等光电子器件失效机理及可靠性评价技术。

英文：Wenyuan Liao received the Ph.D. in microelectronics and solid-state electronics from the Institute of Semiconductors, Chinese Academy of Sciences in 2020. He currently works at State Key Laboratory of Science and Technology on Reliability of Electronic Component from 2020, as a senior engineer. His main research interests include failure mechanism and reliability evaluation technology of optoelectronic devices such as semiconductor lasers and lithium niobate modulators.

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中文：赖灿雄，正高级工程师，2010 年在中山大学获凝聚态物理专业博士学位。目前就职于工业和信息化部电子第五研究所电子元器件可靠性物理及其应用技术重点实验室。主要研究方向为光电器件失效分析、加速寿命试验和可靠性评估。

英文：Canxiong Lai received the Ph.D. degree in Condensed Matter Physics in 2010 from Sun Yat-sen University, China. He currently works as technical chief of optoelectronic device reliability at State Key Laboratory of Science and Technology on Reliability of Electronic Component, China Electronic Product Reliability and Environmental Testing Research Institute. His research interests include failure analysis, accelerated testing, and reliability evaluation for optoelectronic devices