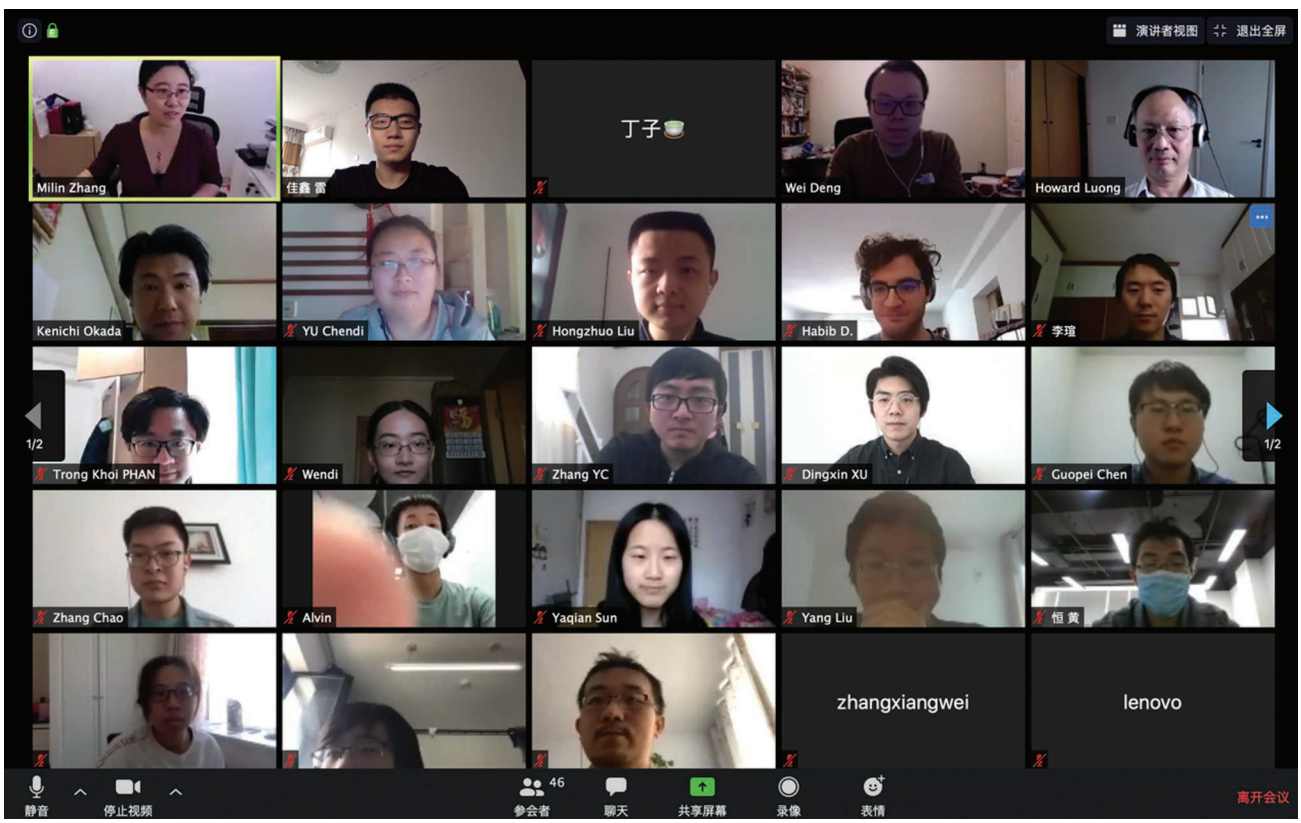
SSCS Beijing Chapter Organizes Three Virtual Distinguished Lecture Seminars

Due to the coronavirus, it is definitely not a good time for a Distinguished Lecturer (DL) to travel around the world. However, the IEEE Solid-State Circuits Society (SSCS) Beijing Chapter has aimed to continue academic activities for local members, organizing three online DL seminars from late April to May. The seminars were advertised on social networking sites through the Chapter's official account. Although it was a pity that the audiences could not physically meet the lecturers, the online seminars enabled non-Beijing-area participants to experience the presentations. For example, Prof. Howard Luong and his students from the Hong Kong University of Science and Technology joined the 29 April event.

Digital Object Identifier 10.1109/MSSC.2020.3001826
Date of current version: 25 August 2020

On that date, Prof. Kenichi Okada from the Tokyo Institute of Technology gave an online talk, "Ultralow-Power, DTC-Based, Fractional-N, Digital PLL Techniques." Recent developments in Internet of Things (IoT) applications have resulted in a rising demand for energy-efficient silicon-on-chip (SoC) solutions. The power consumption reduction in phase-locked loop (PLL) designs is significant in highly energy-efficiency IoT systems. Okada introduced several design techniques for fractional-N digital PLLs to improve both jitter and power-consumption performance. He also performed a system-level power and jitter analysis for the audience. He introduced the design of an all-digital PLL (ADPLL), with an emphasis on the design of the linear and low-power digital-to-time converter (DTC) and time-to-digital



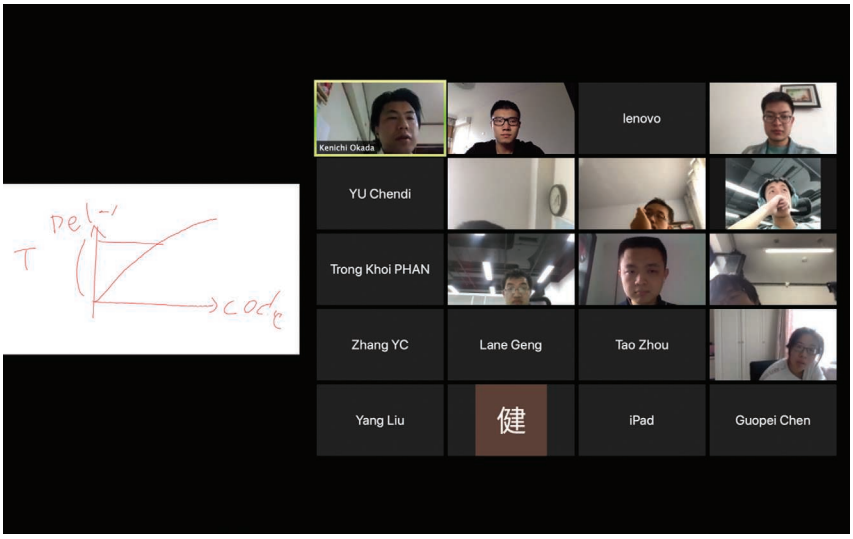
Attendees pose following Prof. Okada's DL presentation (Okada appears in the first column of the second row).

modules. An isolated, constant-slope DTC was proposed, as well. It featured 10-b resolution, with a power consumption of 0.1 mW and sub-ps integral nonlinearity, benefiting from the lower jitter and low power consumption of the DTC.

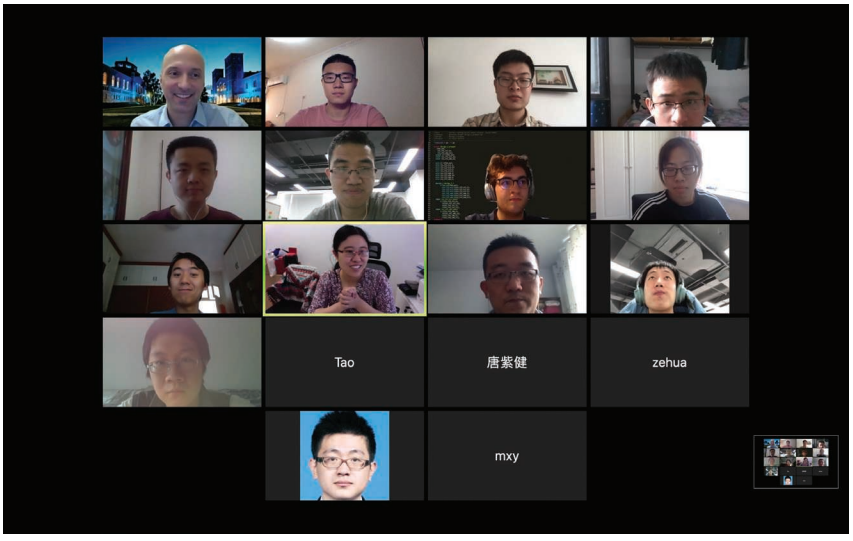
The DTC-based ADPLL achieved a figure of merit of –246 dB, with a power consumption of 0.98 mW. Okada also introduced a fractional-N PLL with a power consumption of 245 μW. A switching feedback was proposed that changes the PLL from a sampling to a subsampling operation, with a duty-cycled frequency-locked loop. The switching feedback enabled the subsampling PLL to recover from large phase disturbances. The design details of a transformer-based, digitally controlled oscillator for impedance peaking was explained. A digital PLL (DPLL)-based analog-to-digital converter and Bluetooth Low Energy transceiver with a DPLL were introduced toward the end of the seminar. Following a Q&A session, the audience members switched on their webcams to take an online group photo.

After the seminar, the SSCS Tsinghua Student Chapter organized an online "meet-the-master" session with Okada, with only students joining the meeting, as usual. They continued to discuss the questions Okada posed during his talk, and he used a whiteboard to draw sketches to better explain some key concepts. In addition to the academic discussion, the students asked Okada to introduce his research group, research area, and admission policy.

The second virtual DL seminar was organized on 6 May. Prof. Dejan Marković, University of California, Los Angeles, gave a talk on closed-loop neuromodulation. Marković started his lecture with the origin and evolution of brain–computer interfaces (BCIs), then emphasized the potential of closed-loop BCIs in neurotherapy. Deep brain stimulation (DBS) has been proved efficacious for Parkinson's disease. However, as Marković pointed out, current DBS approaches are hindered by inadequate technology that



Prof. Okada (upper left) sketches key concepts during the meet-the-master session.



The audience gathers following Prof. Marković's DL presentation (Marković appears in the top left image).

is low-precision and bulky, power-inefficient, and of limited diagnostic utility. To solve these problems, Marković introduced a high-precision implantable neurotechnology for closed-loop neuromodulation of functional networks of the human brain. Key features of the technology include the following:

1) sensing from a high number of channels
2) sensing concurrent with stimulation for true closed-loop operation
3) real-time secure wireless data telemetry.

Marković discussed details of all aspects of the technology. As a conclusion, he claimed that the proposed neurotechnology could revolutionize brain therapies through the efficacy, size, and cost of medical implants. The audience participated in a discussion of additional details with Marković after the seminar.

The third virtual DL seminar was organized on 20 May. Prof. Patrick Mercier, University of California, San Diego, gave his SSCS Distinguished Lecture "Ultralow-Power ICs and Physiochemical Sensors for the Next Generation." To start, Mercier introduced the importance of and promising applications for wearable devices, including for medical diagnosis and monitoring. He pointed out the limits

Participants pose at the end of Prof. Mercier's DL presentation (Mercier appears in the top left image).

of existing wearable devices: limited available data and compatibility with the human body. He summarized some practical solutions to these issues and revealed that wearable devices can be developed through advanced sensors, efficient circuits, and new data-processing methods. Mercier also discussed emerging sensor technologies that can noninvasively monitor physiochemistry. At the end of the lecture, he introduced self-powered IC building blocks and architectures for wearable devices. The audience discussed more details with him after the seminar.

—Heng Huang, Jiaxin Lei, Yang Liu, and Milin Zhang

Distinguished Lecturer Bernhard Wicht Gives Online Talk to Israel Chapter

On 7 May 2020, IEEE Solid-State Circuits Society (SSCS) Distinguished Lecturer Prof. Bernhard Wicht, Leibniz University Hannover, Germany, gave an online seminar, "Tiny and Efficient: Power Management as a Key Function in Microelectronic Systems," for the SSCS Israel Chapter. Wicht's wide experience with and knowledge of analog and power management IC design made for an informative talk.

Prof. Wicht explained why power management ICs are becoming increasingly important electronic solutions to make products more compact, energy-efficient, and reliable in global growth areas such as renewable energy, autonomous vehicles, and biomedical applications. Future applications in the field of machine learning and artificial intelligence will be possible only with intelligent power management to supply complex processors and sensors. Wicht gave an overview of current and future challenges for power management at the system and circuit levels along with examples including topics such as automotive, wearables, off-grid power supplies, and gallium nitride.

The online lecture was hosted and coorganized by the Advanced Circuits Research Center (ACRC) at Technion–Israel Institute of Technology, Haifa. More than 150 participants from the semiconductor industry and academia attended this fascinating and inspiring talk, which concluded with a lively discussion.

—Solon Spiegel,
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—Shahar Kvatinsky,
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—Masha Schuster,
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Digital Object Identifier 10.1109/MSSC.2020.3001827
Date of current version: 25 August 2020