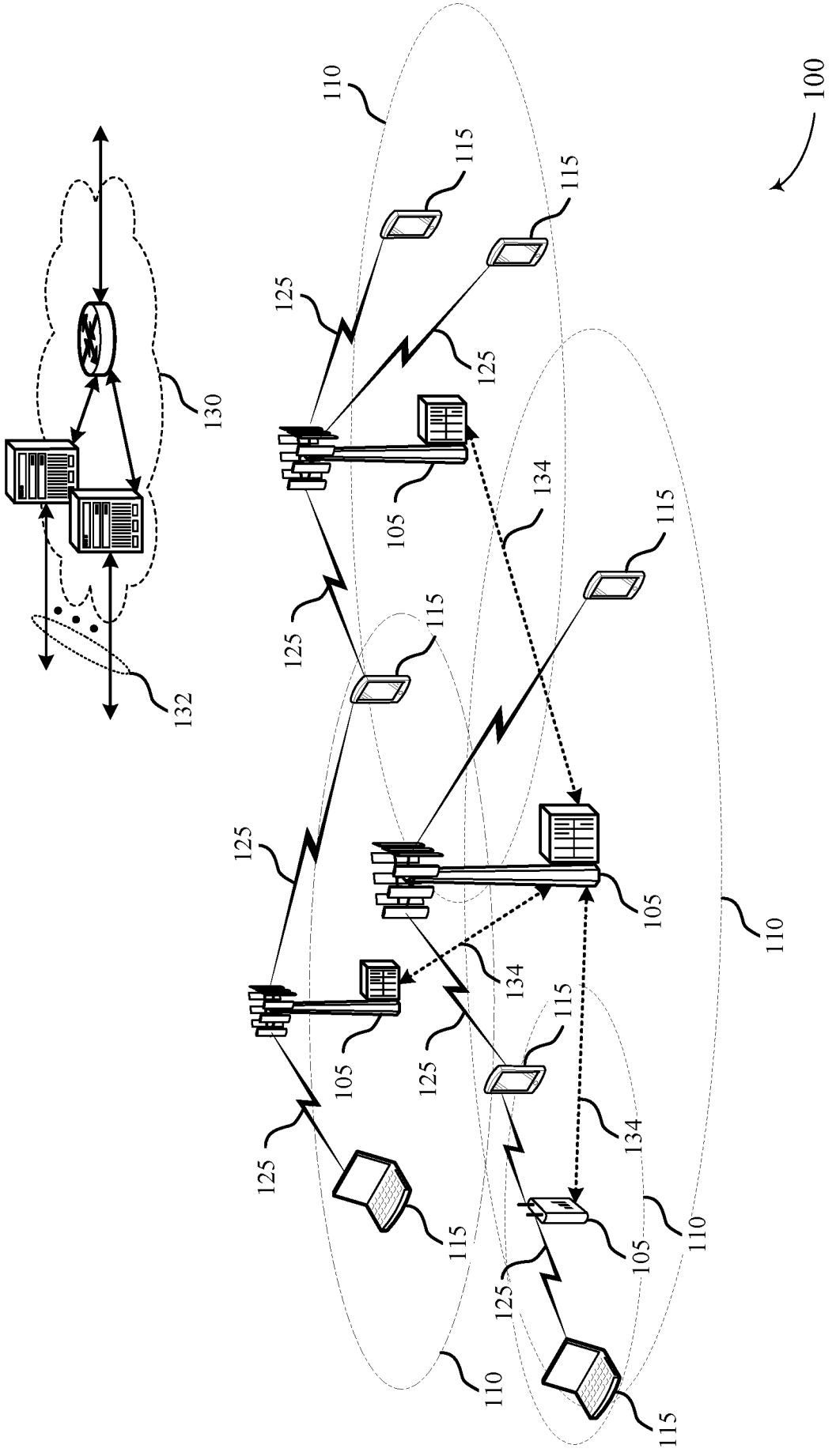
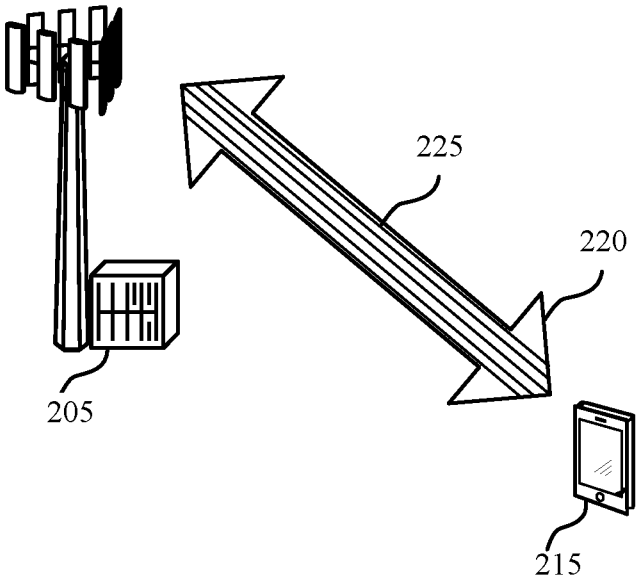


FIG. 1



200

FIG. 2

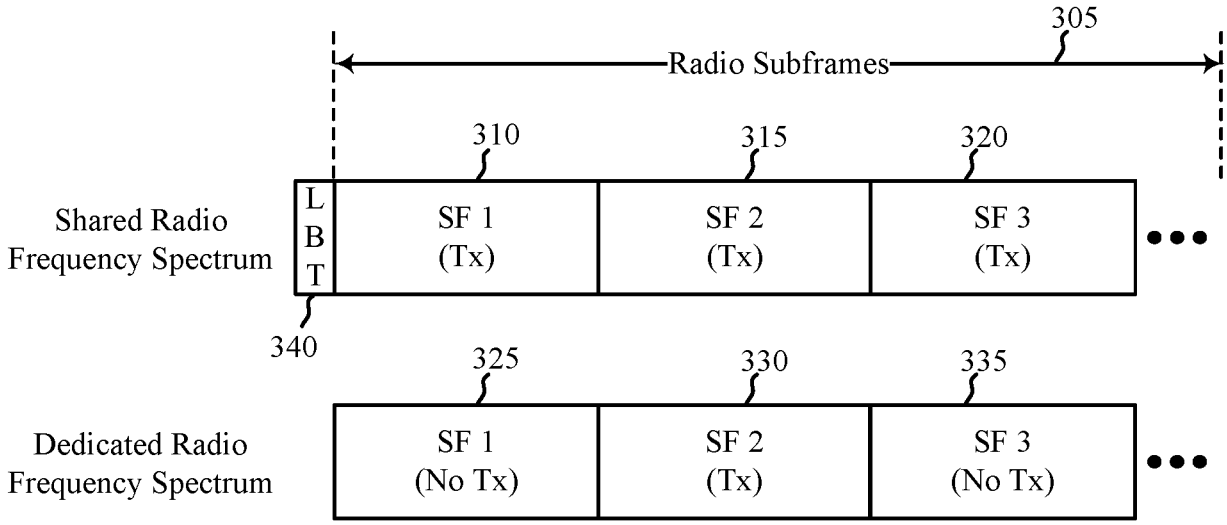
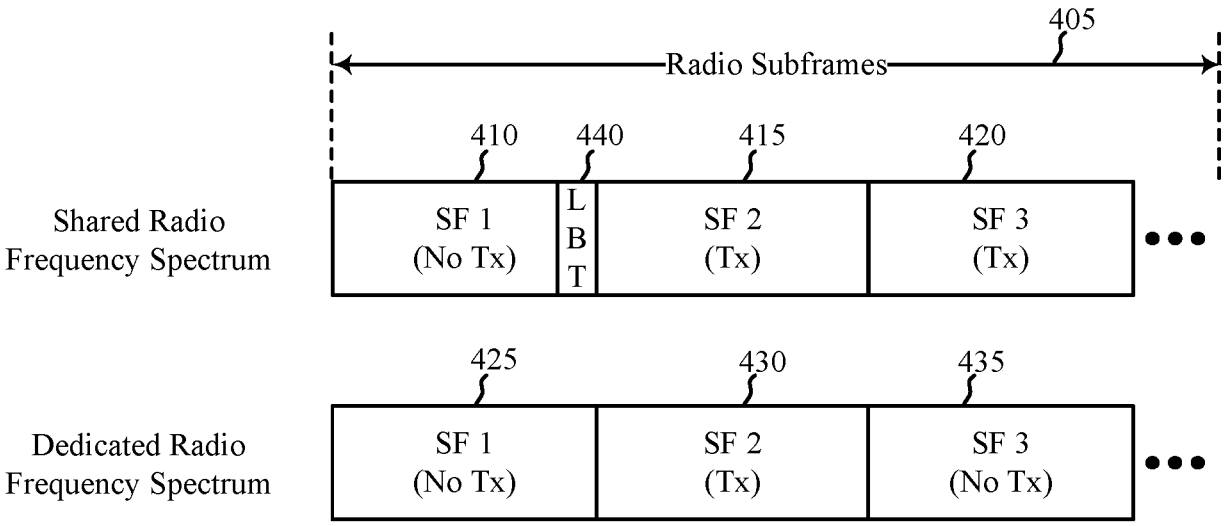

305
Radio Subframes
310
315
320
Shared Radio Frequency Spectrum
LBT
SF 1 (Tx)
SF 2 (Tx)
SF 3 (Tx)
340
325
330
335
Dedicated Radio Frequency Spectrum
SF 1 (No Tx)
SF 2 (Tx)
SF 3 (No Tx)

FIG. 3

300


405
Radio Subframes
410
440
415
420
Shared Radio Frequency Spectrum
SF 1 (No Tx)
LBT
SF 2 (Tx)
SF 3 (Tx)
425
430
435
Dedicated Radio Frequency Spectrum
SF 1 (No Tx)
SF 2 (Tx)
SF 3 (No Tx)

400

FIG. 4

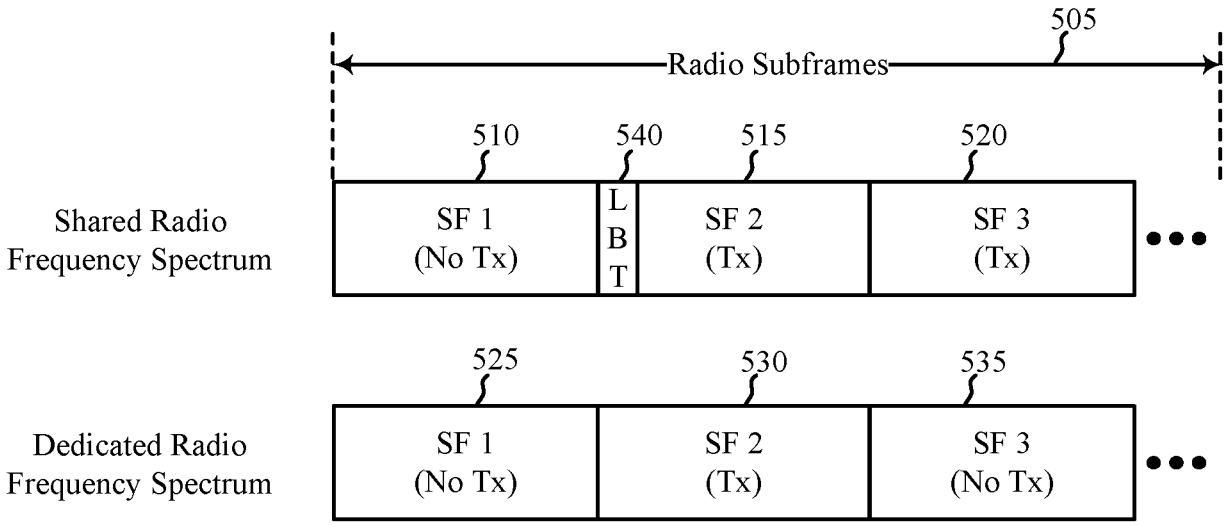

505
Radio Subframes
510
540
515
520
Shared Radio Frequency Spectrum
SF 1 (No Tx)
LBT
SF 2 (Tx)
SF 3 (Tx)
525
530
535
Dedicated Radio Frequency Spectrum
SF 1 (No Tx)
SF 2 (Tx)
SF 3 (No Tx)

FIG. 5

500

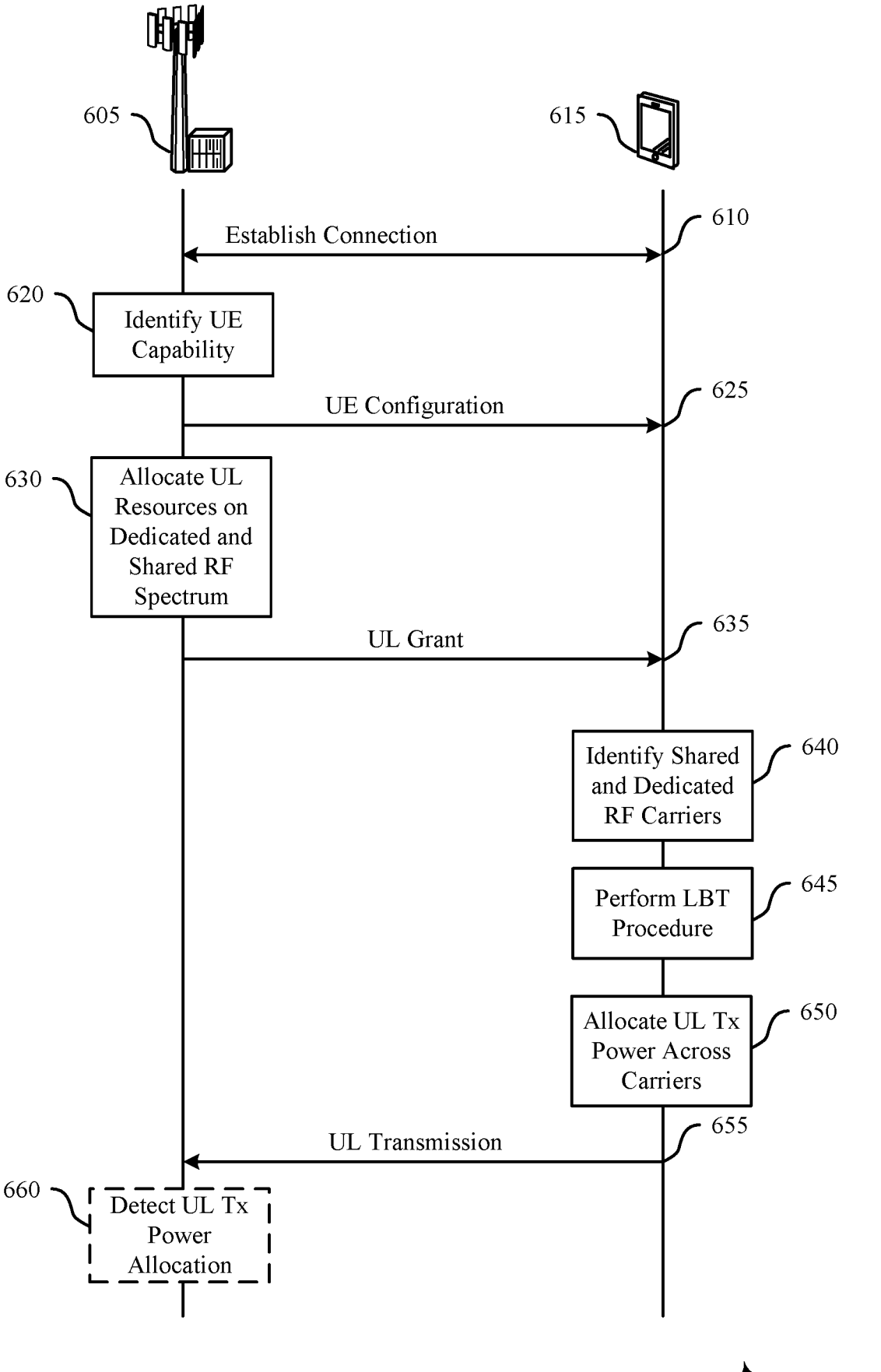
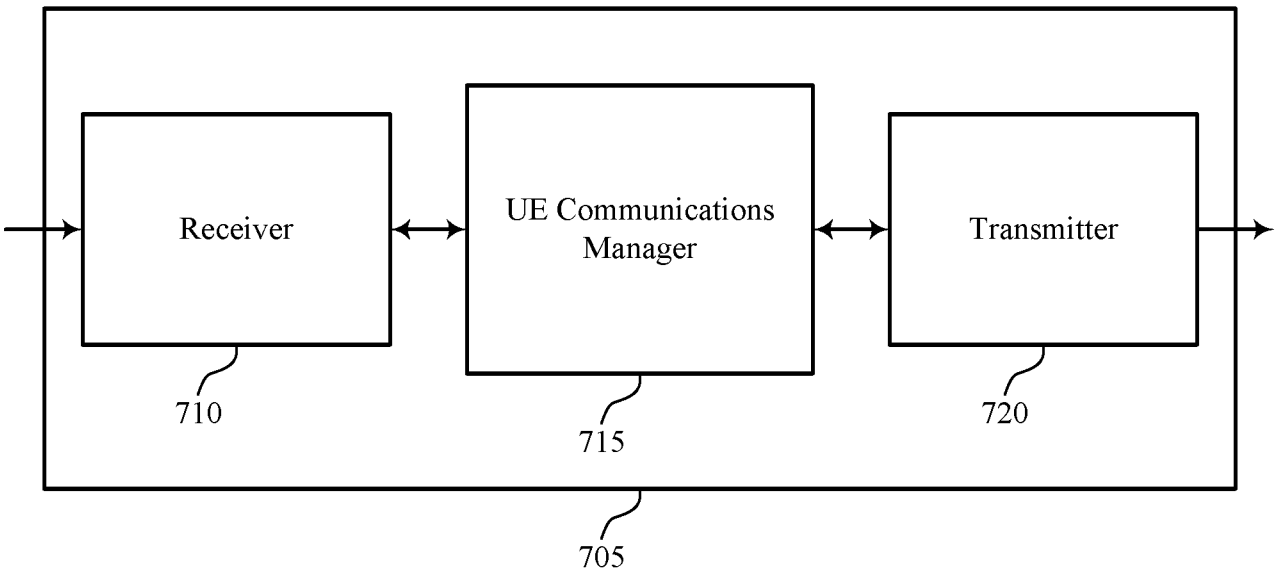

605
615
Establish Connection
610
620
Identify UE Capability
UE Configuration
625
630
Allocate UL Resources on Dedicated and Shared RF Spectrum
UL Grant
635
Identify Shared and Dedicated RF Carriers
640
Perform LBT Procedure
645
Allocate UL Tx Power Across Carriers
650
UL Transmission
655
660
Detect UL Tx Power Allocation
600

FIG. 6


Receiver
UE Communications Manager
Transmitter
710
715
720
705

700

FIG. 7

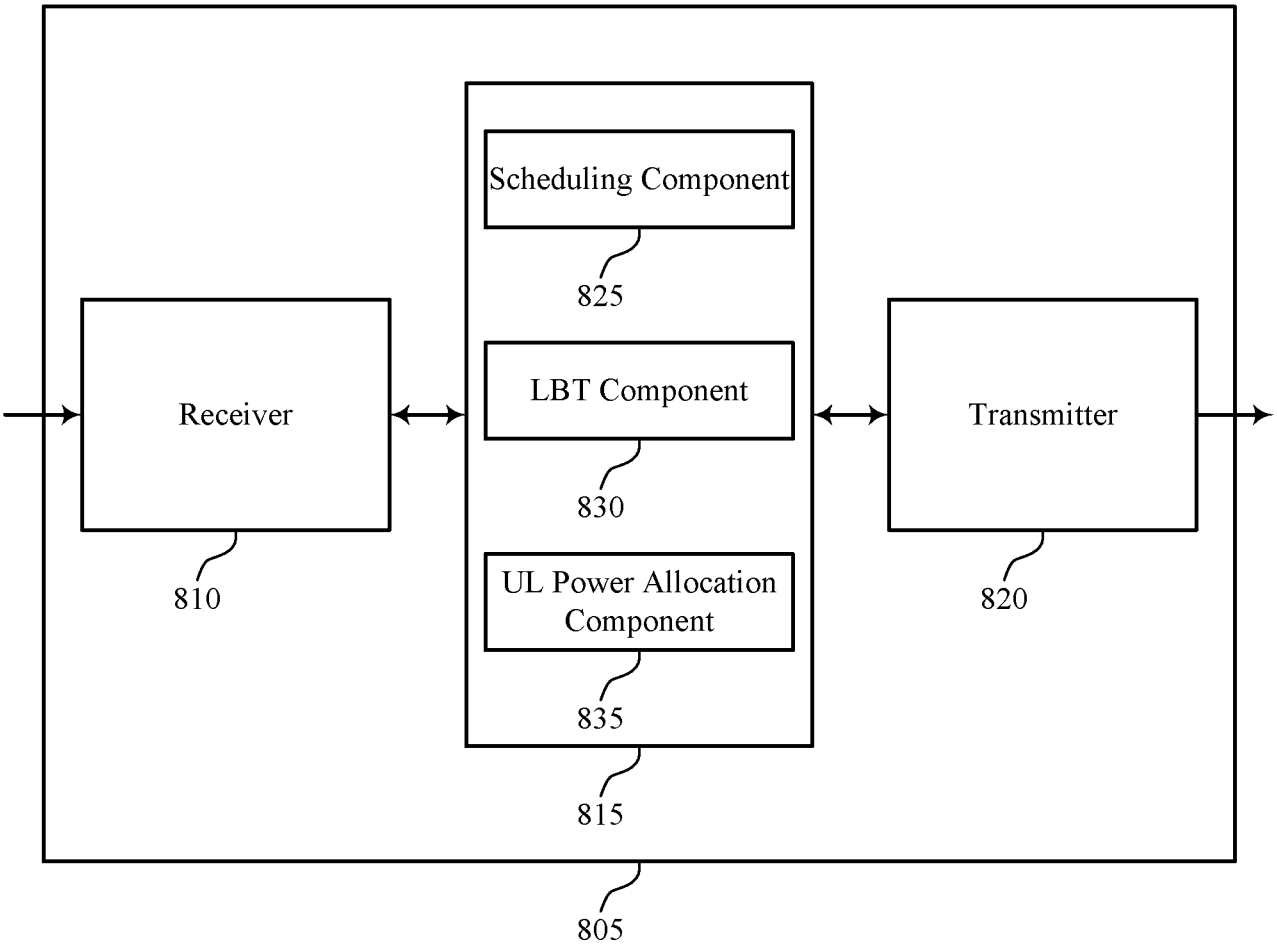

Scheduling Component
825
Receiver
LBT Component
Transmitter
830
810
820
UL Power Allocation Component
835
815
805
800

FIG. 8

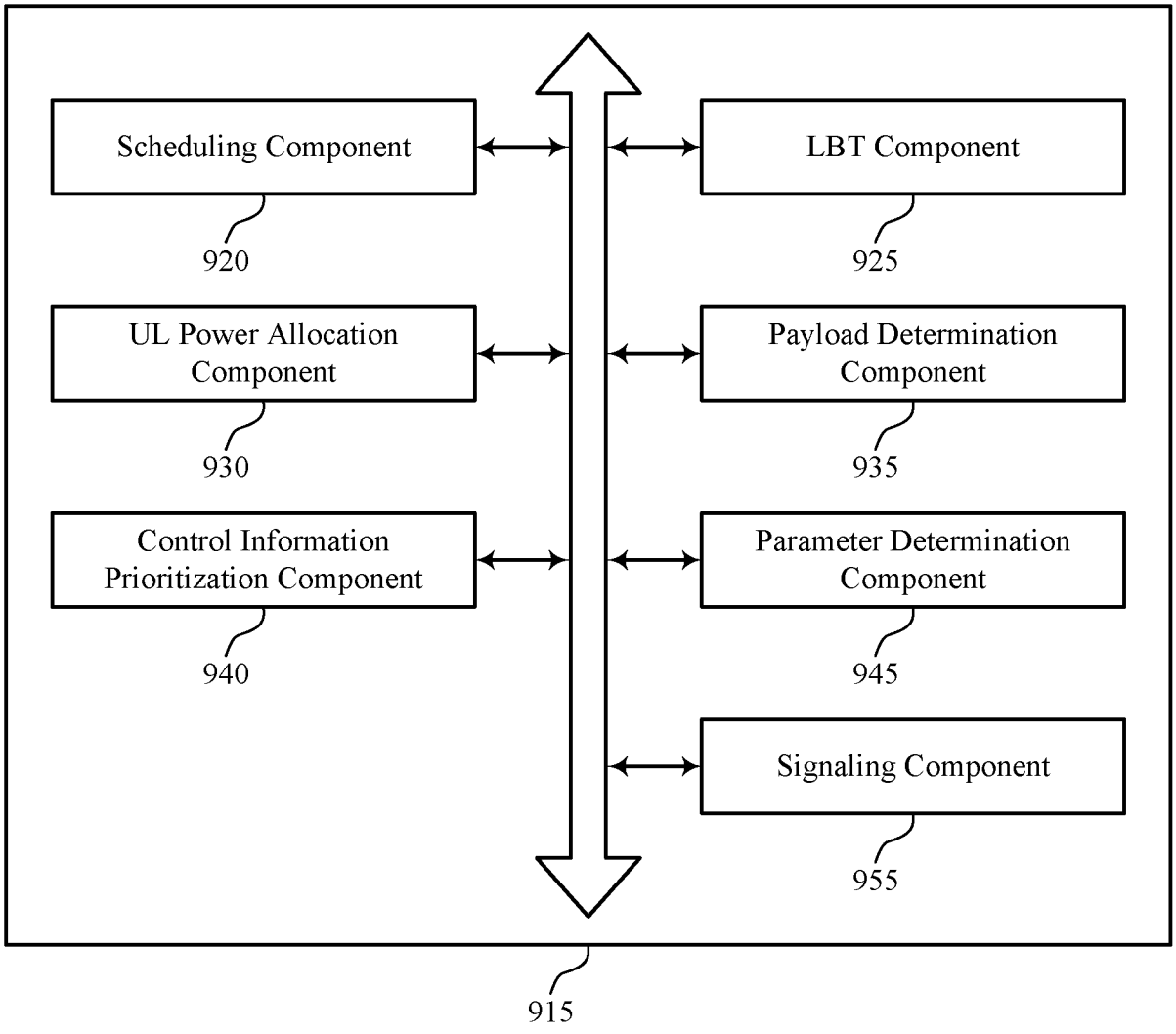

Scheduling Component
920
LBT Component
925
UL Power Allocation Component
930
Payload Determination Component
935
Control Information Prioritization Component
940
Parameter Determination Component
945
Signaling Component
955
915
900

FIG. 9

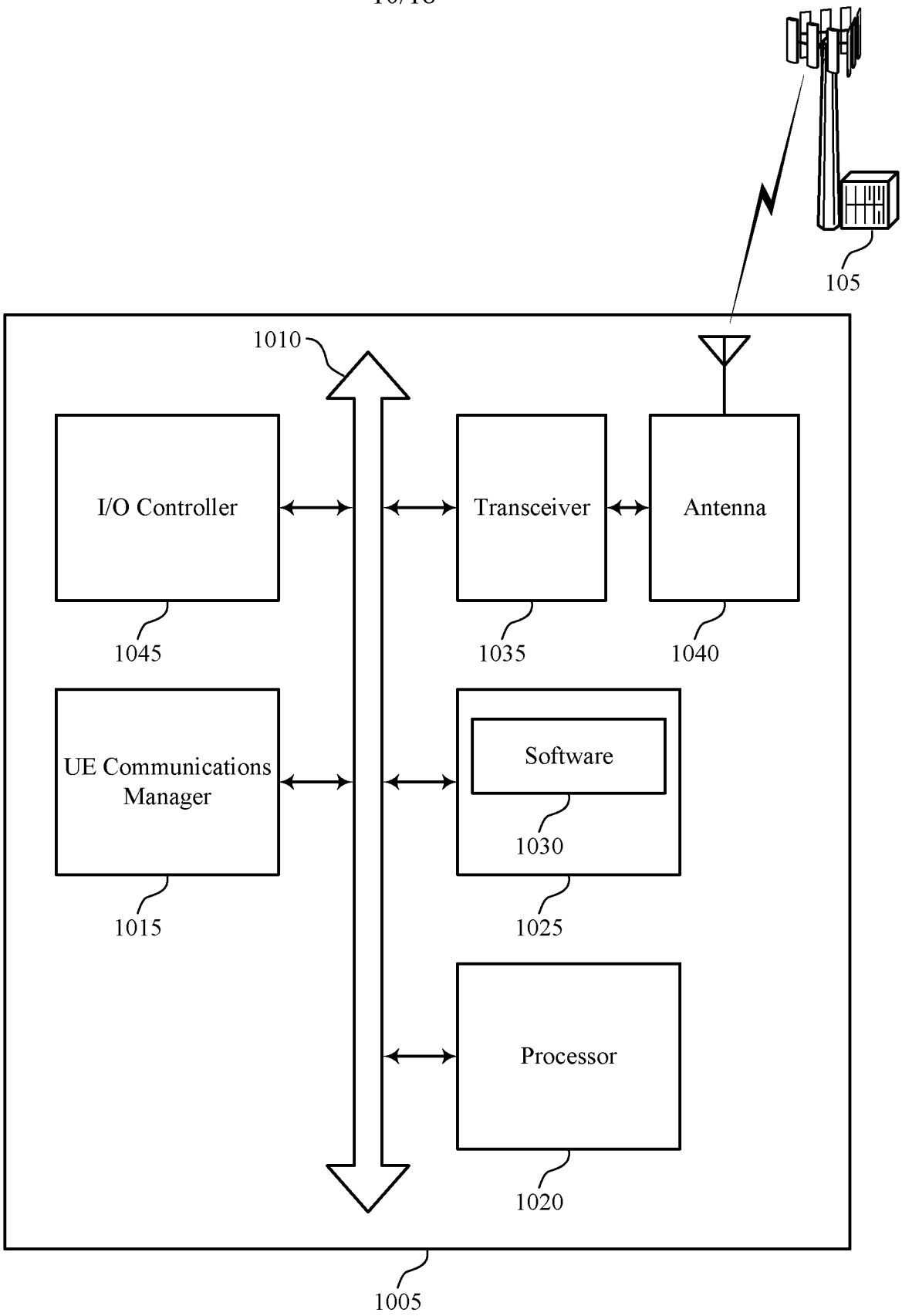

105
1010
I/O Controller
Transceiver
Antenna
1045
1035
1040
UE Communications Manager
Software
1030
1015
1025
Processor
1020
1005
1000

FIG. 10

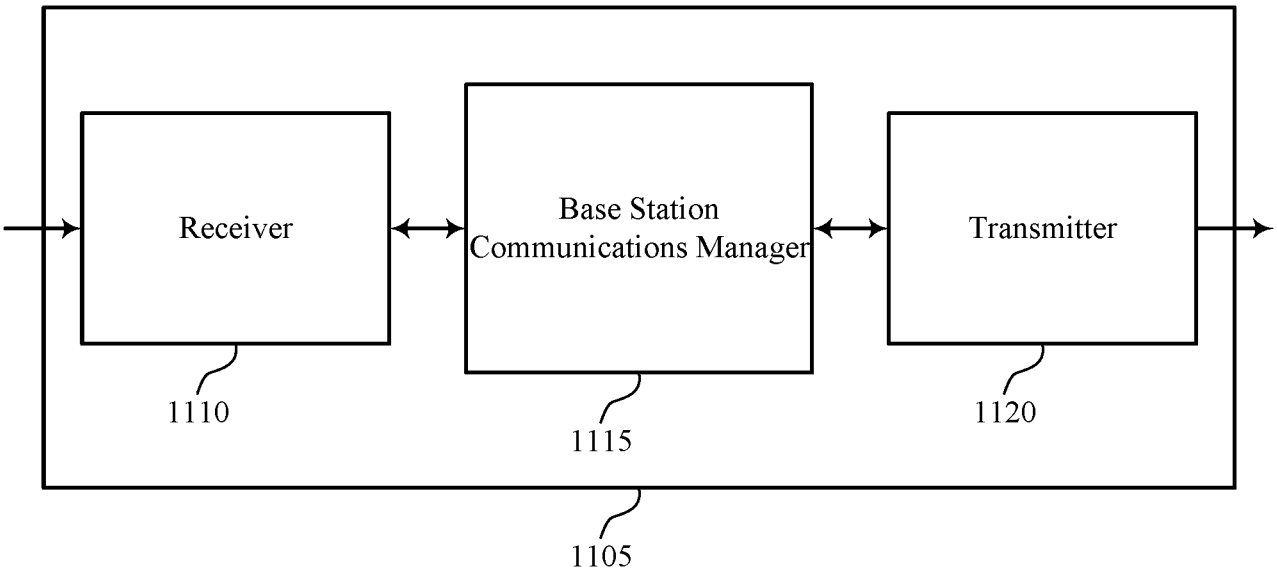

Receiver
Base Station Communications Manager
Transmitter
1110
1115
1120
1105
1100

FIG. 11

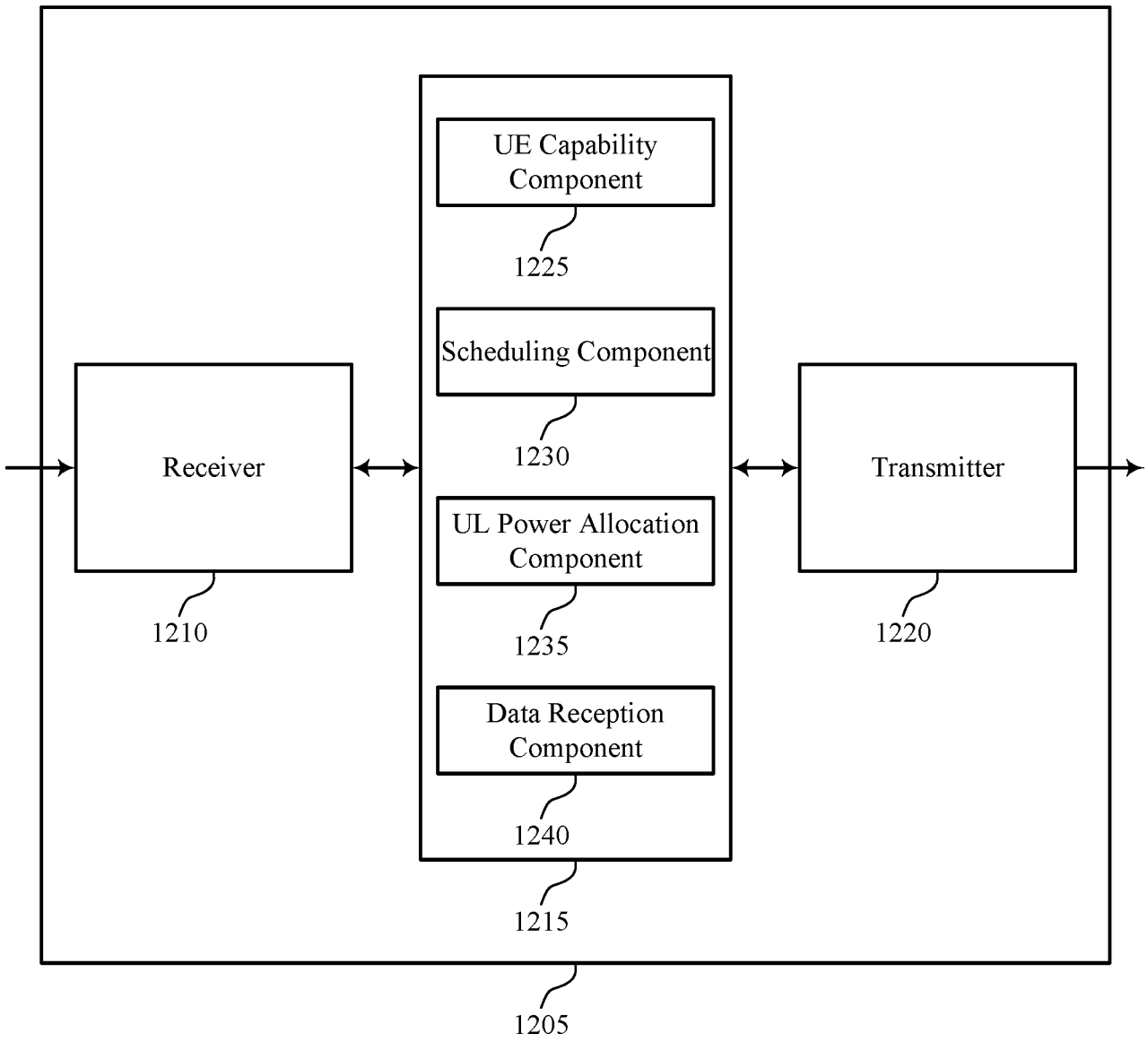

UE Capability Component
1225
Scheduling Component
1230
UL Power Allocation Component
1235
Data Reception Component
1240
1215
Receiver
1210
Transmitter
1220
1205
1200

FIG. 12

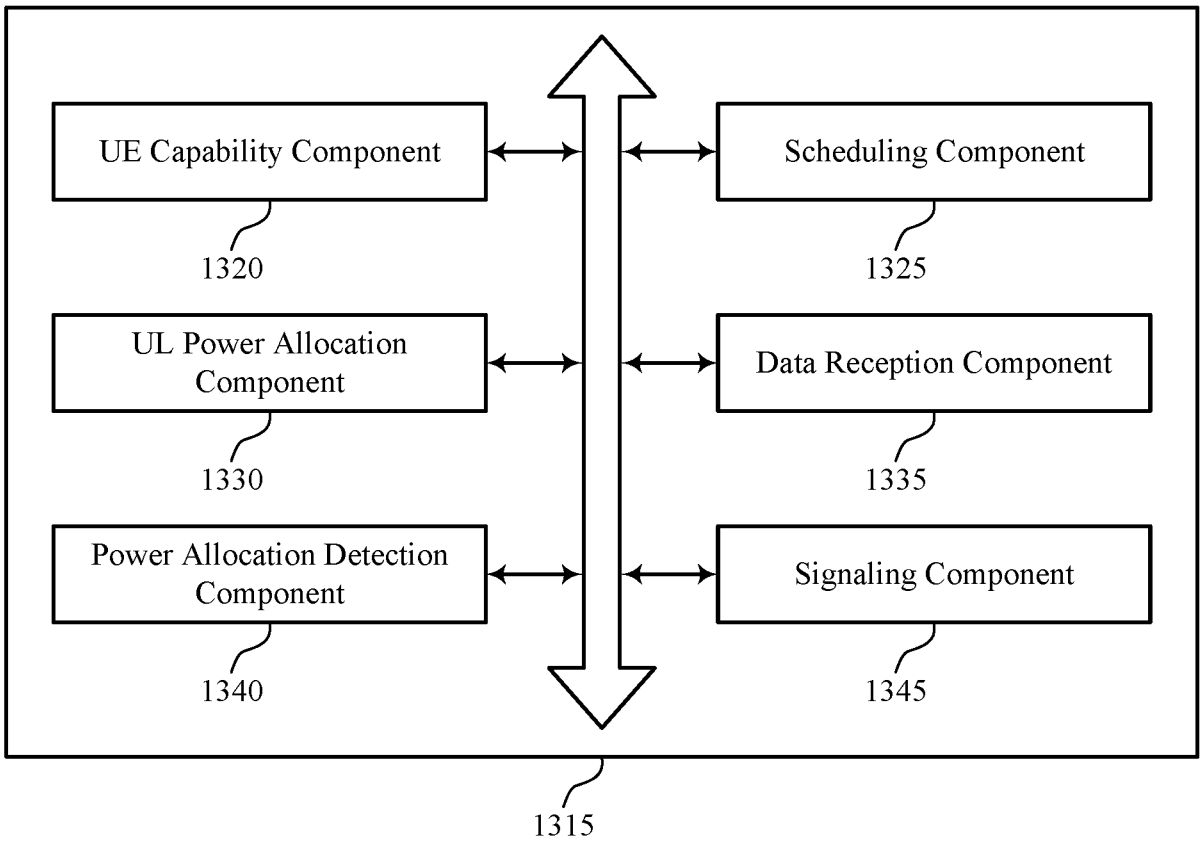

UE Capability Component
1320
Scheduling Component
1325
UL Power Allocation Component
1330
Data Reception Component
1335
Power Allocation Detection Component
1340
Signaling Component
1345
1315
1300

FIG. 13

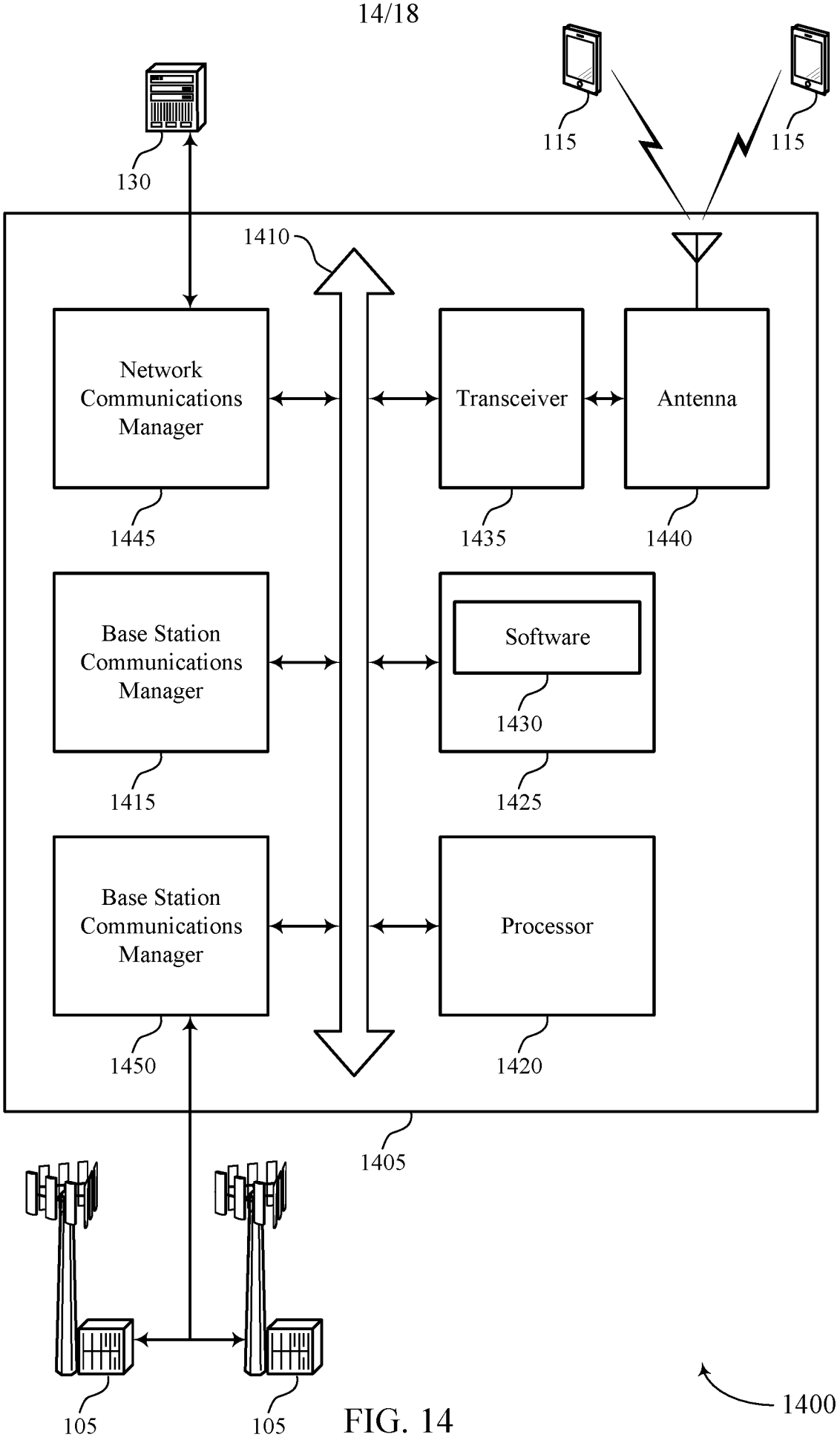

130
115
115
1410
Network Communications Manager
Transceiver
Antenna
1445
1435
1440
Base Station Communications Manager
Software
1430
1415
1425
Base Station Communications Manager
Processor
1450
1420
1405
105
105
1400

FIG. 14

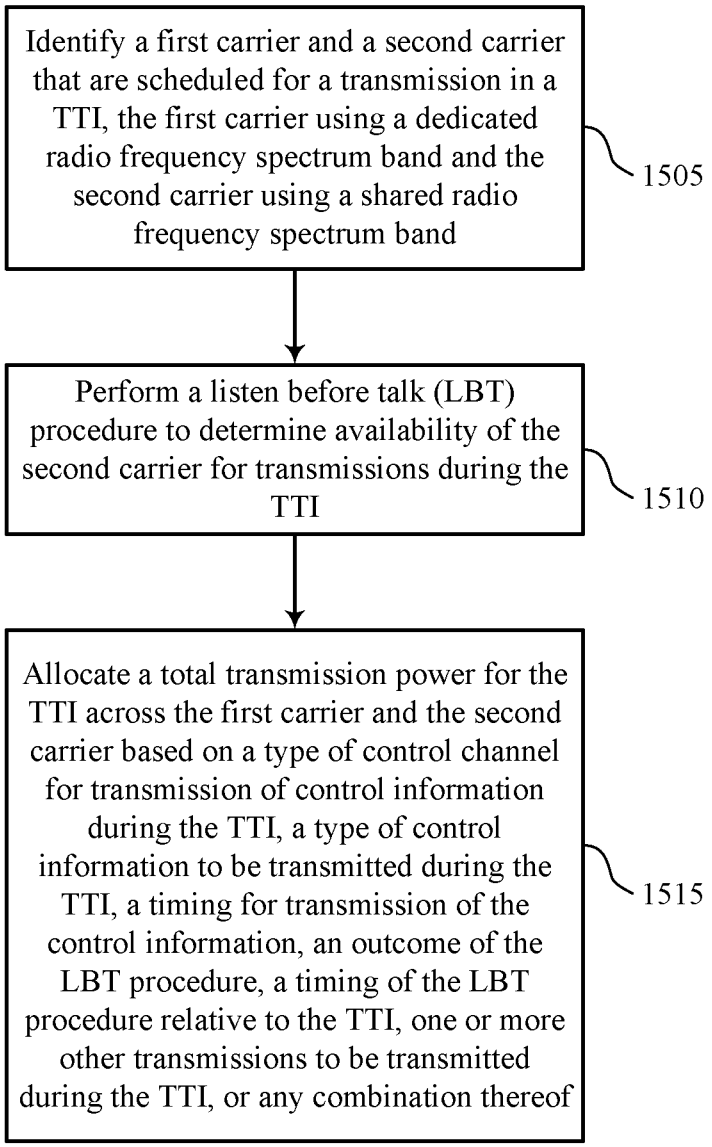

Identify a first carrier and a second carrier that are scheduled for a transmission in a TTI, the first carrier using a dedicated radio frequency spectrum band and the second carrier using a shared radio frequency spectrum band
1505
Perform a listen before talk (LBT) procedure to determine availability of the second carrier for transmissions during the TTI
1510
Allocate a total transmission power for the TTI across the first carrier and the second carrier based on a type of control channel for transmission of control information during the TTI, a type of control information to be transmitted during the TTI, a timing for transmission of the control information, an outcome of the LBT procedure, a timing of the LBT procedure relative to the TTI, one or more other transmissions to be transmitted during the TTI, or any combination thereof
1515
1500

FIG. 15

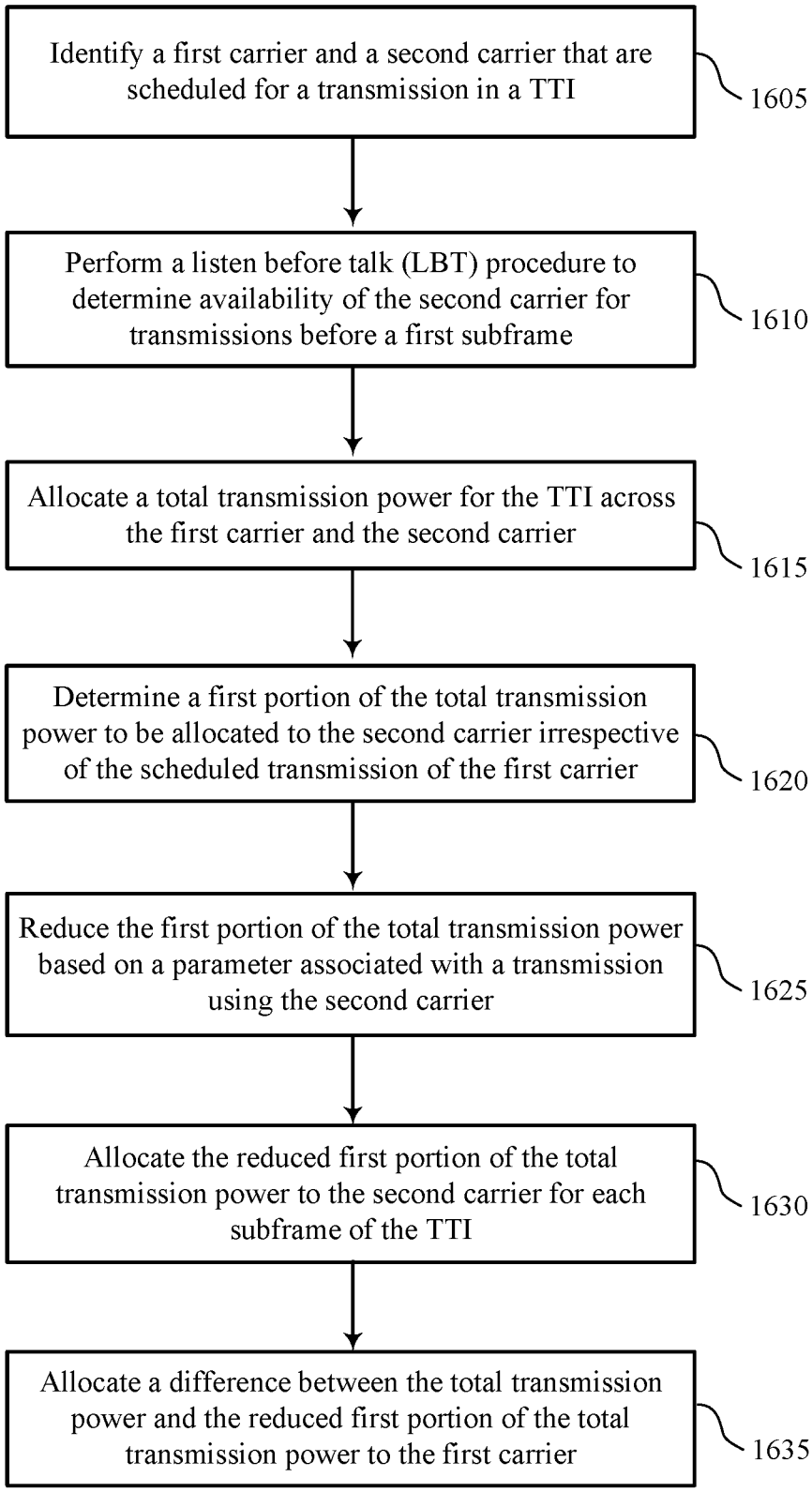

Identify a first carrier and a second carrier that are scheduled for a transmission in a TTI
1605
Perform a listen before talk (LBT) procedure to determine availability of the second carrier for transmissions before a first subframe
1610
Allocate a total transmission power for the TTI across the first carrier and the second carrier
1615
Determine a first portion of the total transmission power to be allocated to the second carrier irrespective of the scheduled transmission of the first carrier
1620
Reduce the first portion of the total transmission power based on a parameter associated with a transmission using the second carrier
1625
Allocate the reduced first portion of the total transmission power to the second carrier for each subframe of the TTI
1630
Allocate a difference between the total transmission power and the reduced first portion of the total transmission power to the first carrier
1635
1600

FIG. 16

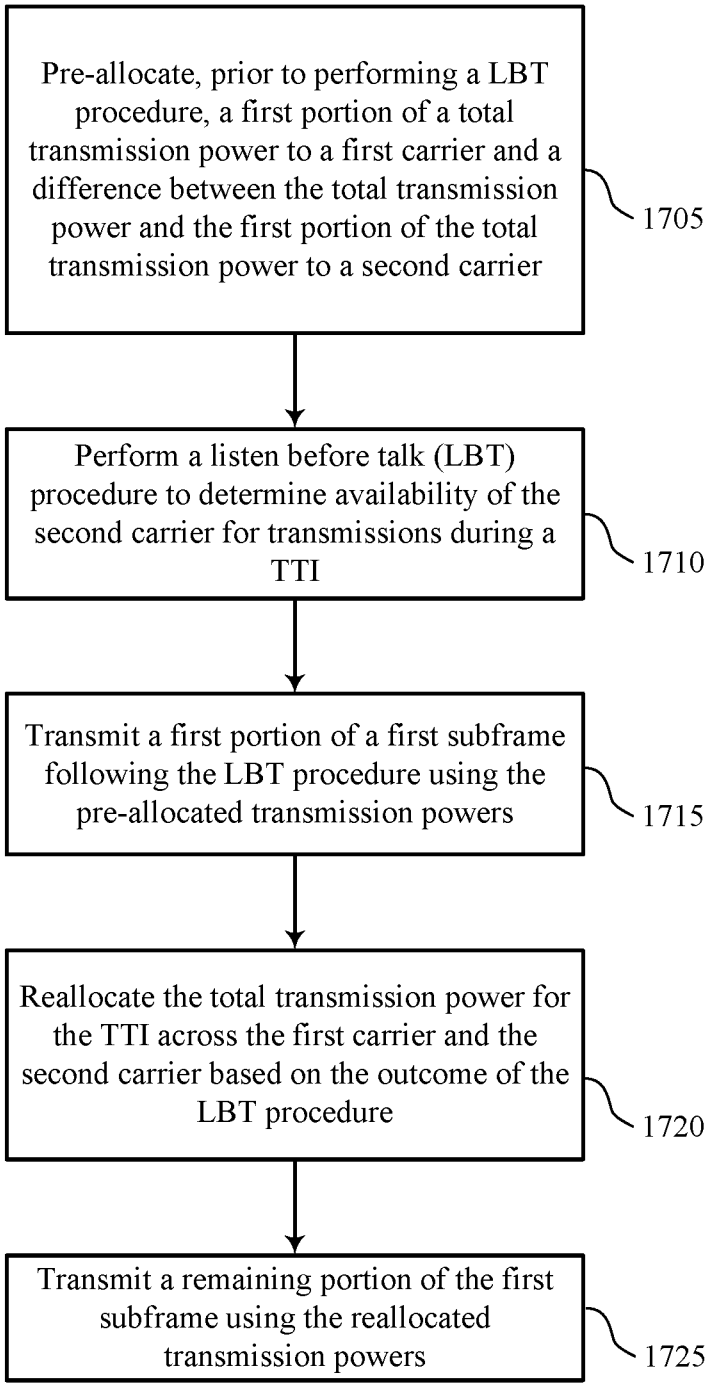

Pre-allocate, prior to performing a LBT procedure, a first portion of a total transmission power to a first carrier and a difference between the total transmission power and the first portion of the total transmission power to a second carrier
1705
Perform a listen before talk (LBT) procedure to determine availability of the second carrier for transmissions during a TTI
1710
Transmit a first portion of a first subframe following the LBT procedure using the pre-allocated transmission powers
1715
Reallocate the total transmission power for the TTI across the first carrier and the second carrier based on the outcome of the LBT procedure
1720
Transmit a remaining portion of the first subframe using the reallocated transmission powers
1725
1700

FIG. 17

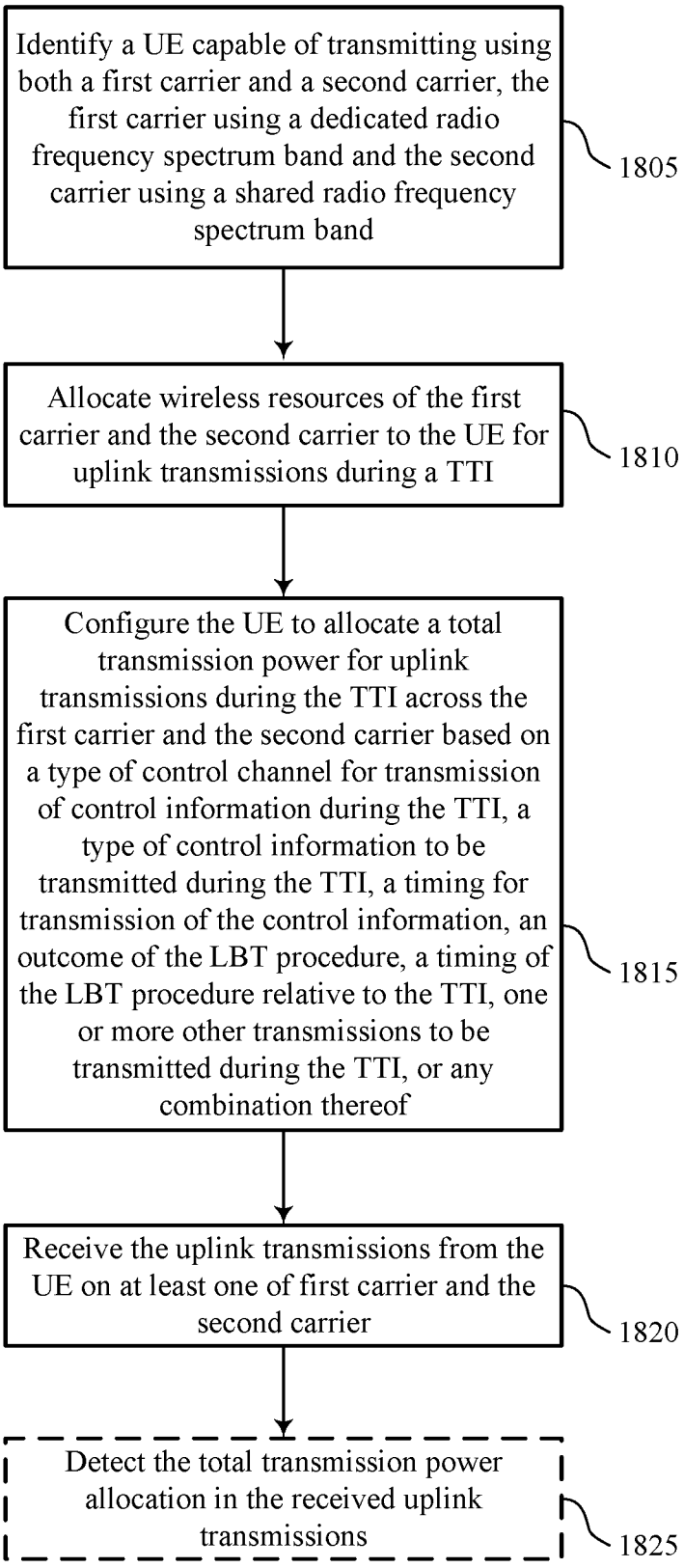

Identify a UE capable of transmitting using both a first carrier and a second carrier, the first carrier using a dedicated radio frequency spectrum band and the second carrier using a shared radio frequency spectrum band
1805
Allocate wireless resources of the first carrier and the second carrier to the UE for uplink transmissions during a TTI
1810
Configure the UE to allocate a total transmission power for uplink transmissions during the TTI across the first carrier and the second carrier based on a type of control channel for transmission of control information during the TTI, a type of control information to be transmitted during the TTI, a timing for transmission of the control information, an outcome of the LBT procedure, a timing of the LBT procedure relative to the TTI, one or more other transmissions to be transmitted during the TTI, or any combination thereof
1815
Receive the uplink transmissions from the UE on at least one of first carrier and the second carrier
1820
Detect the total transmission power allocation in the received uplink transmissions
1825
1800

FIG. 18