A 44/60-GHz Concurrent Dual-Band Power Amplifier

Juseok Bae and Cam Nguyen
Texas A&M University

Advanced communication and radar systems working "concurrently" over multiple bands provide numerous advantages and have more capabilities as compared to their single-band counterparts for communications and sensing - a fact that is simple to understand since the communications and sensing are performed at multiple frequencies simultaneously. True concurrent multiband systems require many components to work concurrently in multiple bands. Concurrent multiband power amplifiers (PAs) are one of them. Majority of power consumption in systems is due to power amplifiers, so one of the crucial factors in power amplifier design is improving the PA's power-added efficiency (PAE). Typically, high PAE can be achieved by tuning the harmonics. By optimally terminating the second harmonic, it has been reported that the theoretical maximum drain efficiency can reach 86 %.

In this work, a concurrent dual-band power amplifier with high PAE implemented on a 0.18μm BiCMOS process is reported. It has dual pass-band centered at 44 GHz and 60 GHz and rejection band centered at 88 GHz. The design of the concurrent dual-band PA relies on the design of the series and shunt resonators having dual pass-band and single rejection band. These special resonators enable minimization of the number of passive components in the PA such as an inductor and capacitor. The resonators are used at the input and output of the PA for dual-band input matching and high PAE performance. The analysis of these resonators is described. Also, design equations for the resonators, which help obtain the resonators' component value, are derived based on their input impedance characteristics.