

The Global LiFi Innovation and Industry Seminar

Hosted by the International SSL Alliance (ISA)

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Dr. Jianlin Cao

**President of ISA,
Deputy Director, Subcommittee of Education,
Science, Culture, Health and Sports of National
Committee of the National Committee of the
Chinese People's Political Consultative
Conference,
Former Vice Minister, Ministry of Science and
Technology, China**

**曹健林 博士
ISA 主席
全国政协教科文卫体委员会副主任
中国科技部原副部长**

Welcome Address

致欢迎辞



Prof. Harald Haas

**Distinguished Professor, University of
Strathclyde, UK**

“LiFi – The Catalyst for New LED Applications” “LiFi - LED 新应用之催化剂”

Abstract

We will review the wider opportunity of light-based wireless communication. Moving on, we discuss existing technical challenges in relation to light sources and detectors for LiFi. We highlight some recent research highlights and address general misconceptions. Finally, we will share our view on the commercial prospects of LiFi.

<p>Chairman of ISA LiFi Committee Member of ISA Board of Advisors</p> <p>哈拉尔德·哈斯 教授, 英国斯特拉斯克莱德大学 ISA LiFi 委员会主席 ISA 顾问委员会成员</p>	
<p>Harald Haas FREng FRSE FIEEE FIET is a Distinguished Professor and the Director of the LiFi Research and Development Centre at the University of Strathclyde. He set up and co-founded pureLiFi Ltd which it serves as Chief Scientific Officer. He has authored 550 conference and journal papers and holds 45 patents. He has been among the Clarivate/Web of Science highly cited researchers between 2017-2020. In 2016, he received the Outstanding Achievement Award from the International Solid State Lighting Alliance, and in 2019 he was recipient of IEEE Vehicular Society James Evans Avant Garde Award.</p>	
 <p>Prof. Fengyi Jiang</p> <p>Academician of Chinese Academy of Science Nanchang University, China</p> <p>江风益 教授 中国科学院院士 南昌大学</p>	<p>“Innovation in silicon substrate LED technology for LiFi” “用于 LiFi 技术的硅衬底 LED 技术创新”</p> <p><i>Abstract</i> <i>With unique structure and special features, LEDs on silicon substrate show many advantages for VLC applications. To further improve the VLC performance of silicon substrate LEDs, innovations from the aspects of epitaxy growth, chip fabrication and device packaging have been made.</i></p>
<p>Fengyi Jiang is Professor of Nanchang University. With research interest focusing on GaN/Si LED technologies, Professor Jiang is the first one who developed efficient GaN/Si blue LEDs and realized commercialization, and awarded the 1st Prize of National Technology Invention Awards of China in 2015. Recently, Jiang successfully made a breakthrough on high-efficient yellow LEDs and comprehensively improves the efficiency of LEDs in visible light range to a high level. Professor Jiang is an academician of Chinese Academy of Sciences and the Vice President of Nanchang University.</p>	
	<p>“High-Speed VLC for Long-Distance Applications Using a GaN-Based Series-Biased Micro-LED Array” “Micro-LED 矩阵在超高速可见光通信中的应用”</p> <p><i>Abstract</i> <i>Micron-sized gallium nitride LEDs have been shown to have high modulation bandwidths for</i></p>



Prof. Martin Dawson

Distinguished Professor, University of Strathclyde, UK

马丁·道森 教授
英国斯特拉斯克莱德大学

optical wireless communications, however the optical power from each micro-LED is limited to typically a few mW. Here we describe operating micro-LED pixels in series on a single chip, which creates a cluster device retaining high modulation performance but permitting scaling of optical output power. This format has advantageous implications for combining optical wireless communications and lighting functions and operating in a range of challenging environments.

Martin Dawson is Distinguished Professor and Director of Research at the University of Strathclyde’s Institute of Photonics, which he helped establish 25 years ago. He is also, since 2012, the Head of the UK’s only Fraunhofer research centre, the Fraunhofer Centre for Applied Photonics. Martin is a pioneer of micro-LED technology and over the past 20 years has scoped out much of the associated field of research, from fundamentals to applications. He holds fellowships of IEEE, OSA, Institute of Physics and the Royal Society of Edinburgh, and he co-founded mLED Ltd, a micro-LED spin-out company acquired by Facebook/Oculus in 2016.



Prof. Zhengyuan Xu

University of Science and Technology of China

徐正元 教授
中国科学技术大学

“Petahertz Communication for 6G”
“面向 6G 的 Peta 赫兹通信 “

Abstract

With rapid deployment of 5G mobile networks, the research community has initiated discussions on the enabling technologies for 6G. This talk will introduce a new unified Petahertz Communication (PetaCom) framework to harmonize the existing fragmented infrared, visible light as well as ultraviolet subbands into the Petahertz (PHz) band for extremely bandwidth-thirsty applications. It particularly focuses on PetaCom channel and system aspects, connections with existing- optical wireless /visible light /free space optical - communications, and PetaCom applications and challenges.

Zhengyuan XU is a tenured professor at University of Science and Technology of China (USTC) after his tenured professor appointments at University of California at Riverside and Tsinghua University respectively. He was a Founding Chair of IEEE GLOBECOM Workshop on Optical Wireless Communications in 2010, Founding Director of the multi-campus Center for Ubiquitous Communication by Light (UC-Light), University of California, and Founding Director of Wireless-Optical Communications Key Laboratory of Chinese Academy of Sciences. He was a distinguished

expert and chief scientist of the National Key Basic Research Program of China. His research focuses on optical wireless communications, mobile networking, wireless big data, sensing, positioning and navigation. He has published over 380 technical papers, co-authored 3 books, and been on the Elsevier annual list of Most Cited Chinese Researchers since 2014.



Prof. Boon S. Ooi

**Professor and Chair of Electrical Engineering,
King Abdullah University of Science and
Technology (KAUST)**

布恩·欧 教授
沙特国王科技大学电子工程学院院长

**“Laser-based Visible Light Communication”
“基于激光的可见光通信”**

Abstract

Visible light communication (VLC) has been a topic of intense research after the idea was proposed in 2011. At KAUST, we are developing Gbps laser-based VLC. Laser diodes do not suffer efficiency droop at high current densities. This allows for the design of lamps using a single, small footprint, light-emitting chip operating at high current densities. In this talk, I will focus on the recent progress of high-speed optoelectronics and communication systems for multiple Gbps VLC links.

Boon S. Ooi is Professor of Electrical and Computer Engineering at KAUST. His research interest includes the study of III-Nitride based materials and devices, VLC and underwater wireless optical communication. He is Senior Editor of IEEE Photonics Journal and Associate Editor of Optics Express. Ooi is a Fellow of the U.S. National Academy of Inventors (NAI), OSA, SPIE and IoP (UK).



Prof. Ming Chen

Southeast University, China

陈明 教授
东南大学

**“Research on the VLC theory and technology in
NCRL/SEU of China”**

“VLC 理论与技术研究”

Abstract

Researches on the visible light communications (VLC) in National Mobile Communications Research Laboratory of Southeast University (NCRL/SEU) are introduced. In theoretical aspect, the capacity results of VLC systems are obtained and some improved OFDM-based and MIMO-based modulation schemes are proposed. In technological aspect, some test systems are developed by the support of several national science and technology projects, an ongoing National Key Research and Development Project will be introduced in detail.

After received his Ph. D. degrees in Nanjing University of China in 1996, he came to National Mobile Communications Research Laboratory of Southeast University in Nanjing to be a Lecturer. From April of 1998 to March of 2003, he has been an Associate Professor, and from April of 2003 to now he has been a Professor at the laboratory. His research interests include baseband signal

processing, radio resource allocation and network planning of mobile communication systems. By now, he has directed and completed more than 40 research projects and published more than 300 journal papers in the role of author and coauthor.



Prof. Davies William de Lima Monteiro

**PhD - OptMA_lab,
Universidade Federal de Minas Gerais (UFMG),
Brazil**

**戴维斯·蒙特里奥 教授
巴西米纳斯吉拉斯州大学**

“Towards an energy autonomous module for IoT using LiFi/VLC”

“通过使用可见光通信技术实现物联网能源自给模型”

Abstract

The presentation intends to share a glimpse of some of the activities on LiFi in Brazil, namely, at the OptMA_lab, at the Federal University of Minas Gerais, Brazil, where we have been targeting the development of a self-powered electronic IoT module with VLC data exchange. Our R&D strategy involving custom-design integrated components will be discussed, as well as initial attempts to implement international standards and some visionary ideas towards the integration of LiFi with the human body.

Davies William de Lima Monteiro is professor at the Department of Electrical Engineering of the Federal University of Minas Gerais, in Brazil. He coordinates the Laboratory for Optronics and Microtechnology Applications. His current professional interests are multidisciplinary and include Microelectronics, LiFi/VLC, Image Sensors and Ophthalmic Optics. He has been Director to the Brazilian Microelectronics Society, has served as member of the National Research Council, of the Microelectronics Society Council and of the Brazilian Photonics and Optics Society Council.



Professor Nan Chi

**Director of the Department Communications
Science and Engineering,
Fudan University, China**

迟楠 教授

“High Speed Visible Light Communication Technology”

“高速可见光通信的研究进展”

Abstract

Visible light communication (VLC) is expected to act as an alternative candidate in next-generation wireless optical communication. AI algorithms are potential tools to apply in VLC system and improve its transmission performance. In this report, we will summarize the latest progress on the application of machine learning in VLC system and verify its excellent ability for future high-speed and high-quality VLC system.

复旦大学通信科学与工程系主任

Professor Nan Chi is with School of Information Science and Engineering, Fudan University, China. She received the BS degree and PhD degree in electrical engineering from Beijing University of Posts and Telecommunications, China. She is the author or co-author of more than 300 papers and has been cited more than 8100 times. She has been awarded as The National Science Fund for Distinguished Young Scholars, the New Century Excellent Talents Awards from the Education Ministry of China, Shanghai Shu Guang scholarship. Her current research interests include advanced modulation format, optical packet/label switching, optical fiber communication and visible light communication. She is a fellow of the OSA.



Professor Vladislav Bougrov

**Director of School of Photonics, Professor,
ITMO University, Russia**

布格洛夫 教授
俄罗斯圣彼得堡国立信息技术机械与光
学大学光子学学院院长

“IEEE 802.11 compatible Li-Fi systems with heterodyne transceivers”

“兼容 IEEE 802.11 含外差收发器的 Li-Fi 系统”

Abstract

We present our recent developments and nearest plans on visible light communication (VLC) systems, including the recently commercialized IEEE 802.11 compatible Li-Fi system with heterodyne transceivers, capable to transmit data at rates up to 60 Mbit/s on distances up to 4 meters. The system demonstrated possibility of transmitting signals with modulation schemes commonly used in wireless radio frequency networks. We also present a concept of identification & information system LEDPASS for city environments, which is now under construction in the university campus.

Prof. Vladislav E. Bougrov, ITMO University, St. Petersburg, Russia; 47 years old; Master degree in optoelectronics from Department of Optoelectronics chaired by Nobel Prize Laureate Prof. Zhores Alferov, St. Petersburg Electrotechnical University "LETI"; Ph.D. in 1999 and D.Sc. in 2013 in physics from Ioffe Institute, St. Petersburg, Russia; holder of the prize of the Government of Russian Federation in science and engineering; highly qualified in material physics and engineering of semiconductor optoelectronics devices; author of more than 150 papers in reputed journals, inventor of more than 30 granted patents; extensive experience with dynamic management of growing international start-up companies, founder of Optogan.



Professor Guoqiang Li

“High-speed and long-distance visible light communication: core components and applications”

“高速长距离可见光通信的核心部件及应用”

Abstract

With the goal to build a high-speed and compact visible light communication system, we have focused on the fabrication of III-nitride based core components and their applications. The as-prepared white LED devices show a luminous efficiency of 135 lm/W with a

<p>School of Material Science and Engineering, South China University of Technology</p> <p>李国强 教授 华南理工大学材料科学与工程学院</p>	<p>bandwidth of 300 MHz, and the as-fabricated blue light photodetectors reveal a responsivity of 0.74 A/W with a bandwidth of 320 MHz. Based on these core components, the corresponding visible light communication system indicates a high-speed of 5Gbps@5m.</p>
<p>Guoqiang Li received his Ph.D. degree from Northwestern Polytechnical University, China in 2004. From 2004 to 2010, he worked in turn at GE Global Research Center in China, the University of Tokyo, Japan, and University of Oxford, UK. Since 2010, he has been a full professor in South China University of Technology, China. His research interest mainly focuses on the high-speed and long-distance visible light communication used core components and their applications.</p>	
<div data-bbox="317 636 620 1032" data-label="Image"> </div> <p>Mr. Musa Unmehopa</p> <p>Head of Ecosystems and Alliances for LiFi Signify</p> <p>穆萨·埃莫霍帕 昕诺飞 LiFi 事业部主管</p>	<p>“The Future Potential of LiFi is here today” “LiFi 未来发展的潜力，将在今天展现”</p> <p><i>Abstract</i> LiFi is rapidly evolving from promising innovation that may address future problems, into a commercially available value proposition that solves real-life use cases today. A vibrant ecosystem is forming around LiFi, which will put in place the boundary conditions that are necessary to enable the LiFi market to grow. This presentation will focus on industry alliances, standardization, and interoperability certification as key enablers for this growth, and will identify several segments where LiFi provides added value.</p>
<p>Musa Unmehopa is Head of Ecosystems and Strategic Alliances for the LiFi Business Unit of Signify. Prior to joining Signify and Philips Lighting in 2013, he worked for Bell Labs, Lucent Technologies, and Alcatel-Lucent. Musa has held executive leadership roles in various standards bodies, trade organizations and industry consortia. His publications include two books, numerous papers in technical journals and conferences, as well as several patents. Musa received a BSc. and MSc. degree in computer science from Twente University and MBA degrees from TIAS Business School and University of Bradford School of Management.</p>	
<div data-bbox="317 1659 620 2002" data-label="Image"> </div>	<p>“Views and Accomplishments on the Research of Visible Light Communication” “LiFi 技术创新与应用研究”</p> <p><i>Abstract</i> It lists the Chinese government's funding for the research of visible light communication technology, and the four advantages of VLC compared with RF. It particularly focuses on the R&D and commercialization of visible light Internet access and visible light smart home systems.</p>

<p>Prof. Xiongbin Chen</p> <p>Institute of Semiconductors, Chinese Academy of Sciences</p> <p>陈雄斌 研究员 中科院半导体所</p>	
<p>Dr. Xiongbin Chen is a professor at the Institute of Semiconductors, Chinese Academy of Sciences and the University of Chinese Academy of Sciences. The visible light smart home system and Internet access system made by his team were demonstrated in China International Industry Fair in 2009 and Shanghai World Expo in 2010. In 2016, his team's achievement of VLC was awarded as one of the top ten optical communication technologies in the world by OFweek. Now, he is in charge of the state's key R & D program of visible light communication in China with 19 participants.</p>	
<div data-bbox="316 768 624 1093" data-label="Image"> </div> <p>Dr. Nikola Serafimovski</p> <p>PureLiFi, UK</p> <p>尼古拉·塞拉菲姆斯基 博士 PureLiFi 公司（英国）</p>	<p>“LiFi Standardization Progress in IEEE 802.11bb” “LiFi 标准在 IEEE 802.11bb 的进展”</p> <p><i>Abstract</i> International standardization and interoperability is critical to the mass market deployment of LiFi. The IEEE 802.11 working group is responsible for the development and maintenance of the world’s most successful standard – Wi-Fi. The 802.11bb task group is focused on introducing the necessary changes to this standard so that it can support operations in the light spectrum. This talk will provide a high-level overview of the current status and expected progress of TGbb.</p>
<p>Nikola is the current Chair of the IEEE 802.11 Light Communications Task Group, the Vice-Chair of the IEEE 802.15.13 Task Group on Multi-gigabit Optical Wireless Communications and Co-Chair for the Light Communications Alliance. Nikola completed his Masters of Science in Communications System Engineering with Jacobs University Bremen in 2007 including a joint MSc thesis with the University of Edinburgh on Visible Light Communications in 2009 before completing his Ph.D. with the University of Edinburgh on Spatial Modulation, which is a novel physical layer modulation technique, in 2013.</p>	
	<p>“Exploration about Application of LiFi in Intelligent Transportation” “LiFi 在智慧交通应用中的探索”</p> <p><i>Abstract</i> LiFi in the application of intelligent transportation, it connects vehicles and lamps on street lamp poles and multi-function poles, vehicles can obtain the traffic light, pedestrian, traffic flow, the coordinates of itself and other information, so as to realize the application of</p>



Mr. Wenhua Cui

CTO of Gloria Technology, China

崔文华
格利尔数码科技首席技术官

vehicle to everything. With the aid of ADAS system of the vehicle itself, automatic driving can be realized.

Mr Cui was the R&D Leader of LEP (Light Emitting Plasma) in LUMA Opto (China) Co. Ltd. He is the CTO of Gloria Technology, LCC and the GM of Xuzhou ZhiGu Optical Frequency Industry Research Institute.



Dr. Binbin Zhu

**General Manager of Shenzhen HCCL
Technology, China**

朱斌斌 博士
深圳华创芯光科技有限公司总经理

**“Industrialization Path of Visible Light
Communication in China”**

“可见光通信在中国的产业化路径”

Abstract

Visible light communication is a rapidly developing blue ocean market. There are three steps to fully release the potential of VLC in China. First, specific scenarios need to be explored. Second, full industrial chain of VLC, which includes high speed chips, integrated modules and product systems, need to be concerned. Last, a platform needs to be built, which attracts renowned scientists, potential customers, as well as investors, to promote the commercialization of this field

Dr. Binbin Zhu, graduated from Nanyang Technological University in Singapore, and founded Shenzhen Hua Chuang Chip Lighting Technology Co., Ltd. in 2019. The company's main business is LED-based visible light communication. During working period, he is rated as a senior engineer in Guangdong Province, wins Shenzhen overseas high-level talents, Nanshan District Leading Talents, Pingshan District Dragon Talents, Innovation Plaza "Youth Fighter" and many other honors, and concurrently served as member council of Shenzhen Pingshan Oversea Returnees Association and

shortlisted for Shenzhen Good Youth Selection. He has published more than 20 academic papers, applied for multiple patents, and served as a reviewer for multiple journals.



Dr. Chao Shen

General Manager of Sanoor Tech, China

沈超 博士
Sanoor Tech 总经理

“Principles and Applications of Emerging Optoelectronic Devices for High-speed Underwater Wireless Optical Communications”
“高速水下无线光通信新型光电子器件原理与应用”

Abstract

The presentation focuses on the emerging LiFi devices and physical layer techniques for underwater wireless optical communications (UWOC). The talk will feature the development of novel transmitters, including the superluminescent diodes (SLDs), laser diodes, VCSELs, and receiving technologies, such as optical antenna and PD array. I will also discuss the advances of VLC for digital ocean applications and industrial IoT networks

Dr. Chao Shen received his PhD in Electrical Engineering from KAUST and his BSc in Materials Physics from Fudan University. Dr. Shen has published 80+ publications in the fields of optoelectronics devices and components, semiconductor lasers, visible light communications (VLC), LiFi devices and systems, laser lighting, underwater wireless optical communications (UWOC) and photonics integrated circuit. Dr. Shen has served as TPC member and invited speaker in many IEEE, OSA, and SPIE conferences. He authored a book on the principle and applications of novel light-emitting devices for visible light communication. His work has been featured by over 40 global media, including Optics & Photonics News, IEEE Spectrum, Compound Semiconductor, SPIE Newsroom, EE Times Europe, Semiconductor Today, IET E&T, LaserFocusWorld, and Communications of the ACM.