

Mobile Broadband Transmit Power Module Requirements and Solutions

In the past few years, cellular communication technology has advanced rapidly to enable new applications to be offered by wireless service providers. Digital modulation schemes have evolved from the "constant envelope" GMSK technique applied for GSM, the digital air interface standard first established in Europe, to complex, multi-channel, code-domain-multiplexed methods employed in CDMA2000 and WCDMA systems introduced more recently. Although the more complex modulation schemes facilitate the offering of wireless packet switched data services analogous to today's wired internet, the linearity requirements imposed on the components making up the transmit chain in the handset radio become much more stringent. This paper first reviews the motivation and basic concepts behind modern digital modulation techniques as applied to cellular networks. Next the some metrics and the ramifications of the evolution toward more complex modulation schemes on transmit components will be discussed, with a focus on the power amplification function. This will lead into survey of power amplifier approaches that have been taken to meet various application requirements. Finally, the paper will conclude with a prognosis of the challenges that will be imposed on the handset RF component vendors as services migrate from the present second generation cellular systems to "3G" and "4G" in the future.



Kenneth P. Weller received his B.S., M.S., and Ph.D. degrees from the University of California, Berkeley. Upon graduation, he joined David Sarnoff Research Center in Princeton, NJ, where he worked on the fabrication and characterization of millimeter-wave devices, including GaAs and silicon IMPATT diode oscillators and reflection amplifiers. After moving to Hughes Aircraft Company in Torrance, CA, he applied this technology to the development of IMPATT sources and power amplifiers for applications up to 220 GHz. While at Hughes, he also initiated early product development activity based on GaAs FET devices. At TRW and later Avantek he conducted research and managed development of GaAs FET based hybrid and MMIC components for analog signal processing, and both low noise and power amplifier applications. Dr. Weller is currently a senior director at Skyworks Solutions, Newbury Park, CA, where he manages Design Automation and has responsibility for technology roadmap definition and execution. A primary focus of his work at Skyworks has been

development of (W)CDMA and multi-mode front end module product for wireless communication network subscriber equipment. Dr. Weller is a member of Phi Beta Kappa, Tau Beta Pi, Eta Kappa Nu, and Sigma Xi.