세미나 요약 (Abstract)

강연제목 (Title)	mmWave CMOS power amplifiers and recent advanced design examples		
강연자 (Speaker Name)	박현철	일시 (Date)	2022.10.28. 16:00~18:00

The fifth generation (5G) leverages the millimeter-wave (mm-Wave) frequency bands (n257–n262) to deliver multi-gigabit per second speeds and ultra-low milliseconds latency for billions of users, enabling them to experience new services and applications. Phased-array (beamforming) technology is being popularly applied to compensate high propagation loss and poor device performance in the mm-Wave. In particular, 5G NR macro base-station systems use >256 (or >1,000) array elements to dramatically improve TX EIRP and RX EIS, so highly integrated multi-channel (>16) phased-array RFICs have been developed. Silicon-based CMOS device technologies (22 - 65nm) become essential, although the designs of mm-Wave CMOS power amplifiers (PAs) have been very challenging because the PAs exhibit lower P_{OUT} and power gain than III–V devices in the previous generations, e.g., GaAs and GaN.

This talk presents developments (evolutions) of mm-Wave CMOS PAs in various PA design approaches. Beginning with the gain/stability boosting technique of the Cgd neutralization, two-stacked/cascode PAs with a strong harmonic termination scheme will be discussed. Not only the design techniques enable a higher linear P_{OUT}, but also meet the stringent linearity specifications, supporting up to 256-QAM modulations. Then, a newly proposed single transformer-based broadband, compact Doherty PA architecture will be mainly described along with detailed design concepts and methodologies. This Doherty PA can further enhance efficiency, bandwidth, and chip area, compared to other previously reported Doherty PA schemes. Finally, our new commercial RFIC (32-channels) product, which adopts the proposed Doherty PA scheme, and 5G NR macro base-station systems will be briefly introduced.