SUMMARY

[0006] The innovations described in the claims each have several aspects, no single one of which is solely responsible for its desirable attributes. Without limiting the scope of the claims, some prominent features of this disclosure will now be briefly described.

[0007] One aspect of this disclosure is a power amplifier system arranged for dual connectivity. The power amplifier system includes a first power amplifier, a second power amplifier, radio frequency processing circuitry, and a switch. The first power amplifier includes an output configured to provide a radio frequency signal. The first power amplifier configured to be active in a dual connectivity mode and to be active in a different mode. The second power amplifier is configured to be active in the dual connectivity mode such that the first power amplifier and the second power amplifier are concurrently active in the dual connectivity mode. The radio frequency front end processing circuitry includes a first radio frequency signal path and a second radio frequency signal path. The switch is configured to electrically connect the output of the first power amplifier to the first radio frequency signal path in the dual connectivity mode and to electrically connect the output of the first power amplifier to the second radio frequency signal path in the different mode.

[0008] The different mode can be a cellular communication mode. The radio frequency signal can have a lower power in the dual connectivity mode than in the different mode. The different mode can be a second generation mode. The second power amplifier can be inactive in the different mode.

[0009] The dual connectivity mode can be a non-standalone fifth generation mode. The radio frequency signal can be a Long Term Evolution signal in the dual connectivity mode, and the second power amplifier can provide a New Radio signal in the dual connectivity mode. The radio frequency signal can be a New Radio signal in the dual connectivity mode, and the second power amplifier can provide a Long Term Evolution signal in the dual connectivity mode.

[0010] The first signal path can be operatively coupled between the switch and a first antenna, and the second signal path can be operatively coupled between the switch and a second antenna. The first antenna can be configured to transmit the first radio frequency signal in the dual connectivity mode, and the second antenna is configured to transmit the second radio frequency signal in the dual connectivity mode.

[0030] The first mode can be a dual connectivity mode. The first mode can be a multiple input multiple-output mode.

[0031] The first radio frequency signal can be associated with a first cellular radio access technology in the first mode, and the second radio frequency signal can be associated with a second radio access technology in the first mode, where the second radio access technology being different than the first radio access technology. The first radio frequency signal can be a Long Term Evolution signal in the first mode, and the first radio frequency signal can be a second generation technology signal in the second mode. The first radio frequency signal can be a New Radio signal in the first mode, and the first radio frequency signal can be a second generation technology signal in the second mode.

[0032] The first antenna can be in communication with an output of the first power amplifier in the second mode. The second antenna can be in communication with an output of the first power amplifier in the second mode. A third antenna of the plurality of antennas can be in communication with an output of the first power amplifier in the second mode.

[0033] Another aspect of this disclosure is a method of generating radio frequency signals. The method includes generating radio frequency signals in a first mode using a first power amplifier and a second power amplifier that are concurrently active; and activating the first power amplifier for radio signal amplification in a second mode, the power amplifier providing radio frequency signal amplification associated with a different radio access technology in the second mode than the first mode.

[0034] The first mode can be a dual connectivity mode, and the second mode can be a second generation (2G) mode.

[0035] The method can include electrically connecting an output of the first power amplifier to a first signal path for the first mode, and electrically connecting the output of the first power amplifier to a second signal path for the second mode.

[0036] The method can include deactivating the second power amplifier for the different mode.

[0037] For purposes of summarizing the disclosure, certain examples, advantages and novel features of the innovations have been described herein. It is to be

understood that not necessarily all such advantages may be achieved in accordance with any particular

example. Thus, the innovations may be exemplified or carried out in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other advantages as may be taught or suggested herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] Embodiments of this disclosure will now be described, by way of non-limiting example, with reference to the accompanying drawings.

[0039] Figure 1 is a diagram of an example dual connectivity network topology.

[0040] Figure 2 is a schematic diagram of one example of a communication network.

[0041] Figure 3 is a schematic block diagram of a power amplifier system arranged for dual connectivity according to an embodiment.

[0042] Figure 4 is a schematic block diagram of part of a power amplifier module according to an embodiment.

[0043] Figure 5 is a schematic block diagram of part of a power amplifier module according to an embodiment.

[0044] Figure 6 is a schematic block diagram of a power amplifier system arranged for dual connectivity according to an embodiment.

[0045] Figure 7 is a schematic block diagram of a power amplifier system arranged for dual connectivity according to an embodiment.

[0046] Figure 8 is a schematic block diagram of a power amplifier system according to an embodiment.

[0047] Figure 9 is a schematic block diagram of a power amplifier system according to an embodiment.

[0048] Figure 10 is a schematic block diagram of a power amplifier system according to an embodiment.

[0049] Figure 11 is a schematic block diagram of a power amplifier system with an input switch according to an embodiment.