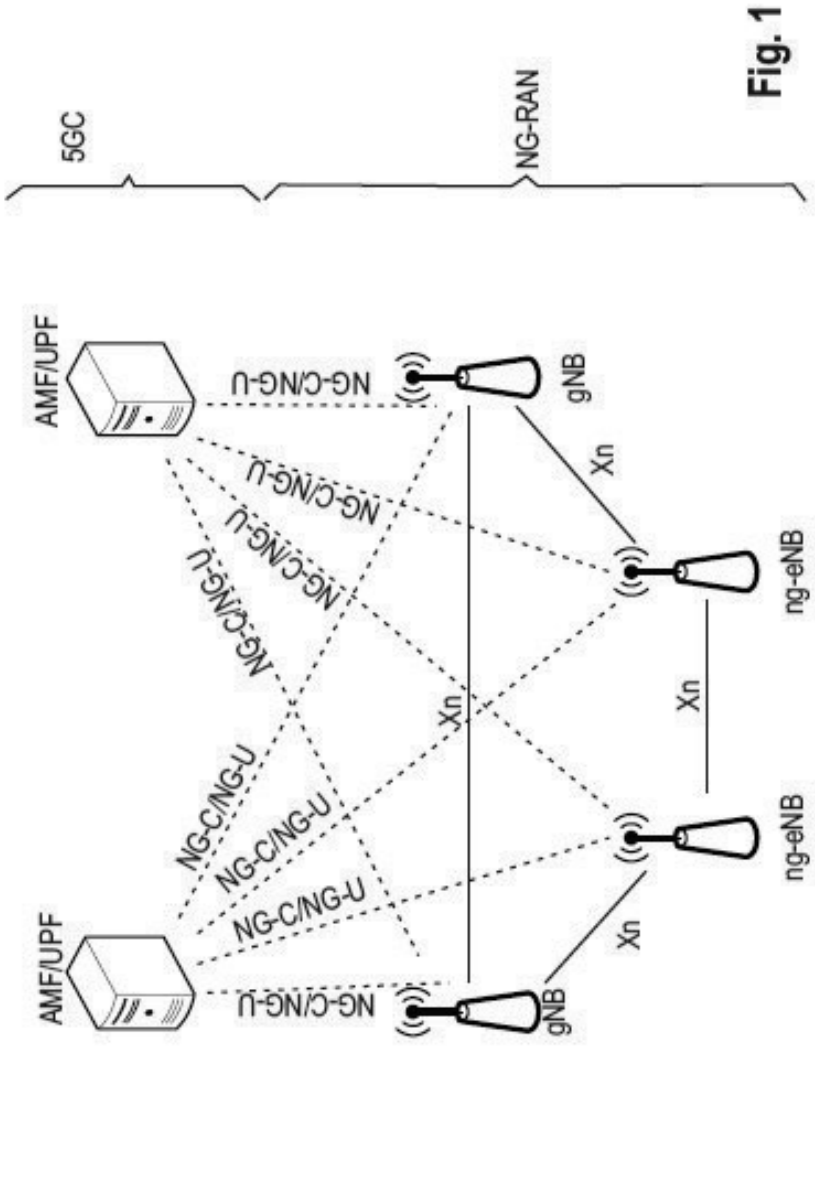

5GC
NG-RAN
AMF/UPF
AMF/UPF
gNB
gNB
ng-eNB
ng-eNB
NG-C/NG-U
NG-C/NG-U
NG-C/NG-U
NG-C/NG-U
NG-C/NG-U
NG-C/NG-U
NG-C/NG-U
Xn
Xn
Xn
Xn
100

Fig. 1

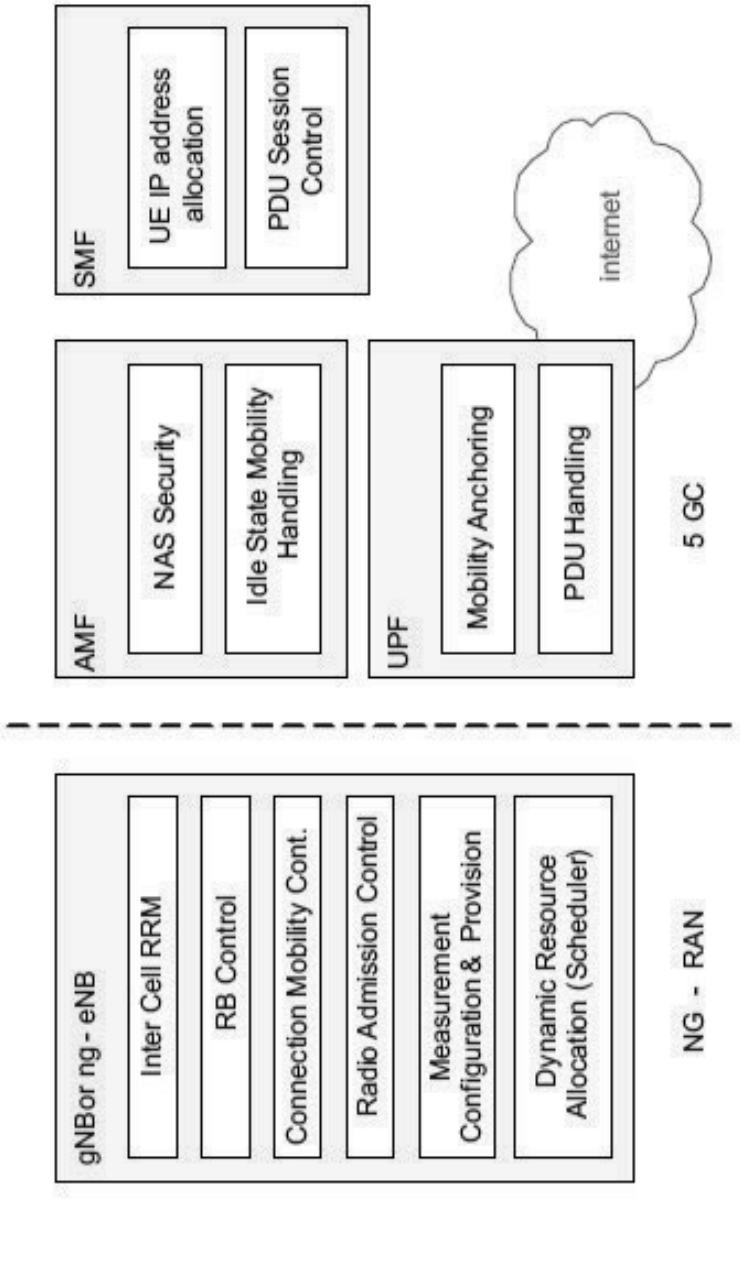

gNBor ng - eNB
Inter Cell RRM
RB Control
Connection Mobility Cont.
Radio Admission Control
Measurement Configuration & Provision
Dynamic Resource Allocation (Scheduler)
NG - RAN
AMF
NAS Security
Idle State Mobility Handling
UPF
Mobility Anchoring
PDU Handling
SMF
UE IP address allocation
PDU Session Control
internet
5 GC
200

Fig. 2

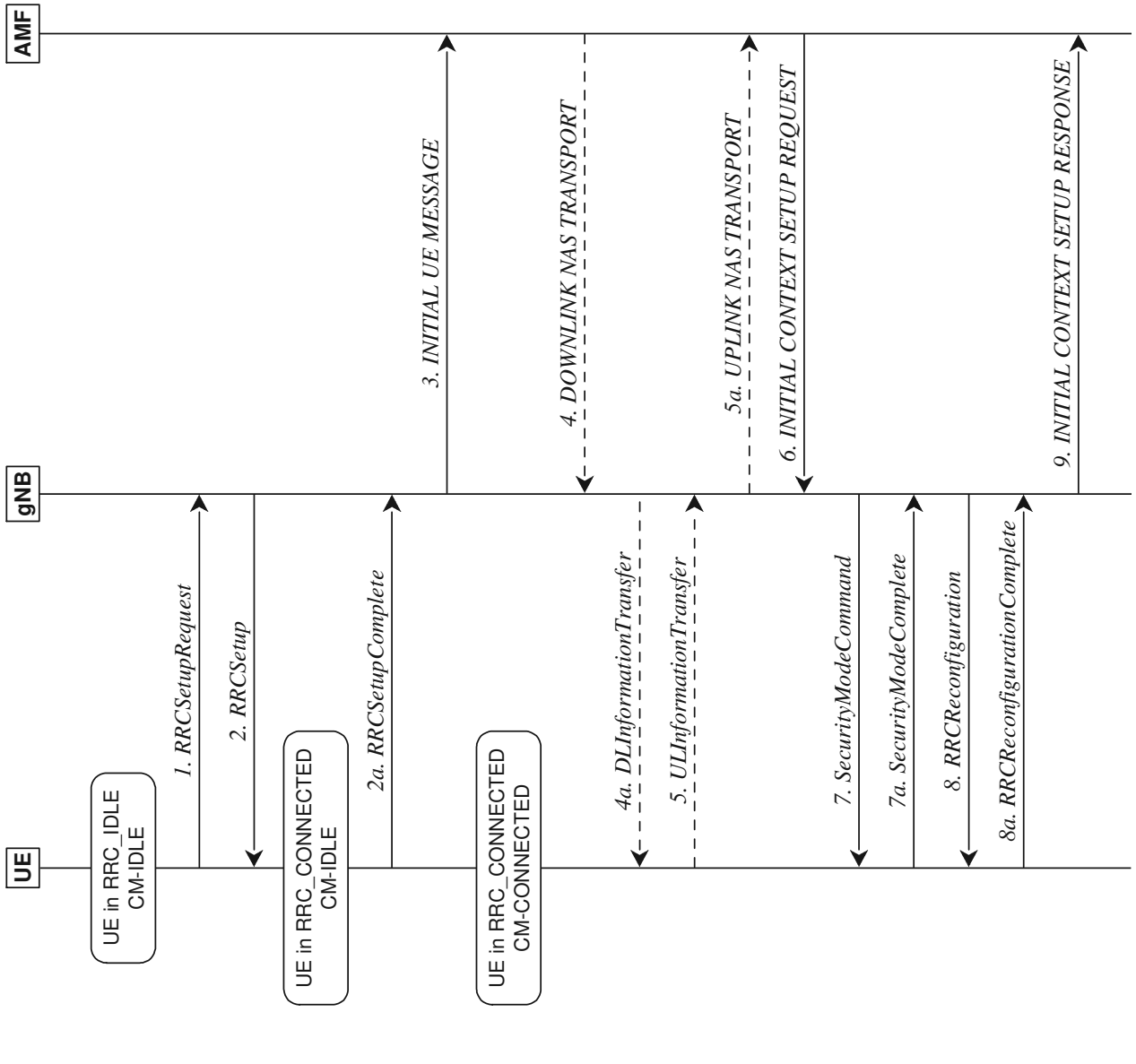

UE
gNB
AMF
UE in RRC_IDLE
CM-IDLE
1. RRCSetupRequest
2. RRCSetup
UE in RRC_CONNECTED
CM-IDLE
2a. RRCSetupComplete
3. INITIAL UE MESSAGE
4. DOWNLINK NAS TRANSPORT
5a. UPLINK NAS TRANSPORT
6. INITIAL CONTEXT SETUP REQUEST
9. INITIAL CONTEXT SETUP RESPONSE
UE in RRC_CONNECTED
CM-CONNECTED
4a. DLInformationTransfer
5. ULInformationTransfer
7. SecurityModeCommand
7a. SecurityModeComplete
8. RRCReconfiguration
8a. RRCReconfigurationComplete
300

Fig. 3

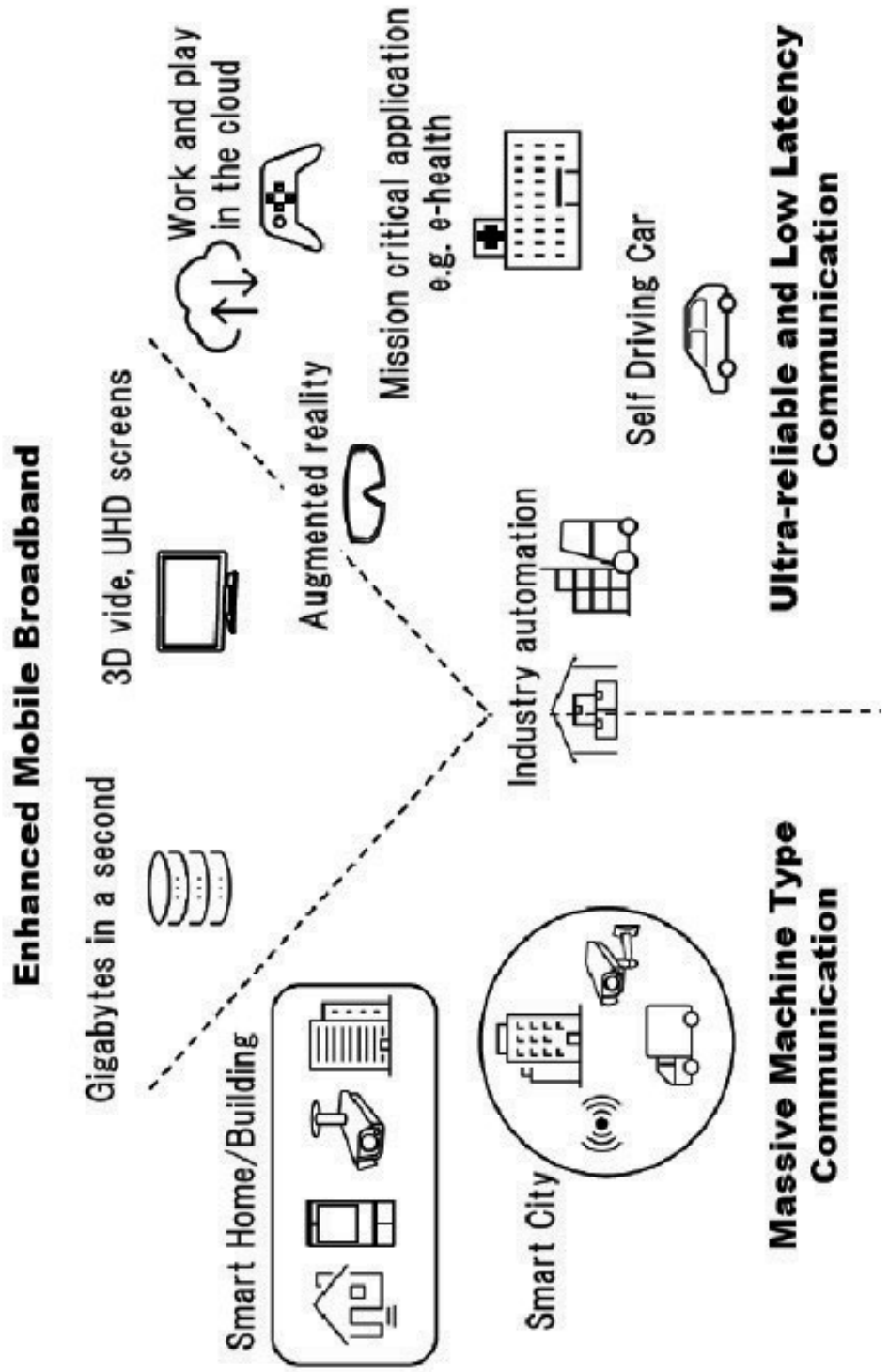

Enhanced Mobile Broadband
Gigabytes in a second
3D vide, UHD screens
Work and play in the cloud
Augmented reality
Mission critical application e.g. e-health
Smart Home/Building
Industry automation
Self Driving Car
Ultra-reliable and Low Latency Communication
Smart City
Massive Machine Type Communication
400

Fig. 4

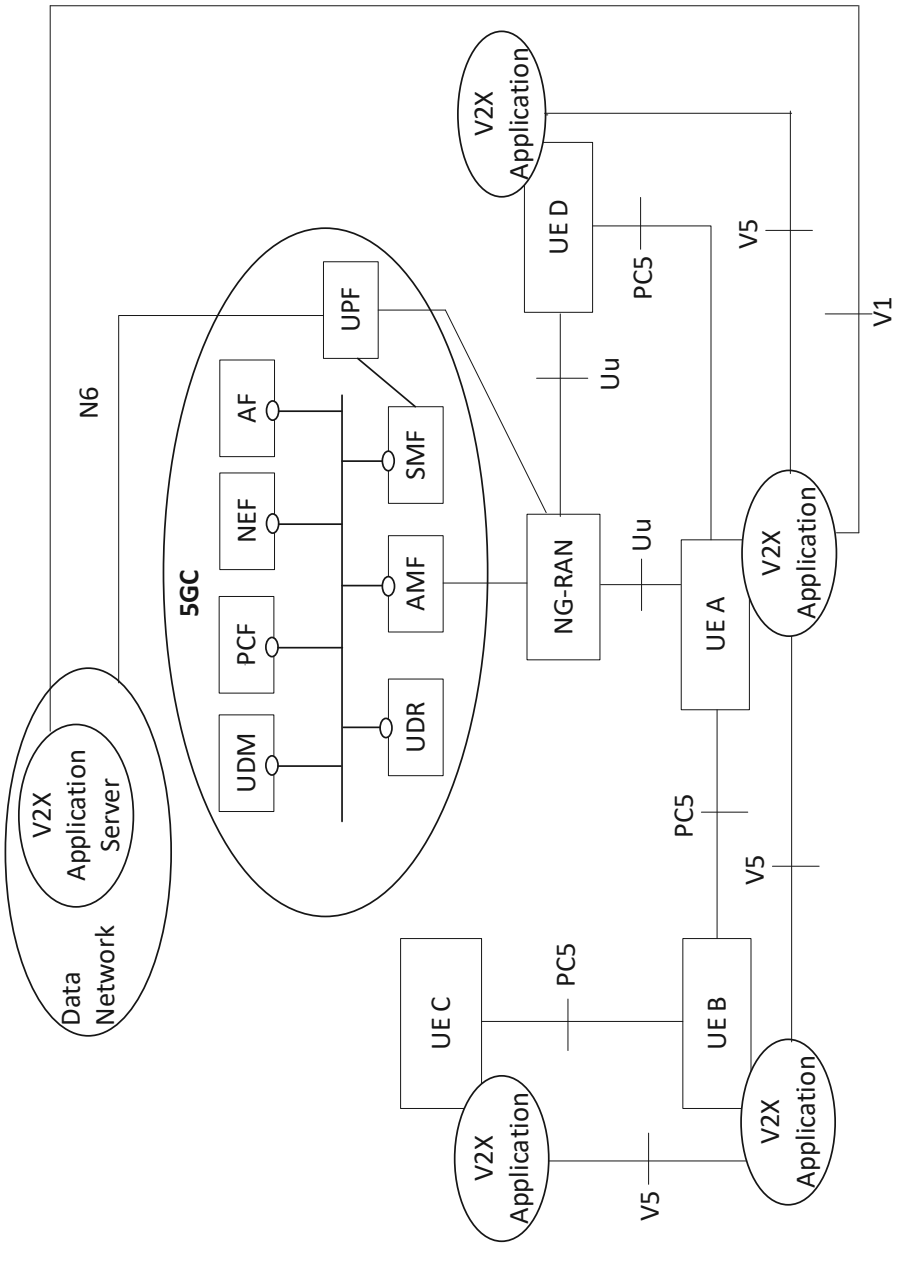

Data Network
V2X Application Server
N6
5GC
UPF
AF
NEF
PCF
UDM
SMF
AMF
UDR
NG-RAN
Uu
Uu
UE D
UE A
UE B
UE C
V2X Application
V2X Application
V2X Application
V2X Application
PC5
PC5
PC5
V5
V5
V5
V1
500

Fig. 5

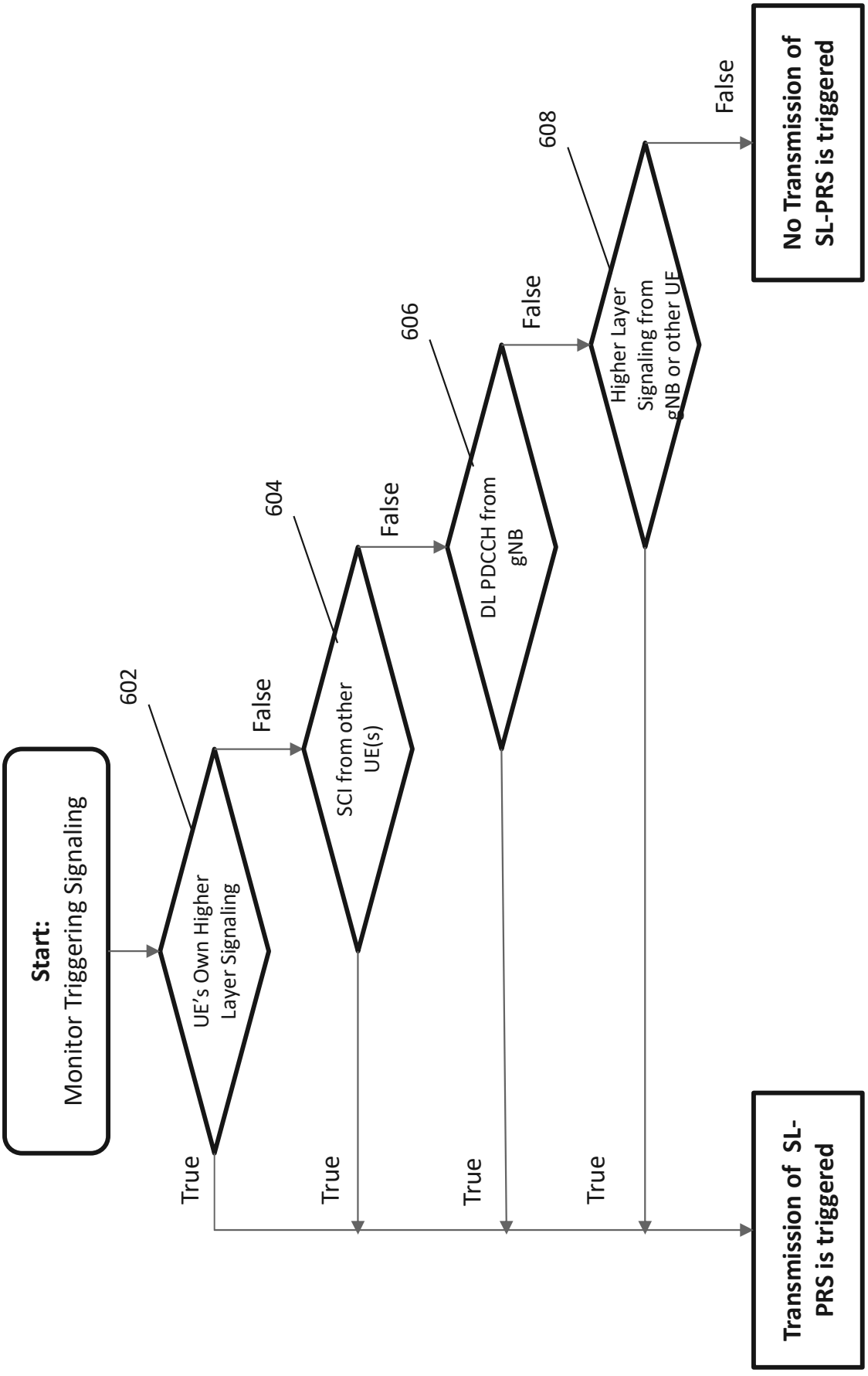

Start:
Monitor Triggering Signaling
602
UE's Own Higher Layer Signaling
True
False
604
SCI from other UE(s)
True
False
606
DL PDCCH from gNB
True
False
608
Higher Layer Signaling from gNB or other UE
True
False
Transmission of SL-PRS is triggered
No Transmission of SL-PRS is triggered
600

Fig. 6

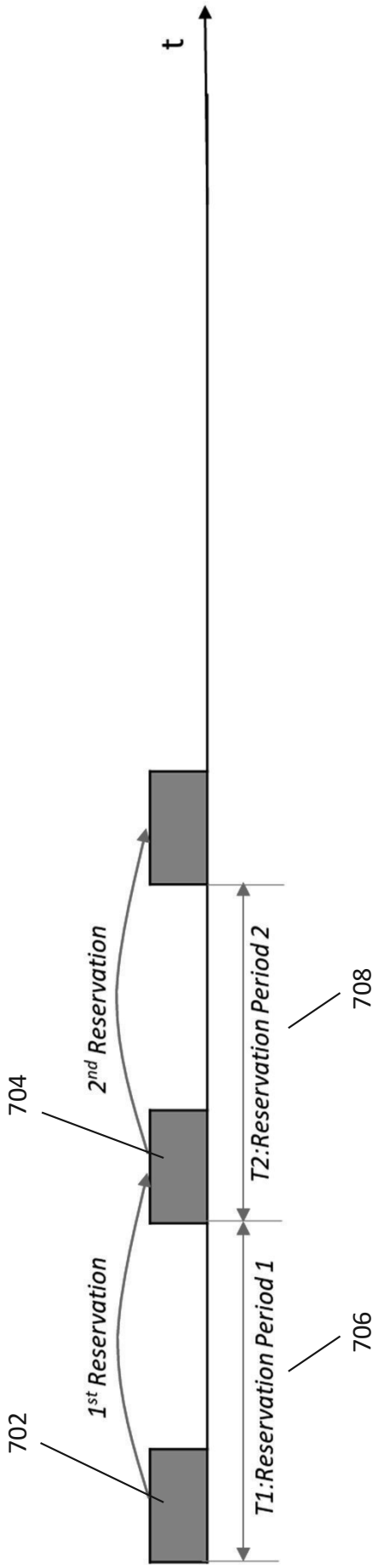

t
2nd Reservation
1st Reservation
T2:Reservation Period 2
T1:Reservation Period 1
702
704
706
708
700

Fig. 7

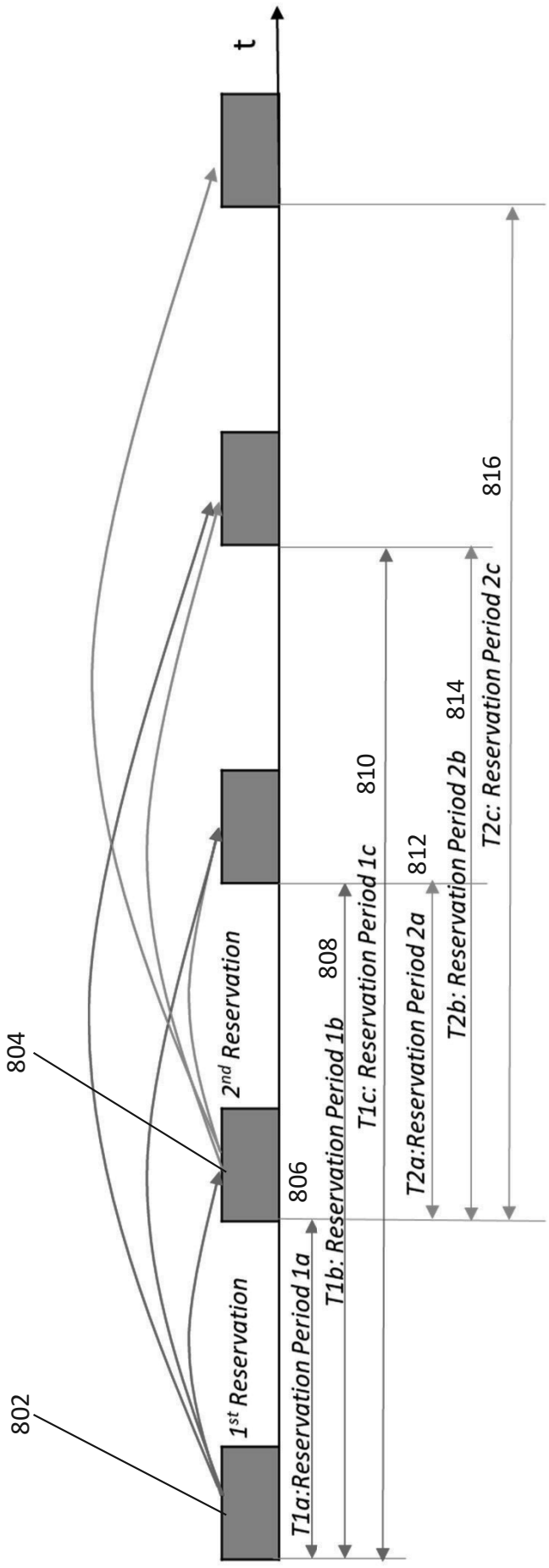

t
802
804
1st Reservation
2nd Reservation
806
808
810
812
814
816
T1a:Reservation Period 1a
T1b: Reservation Period 1b
T1c: Reservation Period 1c
T2a:Reservation Period 2a
T2b: Reservation Period 2b
T2c: Reservation Period 2c
800

Fig. 8

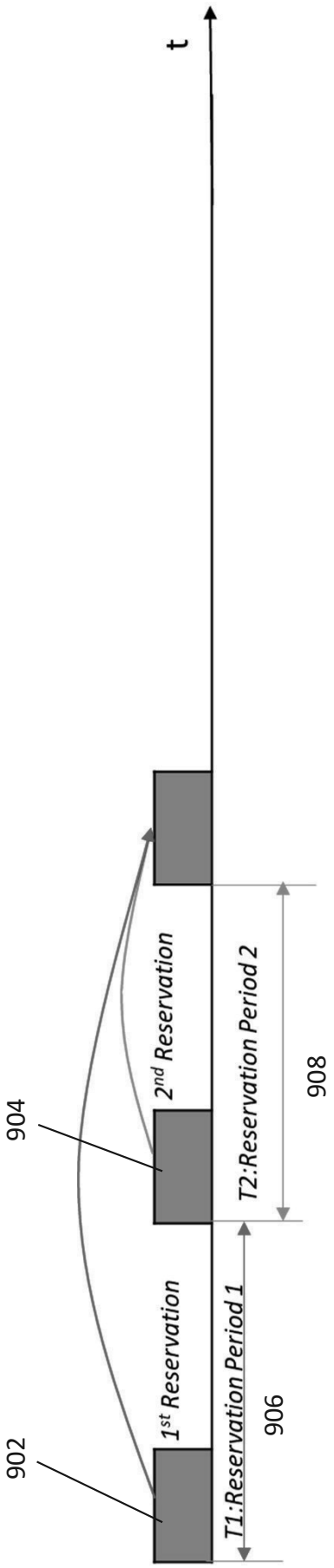

t
902
904
1st Reservation
2nd Reservation
T1:Reservation Period 1
T2:Reservation Period 2
906
908
900

Fig. 9

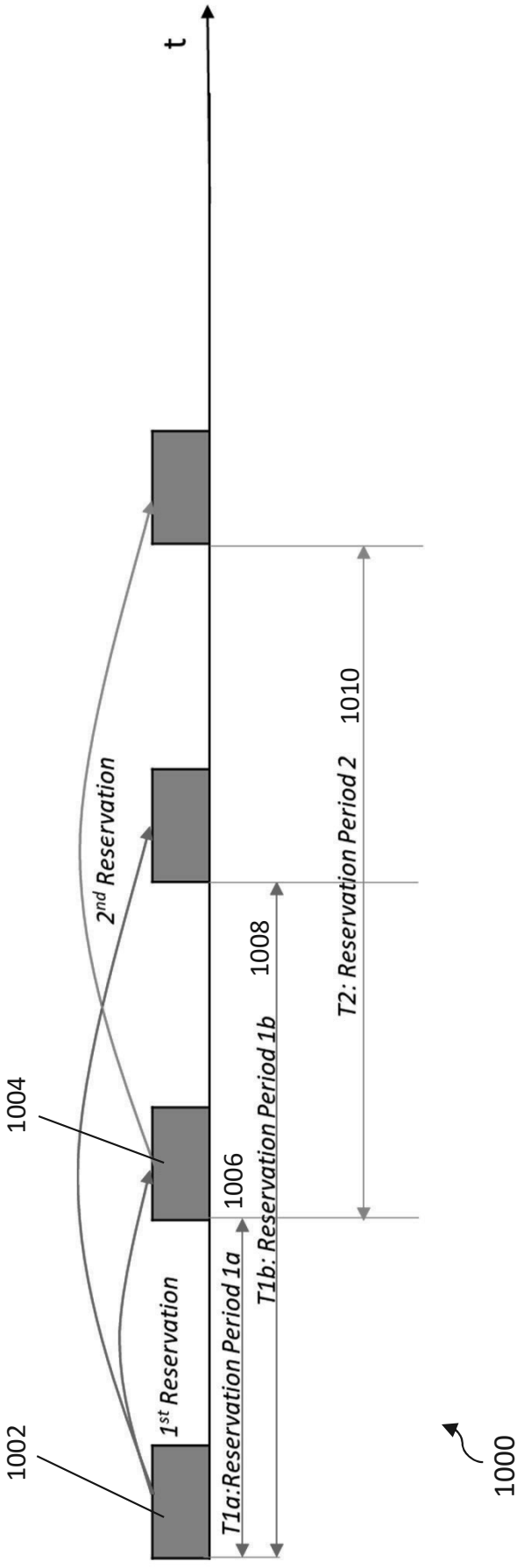

t
1002
1004
1006
1008
1010
1st Reservation
2nd Reservation
T1a:Reservation Period 1a
T1b: Reservation Period 1b
T2: Reservation Period 2
1000

Fig. 10

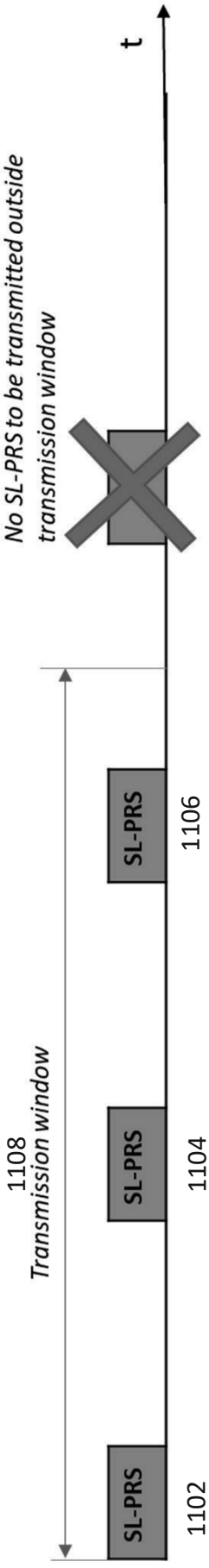

t
No SL-PRS to be transmitted outside transmission window
SL-PRS
SL-PRS
SL-PRS
1102
1104
1106
1108
Transmission window
1100

Fig. 11

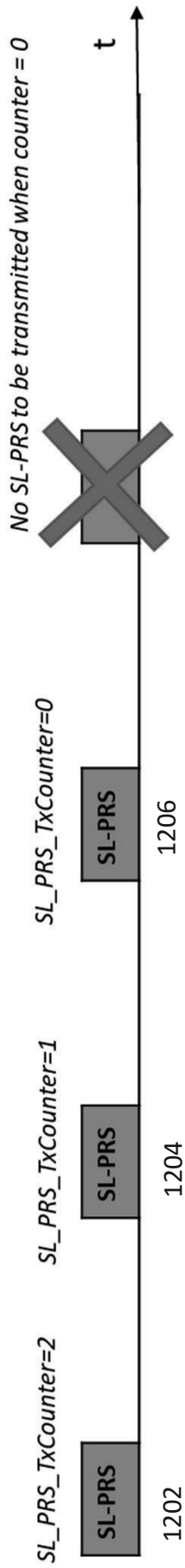

SL_PRS_TxCounter=2
SL-PRS
1202
SL_PRS_TxCounter=1
SL-PRS
1204
SL_PRS_TxCounter=0
SL-PRS
1206
No SL-PRS to be transmitted when counter = 0
t
1200

Fig. 12

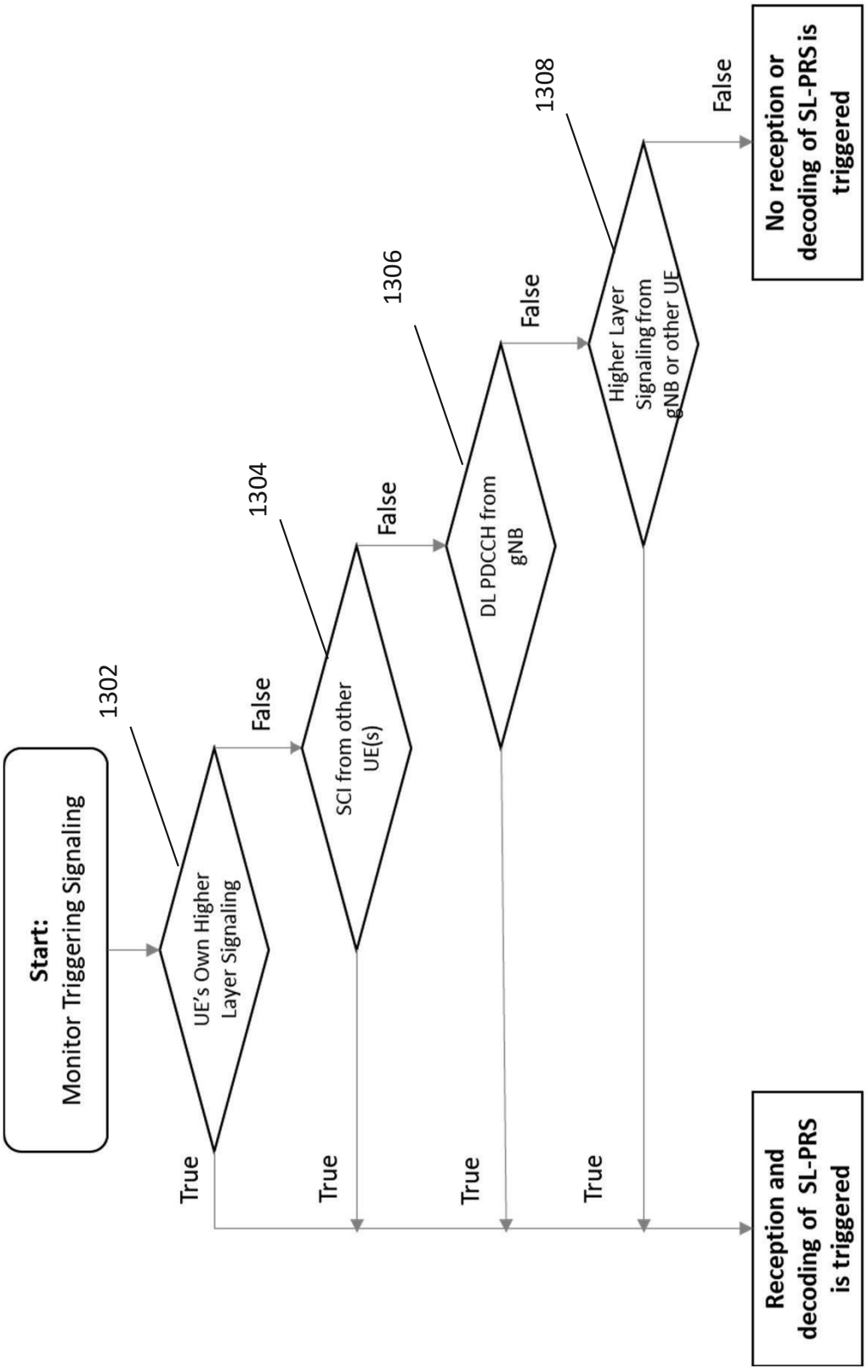

Start:
Monitor Triggering Signaling
1302
UE's Own Higher Layer Signaling
True
False
1304
SCI from other UE(s)
True
False
1306
DL PDCCH from gNB
True
False
1308
Higher Layer Signaling from gNB or other UE
True
False
Reception and decoding of SL-PRS is triggered
No reception or decoding of SL-PRS is triggered
1300

Fig. 13

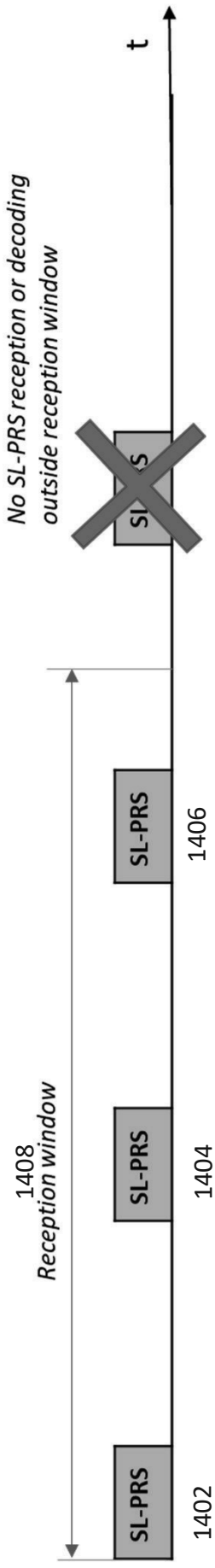

t
No SL-PRS reception or decoding outside reception window
SL-PRS
1406
SL-PRS
1404
SL-PRS
1402
1408
Reception window
1400

Fig. 14

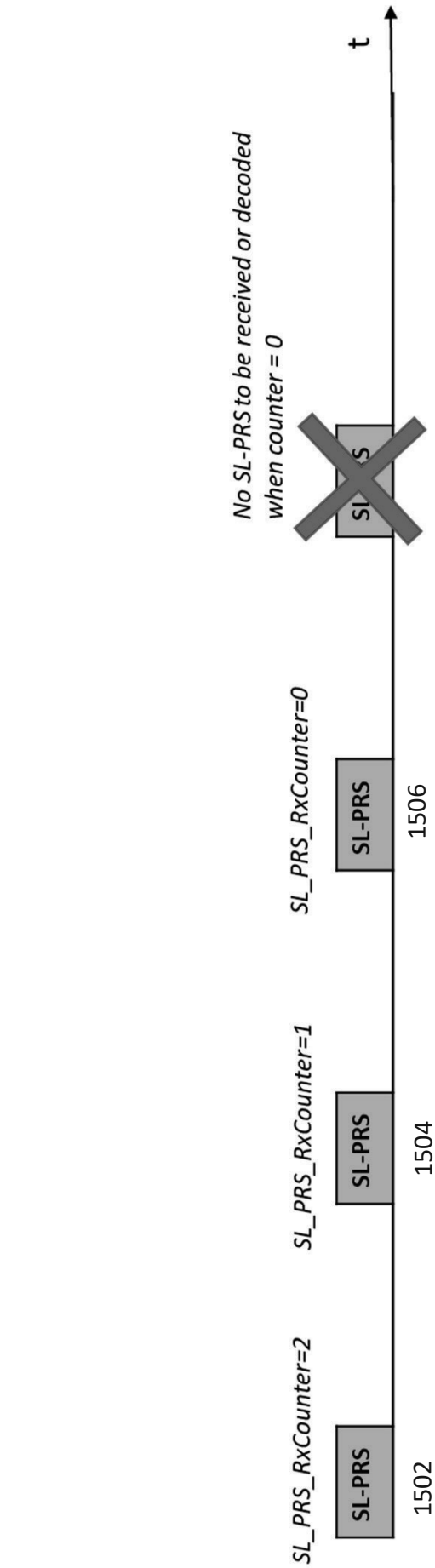

t
No SL-PRS to be received or decoded when counter = 0
SL_PRS_RxCounter=0
SL_PRS_RxCounter=1
SL_PRS_RxCounter=2
SL-PRS
SL-PRS
SL-PRS
1506
1504
1502
1500

Fig. 15

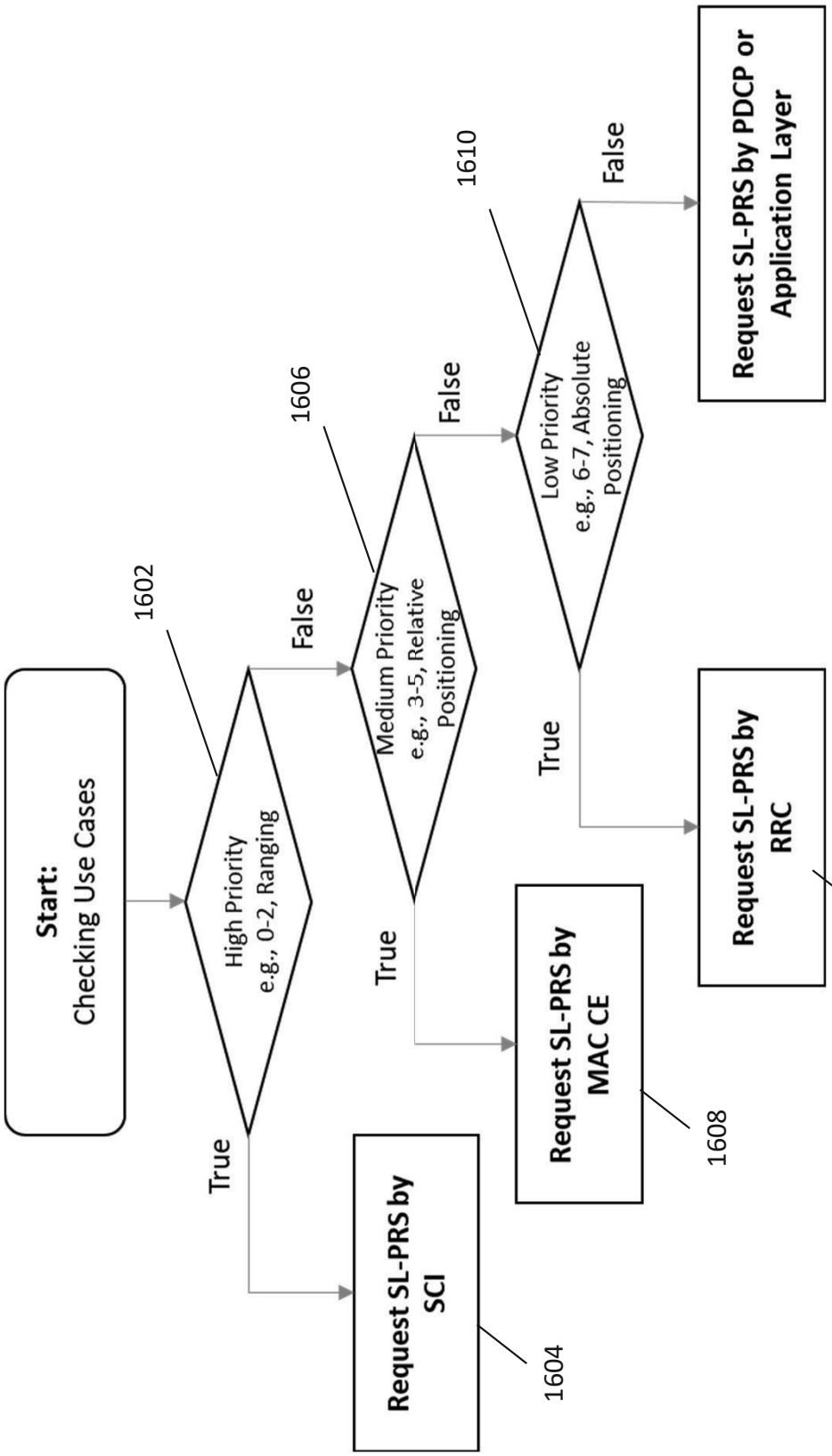

Start:
Checking Use Cases
1602
High Priority
e.g., 0-2, Ranging
True
False
1604
Request SL-PRS by
SCI
1606
Medium Priority
e.g., 3-5, Relative
Positioning
True
False
1608
Request SL-PRS by
MAC CE
1610
Low Priority
e.g., 6-7, Absolute
Positioning
True
False
1612
Request SL-PRS by
RRC
Request SL-PRS by PDCP or
Application Layer
1600

Fig. 16

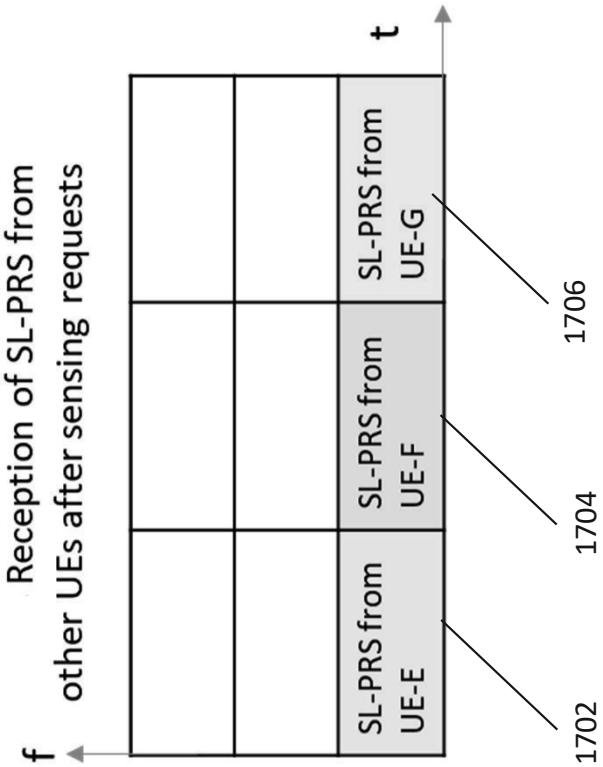

Reception of SL-PRS from other UEs after sensing requests
f
t
SL-PRS from UE-E
SL-PRS from UE-F
SL-PRS from UE-G
1702
1704
1706
1700

Fig. 17

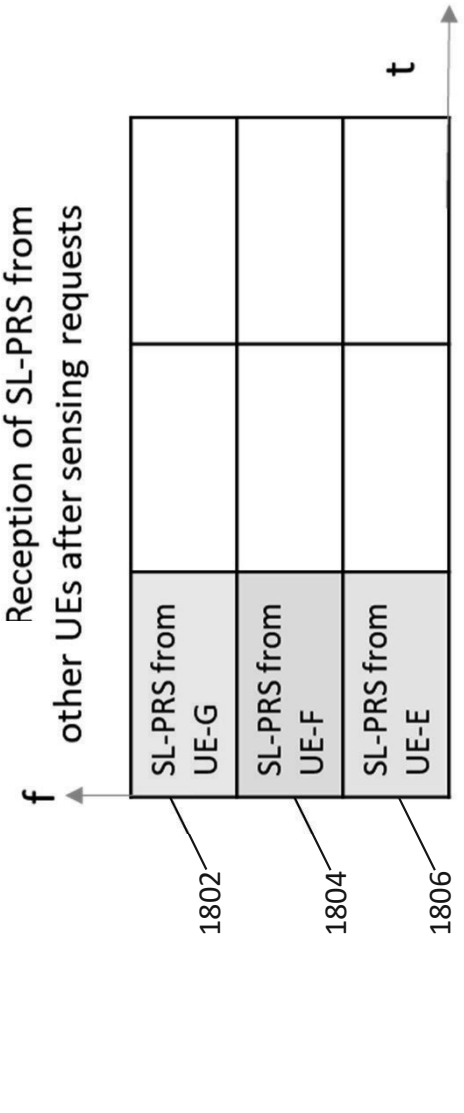

Reception of SL-PRS from other UEs after sensing requests
f
t
SL-PRS from UE-G
SL-PRS from UE-F
SL-PRS from UE-E
1802
1804
1806
1800

Fig. 18

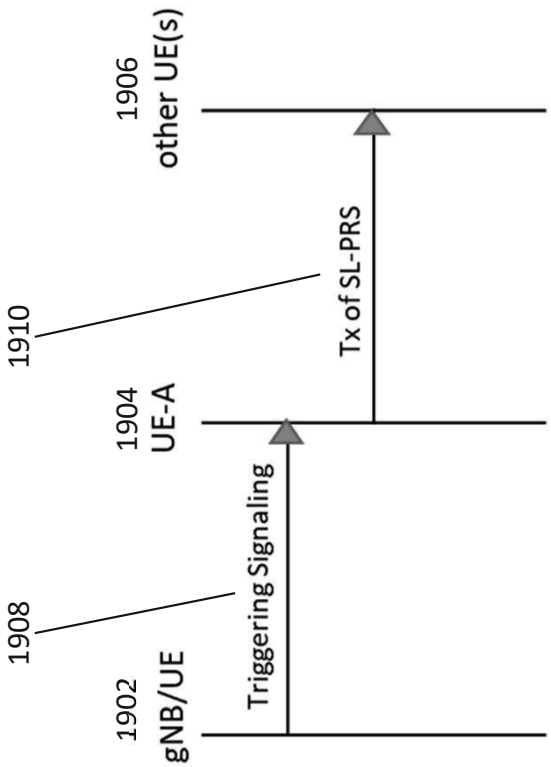

1906
other UE(s)
1910
Tx of SL-PRS
1904
UE-A
1908
Triggering Signaling
1902
gNB/UE
1900

Fig. 19

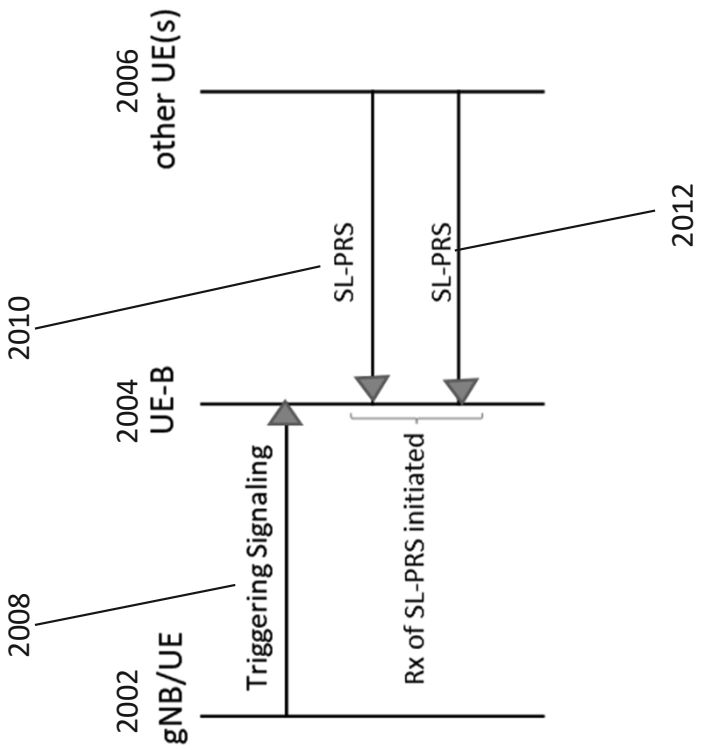
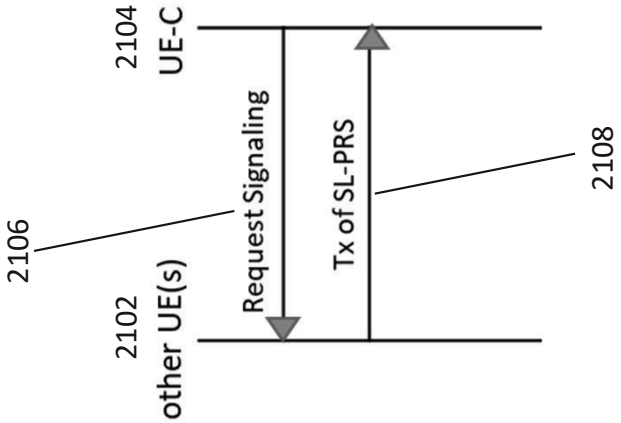
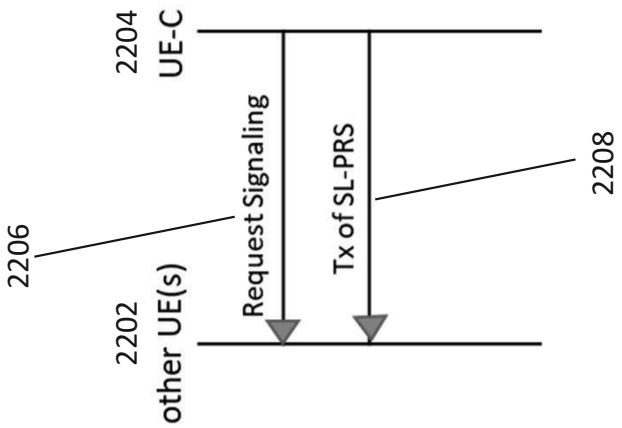

2006
other UE(s)
2010
SL-PRS
SL-PRS
2012
2004
UE-B
2008
Triggering Signaling
Rx of SL-PRS initiated
2002
gNB/UE
2000

Fig. 20


2104
UE-C
Request Signaling
Tx of SL-PRS
2106
2108
2102
other UE(s)

2100

Fig. 21


2204
UE-C
Request Signaling
Tx of SL-PRS
2206
2208
2202
other UE(s)

2200

Fig. 22

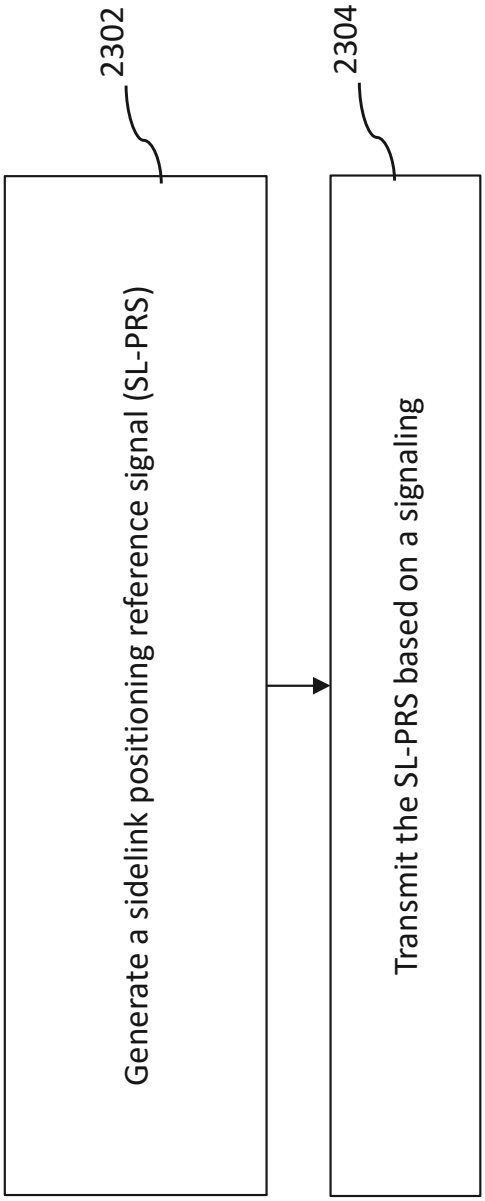

2302
2304
Generate a sidelink positioning reference signal (SL-PRS)
Transmit the SL-PRS based on a signaling
2300

Fig. 23

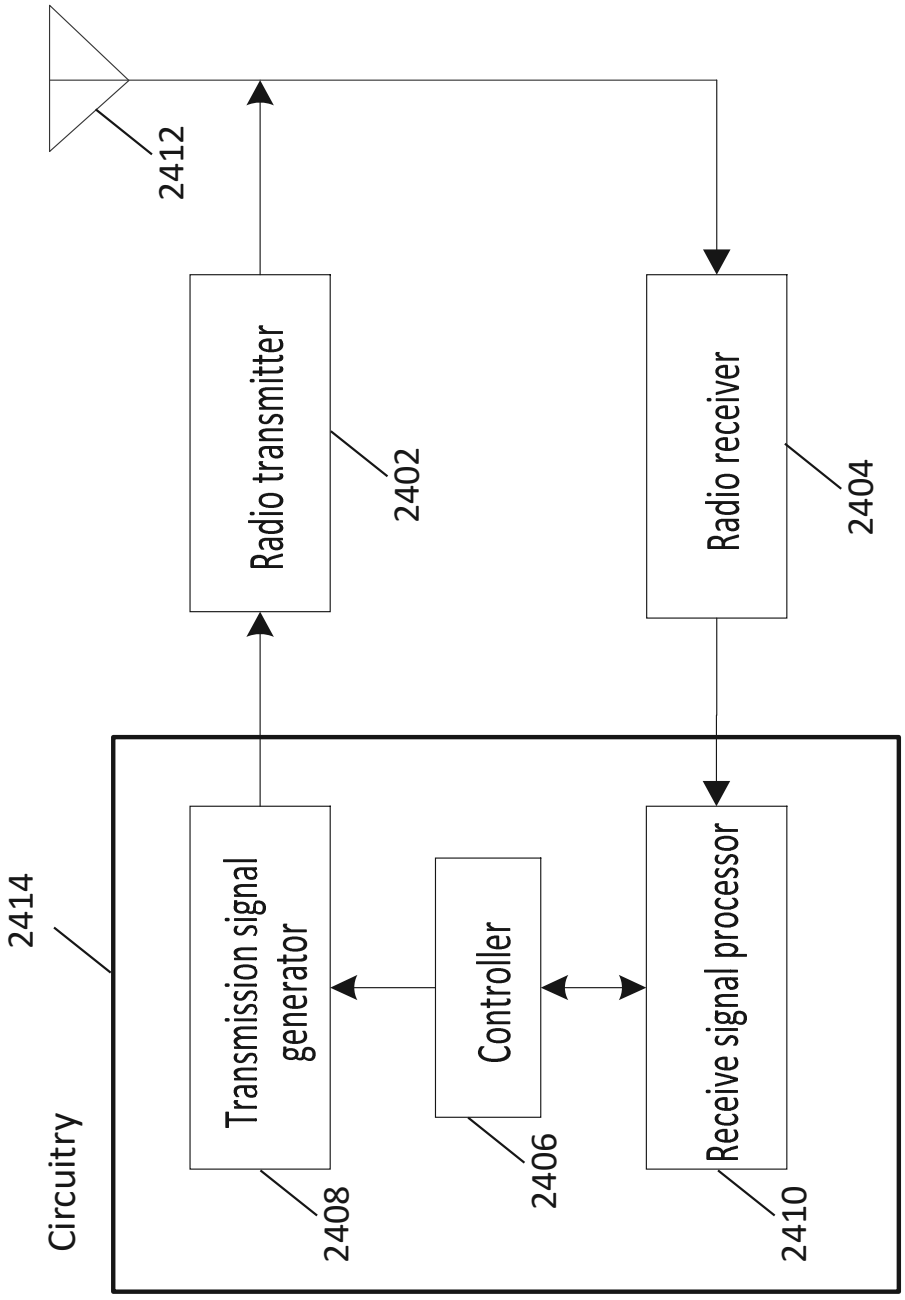

2412
Radio transmitter
2402
Radio receiver
2404
2414
Circuitry
Transmission signal generator
2408
Controller
2406
Receive signal processor
2410
2400

Fig. 24