Alvin Loke Talks About Design Challenges in 7-nm CMOS and Beyond

Long-time IEEE Solid-State Circuits Society (SSCS) member Alvin Loke of Qualcomm delivered two fascinating talks in Ireland addressing the technological and circuit design challenges of advanced complimentary metal–oxide–semiconductor (CMOS) processes. While visiting Qualcomm's design center in Cork, Loke took time out to support the SSCS United Kingdom and Ireland Chapter by delivering the lecture "Analog/Mixed-Signal Design Challenges in 7-nm CMOS and Beyond." He gave the lecture twice, first at Tyndall National Institute in Cork and then at University College Dublin. Seventy participants from industry and academia traveled from as far as Limerick and Belfast to attend.

Alvin Loke at the University College Dublin, Ireland.

—Peter Kennedy
Chair, United Kingdom and Ireland Chapter

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Successful IEEE Advanced CMOS Technology School Summer 2018 at Tsinghua University

Encouraged by the success of the IEEE Advanced Complementary Metal–Oxide–Semiconductor (CMOS) Technology School (ACTS) summer 2017 and winter 2018 sessions, the IEEE Solid-State Circuits Society (SSCS) Beijing Chapter launched IEEE ACTS Summer 2018 on 13 August 2018. ACTS was a joint activity supported by SSCS and the IEEE Circuits and Systems Society. Student members of the two sponsoring Societies had the opportunity to attend the school free of charge. Academia members from either Society are eligible for a 90% off discount on registration fees. IEEE ACTS Summer 2018 was sponsored by Synopsys. Lecture topics focused on radio frequency (RF), terahertz radiation, millimeter-wave (mm-wave), and fifth-generation technology. The cochairs were Milin Zhang from Tsinghua University, Beijing, and Liyuan Liu from the Institute of Semiconductors, Chinese Academy of Sciences, Beijing.

Matsuzawa has developed many mm-wave CMOS transceivers, and one of his designs features the highest data rate.

A welcome banquet was organized on 13 August 2018 for representatives from government, ACTS sponsors, and academic universities. Dr. Zhihua Wang, professor at Tsinghua University as well as one of the founders of ACTS, introduced the motivation and background of ACTS. Dr. Ben U from Synopsys shared how Synopsys conducts

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Attendees mingled with the presenters during the happy hour dinner.

Dr. Woogeun Rhee talked about PLLs.

Dr. Hossein Hashemi talked about RF and mm-wave phase arrays.

After the lectures, attendees had the opportunity to ask the presenters questions.

Dr. Howard Luong presented the talk "Ultra-Wideband RF and mm-Wave CMOS Frequency Synthesizers for Wireless Communications."

local ICs human resources training sessions and facilitates different collaborations between industry and academia.

On the first day of the summer school, Dr. Hossein Hashemi from the University of Southern California, Los Angeles, gave the first lecture, "Radio Frequency, mm-Wave, and Optical Phased Arrays." He talked about RF and mm-wave phase arrays. He introduced the tunable transmission lines used in mm-wave variable phase shifters. He mentioned the touch of power amplifiers and presented two solutions to increase the output power. He also shared ongoing and future research on optical-phase arrays and optical components.

On 14 August 2018, Dr. Howard Luong, Hong Kong University of Science and Technology, gave the lecture "Ultra-Wideband RF and mm-Wave CMOS Frequency Synthesizers for Wireless Communications." He introduced the motivation and challenge in CMOS RF and mm-wave circuit design. He also described and compared various synthesizer architectures. Luong discussed key building blocks in detail. To conclude his talk, he presented case studies for integrated frequency synthesizing with state-of-the-art performance.

Dr. Akira Matsuzawa, from the Tokyo Institute of Technology, gave a lecture on 15 August 2018: "Millimeter-Wave CMOS Transceiver Design: From Basics to Advanced." Matsuzawa has developed many mm-wave CMOS transceivers, and one of his designs features the highest data rate. In his lecture, he described the circuits and systems technology used in the transceivers. He explained that mm-wave features a high potential to increase

Dr. Thomas Lee presented the talk "Dark Secrets of the Instrumentation Wizards."

Students and course attendees talk to Dr. Thomas Lee during the happy hour dinner.

Dr. Akira Matsuzawa talked about mm-wave CMOS transceiver design.

data rates in wireless communication. Matsuzawa shared his research results and introduced high frequency devices and PDK in detail. To conclude, he talked about high-speed and low-power analog-to-digital converter design.

The next day, 16 August 2018, Dr. Woogeun Rhee from Tsinghua University, gave the lecture "Phase-Locked Frequency Synthesis and Modulation." In the morning session, he introduced the typical phase-locked loops (PLLs) for frequency synthesis. He discussed the architecture of type II digital PLLs in detail. During the afternoon session, Rhee talked about PLL-based phase modulation. He introduced several PLL-based modulation methods. He also talked about the evolution of monolithic PLLs and gave the audience an overview of PLL development.

On the last day of IEEE ACTS Summer 2018, Dr. Thomas Lee from Stanford University, California, gave the talk "Dark Secrets of the Instrumentation Wizards." He explained how impedance changed transistors and how he used this dark secret as a design tool. He shared the results of a case study that he performed on the dark secrets of classic instruments. Lee also introduced the diodes and explained the charge-control equation of diodes and transistors. He talked about RF signal generators and some magic. Lee said that these ideas are not well known, and he hopes these examples will stimulate a new generation of engineers.

To celebrate the end of a successful summer school, a happy hour dinner was organized by the SSCS Tsinghua Student Chapter. Lee, Wang, Zhang, Liu, and all school attendees were present at the dinner. The students and the presenters networked while dining and talked about their research.

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—Xuecheng Wang
—Heng Huang
—Milin Zhang