Overview of RF Power Amplifier Technology for Wireless Infrastructure and Future Trends.

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ABSTRACT

Ever since the start of base stations for wireless infrastructure in the 1990s the RF power amplifier is a key component and plays a very important role in the over-all performance of the base station. The initial technology used emerged from the existing power amplifier technology in VHF/UHF applications which was Si-bipolar transistors but was soon replaced by Si-LDMOS technology. The tremendous growth of wireless communication fuelled and accelerated the technology developments and large advancements have been made at all levels such as output power, power efficiency, linearity, bandwidth, and reliability. With the most important frequencies that stayed between 2 and 4 GHz, Si-LDMOS was for a long time the dominant technology.

With the roll-out of 5G telecommunication infrastructure systems and especially with the new massive MIMO architecture and the opening of the higher sub-6 GHz frequency bands, the RF power amplifier architecture and technology have gone through a major transformation. This has resulted in the adoption of GaN pHEMT technology as the mainstream technology. In this presentation, I will dive further into the advantages and performance of present state of art GaN devices and technology.

Despite the major advances brought by GaN-technology, it has not led yet to the 'ultimate' RF power amplifier. As an example, multi-mode, highly efficient power amplifiers are still challenging and subject of extensive research. Power amplifiers reaching similar efficiencies at higher frequencies as for the sub-6 GHz power amplifiers are important for energy and thermal reasons. As well as amplifiers that improves efficiency at deep back-off operation. The next and future steps in 5G/6G networks, necessary to fulfil the growing demand of wireless communication, requires these continuous advancements. This presentation sketches the future trends and challenges from an RF power amplifier point of view.