Chapter 5

Conclusions and Future Work

The thesis analyzes all the published topologies of Class-E power amplifier and the loading network by which the power efficiency can be improved. The dissipative mechanisms of Class-E operation are analyzed. According to these analyses, a cascode Class-E power amplifier with second and third order harmonics loading network is proposed. The presented Class-E PA is for applying on the polar-loop transmitter for WiMAX application and is implemented in UMC 0.13-μm CMOS process. This power amplifier provides simultaneously high output power and high power efficiency. The battery life can be greatly saved by employing a high power efficiency power amplifier which is the most power-consuming in a communication system.

5.1 Summary

In order to achieve higher power efficiency, the dissipative mechanisms were analyzed, and also design considerations. A cascode Class-E power amplifier with second and third order

harmonics suppression was implemented. Layout considerations and PCB design were discussed in detail. The proposed cascode Class-E power amplifier exhibits 2.39-2.69 GHz, and simultaneously provides high output power and high power efficiency. It provides 24.66dBm maximum output power and 63.4% maximum power-added efficiency (PAE). With the employment of second and third order harmonics suppression technique, the maximum second and third order harmonics suppression is 75.8dBc and 59dBc, respectively. The power-related behavior model is presented. The simulation time of large signal S parameters can be saved to 1/23,640 and the variances of input and output impedance are $1.097 - j\,1.297$ and $10.469 - j\,22.371$, respectively.

5.2 Future Work

In this thesis, some design considerations are discussed. We give some recommendations and improvement in this section. First, in order to further save battery's life, a control mechanism of output power is needed. In a portable wireless communication system, the required output power depends on the distance between a mobile and the base station. If a power amplifier with high power efficiency can select the optimum output power, the efficiency of the whole system can be further improved. Second, VDD port is used to control the amplitude of output signal for polar loop transmitter application so that the linearity of

VDD port versus output power should be considered.