

Abstracts

Switched-mode high-efficiency microwave power amplifiers in a free-space power-combiner array

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A design-oriented analysis of the microwave transmission-line class-E amplifier is presented. Experiments and harmonic-balance circuit simulations verify the theoretical equations which predict class-E-amplifier output power, maximum frequency of operation, and dc-RF conversion efficiency. Experimental results at 0.5, 1.2, and 5 GHz are presented. At 0.5 GHz, 83% drain efficiency and 80% power-added efficiency (PAE) are measured, with an output power of 0.55 W, using the Siemens CLY5 MESFET. These results are compared to a class-A and class-F power amplifier using the same device. At 5 GHz, 81% drain efficiency and 72% PAE are measured, with an output power of 0.61 W, using the Fujitsu FLK052WG MESFET. Finally, the 5-GHz class-E power amplifier is successfully integrated into an active-antenna array, demonstrating power combining of four elements with an 85% power-combining efficiency. At 5.05 GHz, the class-E power-amplifier antenna array delivers a total of 2.4 W of output power, with a dc-RF conversion efficiency of 74% and a PAE of 64%.

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