Editorial

SIX months ago, MWCL editorial office launched a "Special Topic" endeavor in addition to the existing regular five topics, namely, 1) Theory and Numberical Methods, 2) Passive Components and Circuits, 3) Electron Devices and Device Modeling, 4) Hybrid and Monolithic RF Integrated Circuits, and 5) Measurement Techniques, System Modeling Techniques, and Applications. Professor Donald Y. C. Lie, to whom the MWCL editorial office is most grateful for his services to the IEEE MTT-S on the first issue of the "Special Topic" in MWCL, organized the submission and rigorous peers-review of papers, which spearhead an important domain knowledge fundamental and key to the success of new power amplifier design concepts and techniques for the state-of-the-art RF apparatuses. Professor Lie highlights the four papers in the "Special Topic" with brief technical insights contributed by authors, to whom this editorial office whish to extend the sincere thanks, wishing that our readers have funs reading and find papers useful.

The first paper in the special focus topic of MWCL on "High Efficiency Supply-Modulated RF Power Amplifier" is by M. Roberg *et al.* with the title "Efficient and Linear Amplification of Spectrally Confined Pulsed AM Radar Signals." This paper presents a pulsed high-efficiency power amplifier (PA) with increased spectral purity obtained by supply modulation of the pulse envelope. This paper presents an alternative method of creating spectrally confined radar signals based on Envelope-Elimination and-Restoration (EER). The PA operates at 2.14 GHz with 78% efficiency at 6 W peak power, and with 66.4% average efficiency over a 14.7 μs pulse with a 4.1 dB peak-to-average ratio (PAR) shaped by a 90% efficient resonant-pulse envelope supply modulator. For PARs greater than 4.1 dB, the signal envelope can be split between the supply modulator and the PA drive, with up to 25% improvement in composite efficiency.

The second paper "Impact of Switching Glitches in Class-G Power Amplifiers" by S. Sehajpal *et al.* presents the study of the effects of glitches in class-G EER transmitters. This paper examines limitations associated with voltage supply switching glitches in class-G power amplifiers. The predicted error-vector-magnitude (EVM) based on theoretical calculations for the signal-to-noise-ratio (SNR) agrees closely with simulations of an IEEE 802.11a,g signal with an added glitch. To verify the theoretical calculations, a class-G modulator was fabricated in a 130 nm CMOS process. By adjusting the pole frequency of the modulator, the glitch duration can be controlled, resulting in a tradeoff between efficiency and signal fidelity. In this design, the glitch duration was measured to be $< 2\,\mathrm{ns}$, corresponding to $< 0.04\,\mathrm{Tsym}$. The PA and modulator achieved a measured $\mathrm{EVM} = 2.5\%$-rms. The measured output power-spectral density (PSD) of the PA and modulator verify that the theoretical calculations match well with the measured results.

The third paper "Highly Efficient Dual-Switch Hybrid Switching Supply Modulator for Envelope Tracking Power Amplifier" by D. Kim *et al.* describes a highly efficient dual-switch hybrid switching supply modulator for an envelope-tracking (ET) power amplifier. The supply modulator has a combined structure of a linear amplifier and a switching amplifier and was fabricated in a 0.18 μm CMOS process, using thick oxide I/O devices for a high voltage operation. For an improved efficiency, the switching amplifier employs two buck converters and realizes an adaptive slew rate control of the switching amplifier's current. An adaptive slew rate control of a switching amplifier's current enables a faster output current tracking and a higher efficiency. The supply modulator is utilized with a class-AB PA, fabricated using InGaP/GaAs 2 μm HBT process with the operating frequency of 1.74 GHz. The implemented envelope-tracking power amplifier (ET-PA) delivers a power-added-efficiency (PAE) of 39.1% at an output power of 27 dBm for long term evolution (LTE) signal with 10 MHz channel bandwidth.

Recently, silicon-based fully-monolithic PAs using on-chip power combining have demonstrated good potentials for future wireless and/or handset applications, as their saturated power (Psat) levels have reached 27–34 dBm to compete with the III-V compound semiconductor based PAs. In the fourth and the last paper, titled "A Fully Monolithic BiCMOS Envelope-Tracking Power Amplifier with On-Chip Transformer for Broadband Wireless Applications" by Y. Li *et al.*, presents a power-combined BiCMOS PA system using an envelope-tracking (ET) to serve as a fully monolithic ET-PA solution for high PAR broadband signals. The SiGe PA achieves Psat of 29.1 dBm at 1.9 GHz. Without needing predistortion, this fully monolithic power-combined silicon-based ET-PA delivers the maximum linear Pout of 24.6 dBm/23.8 dBm/23.2 dBm with overall PAE of 26%/24%/22.5% for the LTE 16QAM 5 MHz/LTE 16QAM 10 MHz/WiMAX 64QAM 5 MHz signals, respectively. Compared with the conventional fixed-supply PA, the ET technique improved the PA linearity, allowing higher Pout and PAE without violating the linearity specs. These results demonstrated the effectiveness of the ET technique for power-combined silicon-based PAs in high-PAR wideband applications.

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Donald Y. C. Lie (S'86–M'87–SM'00) received his B.S.E.E. degree from the National Taiwan University, Taipei, Taiwan, in 1987, and the M.S. and Ph.D. degrees in electrical engineering (minor in applied physics) from the California Institute of Technology (Caltech), Pasadena, in 1990 and 1995, respectively.

He has held technical and managerial positions at companies such as Rockwell International, Silicon-Wave (now Qualcomm), IBM, Microtune Inc., SYS Technologies, and Dynamic Research Corporation (DRC). He is currently the Keh-Shew Lu Regents Chair Associate Professor in the Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, Texas, and approved to be promoted as a Full Professor starting September 2012. He is also an Adjunct Professor in the Department of Surgery, Texas Tech University Health Sciences Center (TTUHSC). He is instrumental in bringing in multi-million dollars research funding and also designed real-world commercial communication products sold internationally. He has been a Visiting Lecturer to the ECE Department, University of California, San Diego (UCSD) since 2002 where he taught upper-division and graduate-level classes and affiliated with UCSD's Center of Wireless Communications (CWC) and co-supervised Ph.D. students. He has authored/coauthored over 130 peer-reviewed technical papers and book chapters and holds five U.S. patents. His research interests are: 1) low-power RF/Analog integrated circuits and system-on-a-chip (SoC) design and test; and 2) interdisciplinary research on medical electronics, biosensors, biosignal processing, and the history of modern science versus Christianity.

Dr. Lie has been serving on the Executive Committee of the IEEE Bipolar/BiCMOS Circuits and Technology Meeting (BCTM), IEEE SiRF, IEEE MWSCAS, IEEE TSWMCS, and also serving on various TPC for IEEE RFIC Symp., IEEE VLSI-DAT, IEEE PAWR, IEEE LiSSA, IEEE SoCC and IEEE DCAS, etc. He has received numerous awards from DRC, IBM, Rockwell, and US NAVY SPAWAR SSC, and delivered plenary talks, short courses, invited talks, workshops at various conferences, universities and companies. He and his students have won several Best Graduate Student Paper Awards and Best Paper Awards in international conferences in 1994, 1995, 2006, 2008 (twice), 2010 (twice), 2011, and 2012. He is serving as an Associate Editor of the IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS (MWCL), the Area Editor-in-Chief for the *International Journal on Wireless and Optical Communications*, and also on the Editorial Board for the i-manager's *Journal on Electrical Engineering*. He was a Guest Editor of the IEEE JOURNAL OF SOLID-STATE CIRCUITS (JSSC) in 2009, and also has served as a Reviewer for many journals.

Ching-Kuang Clive Tzuang (S'80–M'80–SM'92–F'99) received the B.S. degree in electronic engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1977, the M.S. degree from the University of California at Los Angeles (UCLA), in 1980, and the Ph.D. degree in electrical engineering from The University of Texas at Austin, in 1986.

From 1981 to 1984, he was with TRW, Redondo Beach, CA, where he was involved in the design of the high-speed analog and digital data converter integrated circuits (ICs). In 1986, he became an Associate Professor with the Institute of Communication Engineering, National Chiao Tung University, and a Full Professor in 1991. In February 2004, he joined the Graduate Institute of Communication Engineering, Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan, where he conducted research on advanced guiding structures for research and development of the RF sensor system-on-chip (SOC), integrating active and passive microwave/millimeter-wave RF signal-processing components into a single CMOS chip. His research activities also involved the field-theoretical analysis and design of waveguide structures and large-array antennas for integrating RF systems in a package. He retired as a public servant from National Taiwan University in January 2012, and joined the School of Electronic Information Engineering, Tianjin University, as a Distinguished Professor, carrying out applications of RF SOC. From 1992 to 1994, he was a team member who supervised the installation of the tracking radar system placed at the Center for Space and Remote Sensing Research, National Central University, Chung Li, Taiwan. He helped execute an eight-year Academic Excellent Program (2000–2008) funded by the Ministry of Education and National Science Council of Taiwan, which focused on the advanced microwave/millimeter-wave RF and communication technology development, leading to the investigation of scaled microwave RF system-on-chip (SOC) technology, and participation in the IEEE 802.15 TG3c 60-GHz wireless personal area network (WPAN) standardization in collaboration with CoMPA, Yokosuka, Japan. He recently explored the feasibility of applying the CMOS technology to the development of terahertz and millimeter-wave SOC, and the RF sensors and system for vehicle detection applications. Since 2007, he has served the Independent Director of the Board of Directors of CyberTAN Technology Inc. He has supervised 29 Ph.D. students and 74 M.S. students.

Dr. Tzuang helped establish the IEEE Microwave Theory and Techniques Society (IEEE MTT-S) Taipei Chapter, and was Secretary, Vice Chairman, and Chairman in 1988, 1989, and 1990, respectively. Since January 2010, he has been the Editor-in-Chief for the IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS. He was the recipient of the 2008 Excellent Project Award presented by the Ministry of Transportation and Communications for practically demonstrating the real-time multilane traffic sensor using a CMOS-based lightweight radar.