

DIVERSITY RECEIVER FRONT END SYSTEM WITH FLEXIBLE BAND ROUTING

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application claims priority to U.S. Provisional Application No. 62/073,043 filed October 31, 2014, entitled DIVERSITY RECEIVER FRONT END SYSTEM, U.S. Provisional Application No. 62/073,042, filed October 31, 2014, entitled FLEXIBLE MULTI-BAND MULTI-ANTENNA RECEIVER MODULE, U.S. Application No. 14/727,739, filed June 1, 2015, entitled DIVERSITY FRONT END SYSTEM WITH VARIABLE-GAIN AMPLIFIERS, and U.S. Application No. 14/836,575, filed August 26, 2015, entitled DIVERSITY RECEIVER FRONT END SYSTEM WITH FLEXIBLE ROUTING, the disclosure of each of which is hereby expressly incorporated by reference herein in its entirety.

BACKGROUND

Field

[0002] The present disclosure generally relates to wireless communication systems having one or more diversity receiving antennas.

Description of the Related Art

[0003] In wireless communication applications, size, cost, and performance are examples of factors that can be important for a given product. For example, to increase performance, wireless components such as a diversity receive antenna and associated circuitry are becoming more popular.

[0004] In many radio-frequency (RF) applications, a diversity receive antenna is placed physically far from a primary antenna. When both antennas are used at once, a transceiver can process signals from both antennas in order to increase data throughput.

SUMMARY

[0005] In accordance with the present disclosure, there is provided a receiving system comprising:

a plurality of amplifiers, each one of the plurality of amplifiers disposed along a corresponding one of a plurality of paths between an input of the receiving system and an output of the receiving system and configured to amplify a radio-frequency (RF) signal received at the amplifier;

an input multiplexer configured to receive one or more RF signals at one or more input multiplexer inputs and to output each of the one or more RF signals to one or more of a plurality of input multiplexer outputs to propagate along a respective one or more of the plurality of paths;

an output multiplexer configured to receive one or more amplified RF signals propagating along the respective one or more of the plurality of paths at one or more respective output multiplexer inputs and to output each of the one or more amplified RF signals to a selected one of a plurality of output multiplexer outputs; and

a controller configured to receive a band select signal and, based on the band select signal, control the input multiplexer and the output multiplexer.

[0005A] The present disclosure also provides a radio-frequency (RF) module comprising:

a packaging substrate configured to receive a plurality of components; and

a receiving system implemented on the packaging substrate, the receiving system including a plurality of amplifiers, each one of the plurality of amplifiers disposed along a corresponding one of a plurality of paths between an input of the receiving system and an output of the receiving system and configured to amplify a radio-frequency (RF) signal received at the amplifier, an input multiplexer configured to receive one or more RF signals at one or more input multiplexer inputs and to output each of the one or more RF signals to a selected one or more of a plurality of input multiplexer outputs to propagate along a respective one or more of the plurality of paths, an output multiplexer configured to receive one or more amplified RF signals propagating along the respective one or more of the plurality of paths at one or more respective output multiplexer inputs and to output each of the one or more amplified RF signals to a selected one of a

plurality of output multiplexer outputs, and a controller configured to receive a band select signal and, based on the band select signal, control the input multiplexer and the output multiplexer.

[0005B] The present disclosure further provides a wireless device comprising:

a first antenna configured to receive a first radio-frequency (RF) signal;

a first front-end module (FEM) in communication with the first antenna, the first FEM including a packaging substrate configured to receive a plurality of components, the first FEM further including a receiving system implemented on the packaging substrate, the receiving system including a plurality of amplifiers, each one of the plurality of amplifiers disposed along a corresponding one of a plurality of paths between an input of the receiving system and an output of the receiving system and configured to amplify a radio-frequency (RF) signal received at the amplifier, an input multiplexer configured to receive one or more RF signals at one or more input multiplexer inputs and to output each of the one or more RF signals to a selected one or more of a plurality of input multiplexer outputs to propagate along a respective one or more of the plurality of paths, an output multiplexer configured to receive one or more amplified RF signals propagating along the respective one or more of the plurality of paths at one or more respective output multiplexer inputs and to output each of the one or more amplified RF signals to a selected one of a plurality of output multiplexer outputs, and a controller configured to receive a band select signal and, based on the band select signal, control the input multiplexer and the output multiplexer; and

a communications module configured to receive a processed version of the first RF signal from the first FEM via a plurality of transmission lines respectively coupled to the plurality of output multiplexer outputs and to generate data bits based on the processed version of the first RF signal.

[0005C] In some implementations, the present disclosure relates to a receiving system including a plurality of amplifiers. Each one of the plurality of amplifiers is disposed along a corresponding one of a