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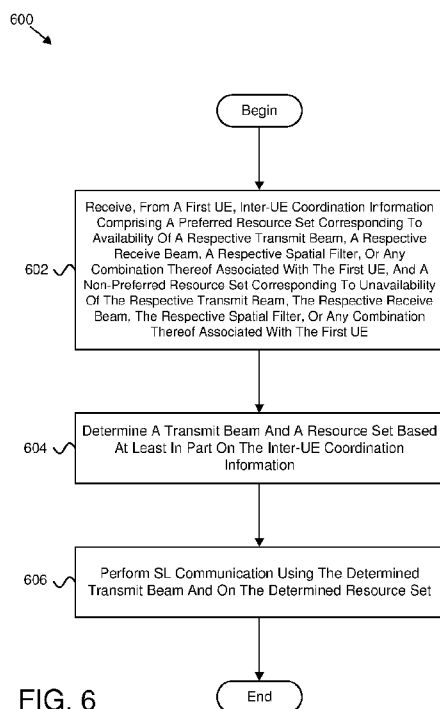


FIG. 6

(57) Abstract: Apparatuses, methods, and systems are disclosed for wireless communication, including sidelink communications based on inter-user equipment ("UE") coordination. One method (600) includes receiving (602), from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. The method (600) includes determining (604) a transmit beam and a resource set based at least in part on the inter-UE coordination information. The method (600) includes performing (606) sidelink ("SL") communication using the determined transmit beam and on the determined resource set.

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WIRELESS COMMUNICATION BASED ON INTER-USER EQUIPMENT COORDINATION

FIELD

5 [0001] The subject matter disclosed herein relates generally to wireless communications and more particularly relates to wireless communication based on inter-user equipment (“UE”) coordination.

BACKGROUND

[0002] A wireless communications system may include one or multiple network
10 communication devices, such as base stations, which may be otherwise known as an eNodeB (“eNB”), a next-generation NodeB (“gNB”), or other suitable terminology. Each network communication devices, such as a base station may support wireless communications for one or multiple user communication devices, which may be otherwise known UE, or other suitable terminology. The wireless communications system may support wireless communications with
15 one or multiple user communication devices by utilizing resources of the wireless communication system (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers). Additionally, the wireless communications system may support wireless communications across various radio access technologies including third generation (“3G”) radio access technology, fourth generation (“4G”) radio access technology, fifth
20 generation (“5G”) radio access technology, among other suitable radio access technologies beyond 5G (e.g., sixth generation (“6G”)).

[0003] The wireless communications systems may also support sidelink (“SL”) communication between UEs. In some cases, use of some resources for the SL communication may be inefficient.

25 BRIEF SUMMARY

[0004] Methods for wireless communication based on inter-UE coordination information are disclosed. Apparatuses and systems also perform the functions of the methods. One embodiment of a method at a second UE includes receiving, from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective
30 transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. In some embodiments, the method includes

determining a transmit beam and a resource set based at least in part on the inter-UE coordination information. In certain embodiments, the method includes performing SL communication using the determined transmit beam and on the determined resource set.

[0005] One apparatus for wireless communication based on inter-UE coordination
5 information includes a processor; and a memory coupled to the processor, the memory comprising instructions executable by the processor to cause the apparatus to: receive, from a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the UE, and a non-preferred resource set corresponding to unavailability
10 of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the UE; determine a transmit beam and a resource set based at least in part on the inter-UE coordination information; and perform SL communication using the determined transmit beam and on the determined resource set.

[0006] Another embodiment of a method for wireless communication based on inter-UE
15 coordination information at a first UE includes transmitting, to a second UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any
20 combination thereof associated with the first UE. In some embodiments, the method includes performing SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

[0007] Another apparatus for wireless communication based on inter-UE coordination information includes a processor; and a memory coupled to the processor, the memory comprising
25 instructions executable by the processor to cause the apparatus to: transmit, to a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the apparatus, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial
30 filter, or any combination thereof associated with the apparatus; and perform SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 illustrates an example of a wireless communications system that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

5 [0009] Figure 2 illustrates an example of an apparatus that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

[0010] Figure 3 illustrates an example of an apparatus that supports wireless communication based on inter-UE coordination in accordance with aspects of the present
10 disclosure.

[0011] Figure 4A illustrates an example of a system that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

[0012] Figure 4B illustrates an example of a system that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

15 [0013] Figure 5 illustrates an example of a resource usage method that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

[0014] Figure 6 illustrates a flowchart of a method that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

20 [0015] Figure 7 illustrates a flowchart of a method that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure.

DETAILED DESCRIPTION

[0016] A wireless communications system may include multiple communication devices, including network communication devices and user communication devices, which may support
25 wireless communication in the wireless communications system. For example, the network communication devices and the user communication devices may support one or multiple radio access technologies including 4G, 5G, and radio access technologies beyond 5G (e.g., 6G). The wireless communications system may also support SL communications between multiple user communication devices (e.g., UEs). Examples of SL communications may include, but is not
30 limited to, device-to-device (D2D) communications, vehicle-based communications, such as vehicle-to-vehicle (V2V) communications, vehicle-to-everything (V2X) communications, etc. As demand for communication high efficiency, high reliability, and low latency increases, it may be desirable for the wireless communications system, including the network communication devices

and the user communication devices to support improvements to resource management for SL communications.

[0017] Various aspects of the present disclosure relate to enabling a user communication device (e.g., a UE) to support wireless communication, such as SL communications based on inter-UE coordination, and specifically exchange of inter-UE coordination information between the user communication device and one or multiple other user communication devices (e.g., UEs). By using inter-UE coordination information, the user communication device may experience low latency and high reliability for SL communications.

[0018] Aspects of the present disclosure are described in the context of a wireless communications system. Aspects of the present disclosure are further illustrated and described with reference to apparatus diagrams and flowcharts.

[0019] Figure 1 illustrates an example of a wireless communications system 100 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure. The wireless communication system 100 may include one or more remote units 102 and one or more network units 104. The wireless communications system 100 may support various radio access technologies. In some embodiments, the wireless communications system 100 may be a 4G network, such as an LTE network or an LTE-Advanced (LTE-A) network. In some other embodiments, the wireless communications system 100 may be a 5G network, such as an NR network. In other embodiments, the wireless communications system 100 may be a network beyond 5G. Additionally, even though a specific number of remote units 102 and network units 104 are depicted in Figure 1, one of skill in the art will recognize that any number of remote units 102 and network units 104 may be included in the wireless communication system 100.

[0020] The one or more remote units 102 may be dispersed throughout a geographic region of the wireless communications system 100. A remote unit 102 may include or may be referred to as a UE, a computing device, such as a desktop computer, a laptop computer, a personal digital assistant (“PDA”), a tablet computer, a smartphone, a smart television (e.g., televisions connected to the Internet), a set-top box, a game console, a security system (including security cameras), vehicle on-board computers, network devices (e.g., routers, switches, modems), aerial vehicles, drones, or the like. In some embodiments, the remote units 102 include wearable devices, such as smart watches, fitness bands, optical head-mounted displays, or the like. Moreover, the remote units 102 may be referred to as subscriber units, mobiles, mobile stations, users, terminals, mobile terminals, fixed terminals, subscriber stations, UE, user terminals, a device, or by other terminology used in the art. The remote units 102 may communicate directly with one or more of

the network units 104 via uplink (“UL”) communication signals. In certain embodiments, the remote units 102 may communicate directly with other remote units 102 via SL communication.

[0021] The network units 104 may be distributed over a geographic region. In certain embodiments, a network unit 104 may also be referred to and/or may include one or more of an access point, an access terminal, a base, a base station, a location server, a core network (“CN”), a radio network entity, a Node-B, an evolved node-B (“eNB”), a 5G node-B (“gNB”), a Home Node-B, a relay node, a device, a core network, an aerial server, a radio access node, an access point (“AP”), new radio (“NR”), a network entity, an access and mobility management function (“AMF”), a unified data management (“UDM”), a unified data repository (“UDR”), a UDM/UDR, a policy control function (“PCF”), a radio access network (“RAN”), a network slice selection function (“NSSF”), an operations, administration, and management (“OAM”), a session management function (“SMF”), a user plane function (“UPF”), an application function, an authentication server function (“AUSF”), security anchor functionality (“SEAF”), trusted non-third generation partnership project (“3GPP”) gateway function (“TNGF”), or by any other terminology used in the art. The network units 104 are generally part of a radio access network that includes one or more controllers communicably coupled to one or more corresponding network units 104. The radio access network is generally communicably coupled to one or more core networks, which may be coupled to other networks, like the Internet and public switched telephone networks, among other networks. These and other elements of radio access and core networks are not illustrated but are well known generally by those having ordinary skill in the art.

[0022] In one implementation, the wireless communication system 100 is compliant with NR protocols standardized in 3GPP, wherein the network unit 104 transmits using an orthogonal frequency division multiplexing (“OFDM”) modulation scheme on the downlink (“DL”) and the remote units 102 transmit on the UL using a single-carrier frequency division multiple access (“SC-FDMA”) scheme or an OFDM scheme. More generally, however, the wireless communication system 100 may implement some other open or proprietary communication protocol, for example, WiMAX, institute of electrical and electronics engineers (“IEEE”) 802.11 variants, global system for mobile communications (“GSM”), general packet radio service (“GPRS”), universal mobile telecommunications system (“UMTS”), long term evolution (“LTE”) variants, code division multiple access 2000 (“CDMA2000”), Bluetooth®, ZigBee, Sigfox, among other protocols. The present disclosure is not intended to be limited to the implementation of any particular wireless communication system architecture or protocol.

[0023] The network units 104 may serve a number of remote units 102 within a serving area, for example, a cell or a cell sector via a wireless communication link. The network units 104

transmit DL communication signals to serve the remote units 102 in the time, frequency, and/or spatial domain.

[0024] In various embodiments, a remote unit 102 may receive, from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a
5 respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. In some embodiments, the remote unit 102 may determine a transmit beam and a resource set based at least in part on the inter-UE
10 coordination information. In certain embodiments, the remote unit 102 may perform SL communication using the determined transmit beam and on the determined resource set. Accordingly, the remote unit 102 may support wireless communication based on inter-UE coordination.

[0025] In certain embodiments, a remote unit 102 may transmit, to a second UE, inter-UE
15 coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. In some embodiments, the remote
20 unit 102 may perform SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information. Accordingly, the remote unit 102 may support wireless communication based on inter-UE coordination.

[0026] Figure 2 illustrates an example of an apparatus 200 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present
25 disclosure. The apparatus 200 may be an example of a remote unit 102 as described herein. The remote unit 102 may include a processor 202, a memory 204, an input device 206, a display 208, a transmitter 210, and a receiver 212. In some embodiments, the input device 206 and the display 208 are combined into a single device, such as a touchscreen. In certain embodiments, the remote unit 102 may not include any input device 206 and/or display 208. In various embodiments, the
30 remote unit 102 may include one or more of the processor 202, the memory 204, the transmitter 210, and the receiver 212, and may not include the input device 206 and/or the display 208.

[0027] The processor 202, in one embodiment, may include any known controller capable of executing computer-readable instructions and/or capable of performing logical operations. For example, the processor 202 may be a microcontroller, a microprocessor, a central processing unit

(“CPU”), a graphics processing unit (“GPU”), an auxiliary processing unit, a field programmable gate array (“FPGA”), or similar programmable controller. In some embodiments, the processor 202 executes instructions stored in the memory 204 to perform the methods and routines described herein. The processor 202 is communicatively coupled to the memory 204, the input device 206, the display 208, the transmitter 210, and the receiver 212.

[0028] The memory 204, in one embodiment, is a computer readable storage medium. In some embodiments, the memory 204 includes volatile computer storage media. For example, the memory 204 may include a RAM, including dynamic RAM (“DRAM”), synchronous dynamic RAM (“SDRAM”), and/or static RAM (“SRAM”). In some embodiments, the memory 204 includes non-volatile computer storage media. For example, the memory 204 may include a hard disk drive, a flash memory, or any other suitable non-volatile computer storage device. In some embodiments, the memory 204 includes both volatile and non-volatile computer storage media. In some embodiments, the memory 204 also stores program code and related data, such as an operating system or other controller algorithms operating on the remote unit 102.

[0029] The input device 206, in one embodiment, may include any known computer input device including a touch panel, a button, a keyboard, a stylus, a microphone, or the like. In some embodiments, the input device 206 may be integrated with the display 208, for example, as a touchscreen or similar touch-sensitive display. In some embodiments, the input device 206 includes a touchscreen such that text may be input using a virtual keyboard displayed on the touchscreen and/or by handwriting on the touchscreen. In some embodiments, the input device 206 includes two or more different devices, such as a keyboard and a touch panel.

[0030] The display 208, in one embodiment, may include any known electronically controllable display or display device. The display 208 may be designed to output visual, audible, and/or haptic signals. In some embodiments, the display 208 includes an electronic display capable of outputting visual data to a user. For example, the display 208 may include, but is not limited to, a liquid crystal display (“LCD”), a light emitting diode (“LED”) display, an organic light emitting diode (“OLED”) display, a projector, or similar display device capable of outputting images, text, or the like to a user. As another, non-limiting, example, the display 208 may include a wearable display such as a smart watch, smart glasses, a heads-up display, or the like. Further, the display 208 may be a component of a smart phone, a personal digital assistant, a television, a table computer, a notebook (laptop) computer, a personal computer, a vehicle dashboard, or the like.

[0031] In certain embodiments, the display 208 includes one or more speakers for producing sound. For example, the display 208 may produce an audible alert or notification (e.g.,

a beep or chime). In some embodiments, the display 208 includes one or more haptic devices for producing vibrations, motion, or other haptic feedback. In some embodiments, all or portions of the display 208 may be integrated with the input device 206. For example, the input device 206 and display 208 may form a touchscreen or similar touch-sensitive display. In other embodiments, the display 208 may be located near the input device 206.

[0032] In certain embodiments, the memory 204 includes instructions executable by the processor to cause the apparatus 200 to: receive, from a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the UE; determine a transmit beam and a resource set based at least in part on the inter-UE coordination information; and perform SL communication using the determined transmit beam and on the determined resource set.

[0033] In some embodiments, the memory 204 includes instructions executable by the processor to cause the apparatus to: transmit, to a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the apparatus, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the apparatus; and perform SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

[0034] Although only one transmitter 210 and one receiver 212 are illustrated, the remote unit 102 may have any suitable number of transmitters 210 and receivers 212. The transmitter 210 and the receiver 212 may be any suitable type of transmitters and receivers. In one embodiment, the transmitter 210 and the receiver 212 may be part of a transceiver.

[0035] Figure 3 illustrates an example of an apparatus that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure. The apparatus 300 may be an example of a network unit 104 as described herein. The network unit 104 may include a processor 302, a memory 304, an input device 306, a display 308, a transmitter 310, and a receiver 312. As may be appreciated, the processor 302, the memory 304, the input device 306, the display 308, the transmitter 310, and the receiver 312 may be substantially similar to the processor 202, the memory 204, the input device 206, the display 208, the transmitter 210, and the receiver 212 of the remote unit 102, respectively.

[0036] It should be noted that one or more embodiments described herein may be combined into a single embodiment.

[0037] In certain embodiments, one or more of the following may be used: 1) SL beamforming (e.g., beam establishment and best beam feedback reception) for unicast transmission with channel state information (“CSI”) reference signal (“RS”) (“CSI-RS”) transmission; 2) beamforming for transmission of first SL control information (“SCI”), second SCI, and a physical SL shared channel (“PSSCH”); 3) configuration of a SL dedicated transmission configuration indicator (“TCI”) table for unicast; 4) a TCI and/or cast type state indication in SCI for receiving a second SCI and PSSCH; and 5) a beamforming aspect for a physical SL feedback channel (“PSFCH”) transmission.

[0038] In some systems, new radio (“NR”) vehicle-to-everything (“V2X”) mmwave frequencies (e.g., frequency range (“FR”) 2 (“FR2”), FR 3 (“FR3”), FR 4 (“FR4”)) have challenges with: 1) SL beam and/or panel establishment for unicast transmissions between a transmit (“TX”) UE and a receive (“RX”) UE; 2) beam and/or panel switching based on a measurement for unicast transmission; and/or 3) SL beam recovery.

[0039] In various systems, due to the distributed scheduling nature of SL, SL communication may have hidden nodes and a half duplex problem which may become severe with beamforming based directional transmission and reception. In certain embodiments, an inter-UE coordination framework may indicate an availability and non-availability of beams in a slot for transmission and reception depending on a number of simultaneous analog beams supported by a UE.

[0040] In some embodiments, schemes of inter-UE coordination in Mode 2 may be categorized as being based on the following types of “a set of resources” sent by a first UE (“UE-A”) to a second UE (“UE-B”): 1) UE-A sends, to UE-B, the set of resources preferred for UE-B’s transmission (e.g., based on UE-B’s sensing result); 2) UE-A sends, to UE-B, the set of resources not preferred for UE-B’s transmission (e.g., based on UE-B’s sensing result and/or expected/potential resource conflict); and/or 3) UE-A sends, to UE-B, the set of resource where a resource conflict is detected.

[0041] In various embodiments, for schemes of inter-UE coordination identified as feasible and/or beneficial, one or more of the following may be determined: 1) how and/or when a UE-A determines the contents of “A set of resources”, including consideration UL scheduling; 2) when UE-A sends “A set of resources” to UE-B, including which UE(s) send it; 3) how UE-A and UE-B are determined; 4) how UE-A sends “A set of resources” to UE-B, including a container used for carrying it (e.g., implicitly and/or explicitly); 5) how, when, and/or whether UE-B receives

“A set of resources” and takes it into account in the resource selection for its own transmission; and/or 6) how and/or whether to define a relationship between support and/or signaling of an inter-UE coordination and cast type. In certain embodiments, a destination UE of a transport block (“TB”) transmitted by UE-B may be UE A.

5 [0042] In some embodiments (e.g., “scheme 2”), the following may be supported for UEs to be UE-As and/or UE-Bs for an inter-UE coordination transmission triggered by a detection of expected and/or potential resource conflicts in Mode 2: 1) a UE that transmitted PSCCH and/or PSSCH with SCI indicating reserved resources to be used for its transmission, received inter-UE coordination information from UE-A indicating expected and/or potential resource conflicts for
10 the reserved resources, and uses it to determine resource re-selection is a UE-B; 2) a UE that detects expected and/or potential resource conflicts on resources indicated by UE-B’s SCI sends inter-UE coordination information to UE-B, subject to satisfy certain conditions, is a UE-A. In various embodiments, a destination UE of a conflicting TB may be transmitted (e.g., TBs to be transmitted in the expected and/or potential conflicting resources) regardless of whether a non-
15 destination UE of a TB transmitted by UE-B can be UE-A is configured or preconfigured. It should be noted that certain features may be enabled, disabled, and/or controlled by a configuration or pre-configuration.

[0043] In certain embodiments (e.g., “scheme 1”), the following may be supported to determine inter-UE coordination information of a preferred resource set: 1) a UE-A considers any
20 resources satisfying all the following conditions as set of resources preferred for UE-B’s transmission, a) resources excluding those overlapping with reserved resources of other UEs identified by UE-A whose reference signal received power (“RSRP”) measurement is larger than a RSRP threshold, b) resources excluding slots where UE-A, when it is an intended receiver of UE-B, does not expect to perform SL reception from the UE-B, and c) resources satisfying UE-
25 B’s traffic requirement.

[0044] In some embodiments (e.g., “scheme 1”), the following may be supported to determine inter-UE coordination information of a non-preferred resource set: 1) a UE-A considers any resources satisfying at least one of the following conditions as a set of resources non-preferred for UE-B’s transmission, a) reserved resources of other UE identified by UE-A from other UEs’
30 SCI (e.g., including priority field) and RSRP measurement, and b) resources (e.g., slots) where UE-A, when it is an intended receiver of UE-B, does not expect to perform SL reception from UE-B.

[0045] In various embodiments (e.g., “scheme 1”) with a non-preferred resource set, the following condition may also be supported: resources (e.g., slots) where UE-A, when it is an

intended receiver of UE-B, does not expect to perform SL reception from UE-B due to half duplex operation. In certain embodiments, there may be a starting and/or ending time location of a resource selection window.

[0046] In some embodiments (e.g., “scheme 1”) with a preferred resource set, the
5 following condition may also be supported: resources excluding slots where UE-A, when it is an intended receiver of UE-B, does not expect to perform SL reception from UE-B due to half duplex operation. As may be appreciated, this may be disabled by radio resource control (“RRC”) configuration or pre-configuration.

[0047] In various embodiments, for certain conditions of scheme 1, a set of resources
10 preferred for UE-B’s transmission is a form of candidate single-slot resource. In such embodiments, a UE-A excludes candidate single-slot candidates belonging to slots where UE-A, when it is an intended receiver of UE-B, does not expect to perform SL reception from UE-B due to half duplex operation.

[0048] As used herein, the term eNB and/or gNB is used for a base station but it may be
15 replaced by any other radio access node (e.g., BS, eNB, gNB, AP, NR, and so forth). Further, the embodiments herein are described mainly in the context of fifth generation (“5G”) NR; however, the embodiments are equally applicable to other mobile communication systems supporting serving cells and/or carriers being configured for SL Communication over a UE-UE (“PC5”) interface.

[0049] Figure 4A illustrates an example of a system 400 that supports wireless
20 communication based on inter-UE coordination in accordance with aspects of the present disclosure. In some embodiments, the system 400 may implement or be implemented by aspects of the wireless communications system 100, the apparatus 200, or the apparatus 300, or any combination thereof as described with reference to Figures 1 through 3. For example, the system
25 400 may include a UE-A 402 and a UE-B 404, which may be examples of a remote unit as described herein. The UE-A 402 and the UE-B 404 may support SL communications over one or more SL channels (e.g., a physical sidelink control channel (PSCCH), a physical sidelink shared channel (PSSCH)). In the example of Figure 4A, the UE-B 404 may transmit, to the UE-A 402, a request for an inter-UE coordination message. For example, the UE-B 404 may transmit, to the
30 UE-A 402, an SL message 406 indicating the request for the inter-UE coordination message. In response to (e.g., based at least in part on) the request 406, the UE-A 402 may transmit, to the UE-B 404, the inter-UE coordination message. For example, the UE-A 402 may transmit, to the UE-B 404, an SL message 408 comprising the inter-UE coordination message.

[0050] Figure 4B illustrates an example of a system 410 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure. In some embodiments, the system 410 may implement or be implemented by aspects of the wireless communications system 100, the apparatus 200, or the apparatus 300, the system 400, or any combination thereof as described with reference to Figures 1 through 4A. For example, the system 410 may include a UE-A 402 and a UE-B 404, which may be examples of a remote unit as described herein. The UE-A 402 and the UE-B 404 may support SL communications over one or more SL channels (e.g., a PSCCH, a PSSCH). In the example of Figure 4B, the UE-A 402 may, in response to a condition (e.g., a condition-based trigger such as: an improvement of resource quality, a degradation in resource quality, a change in resources, and so forth), transmit, to the UE-B 404, a SL message 412 that may be an inter-UE coordination message, including inter-UE coordination information. In some embodiments, the condition may be a request from the UE-B 404 for the inter-UE coordination information to support resource management (e.g., selection of resources, allocation of resources, reservation of resources, release of resources, etc.) for SL communications.

[0051] According to a first embodiment, the UE-A 402 may receive one or more PSCCHs, one or more PSSCHs, or any combination thereof, from the one or more UE-Bs, including the UE-B 404. Each UE-B of the one or more UE-Bs, including the UE-B 404 may be associated with a respective destination identifiers ("IDs"). The UE-A 402 and the one or more UE-Bs, including the UE-B 404 may communicate (e.g., transmit, receive) information (e.g., SL messages, including inter-UE coordination messages), using a same or different transmit ("Tx") beam, receive ("Rx") beam. For example, the UE-A 402 and the one or more UE-Bs, including the UE-B 404 may receive or transmit the one or more PSCCHs, one or more PSSCHs, or any combination thereof using a same Tx beam and/or Rx beam (e.g., a PSCCH Tx beam, a PSSCH Tx beam, a PSCCH Rx beam, a PSSCH Rx beam). Additionally, or alternatively, the UE-A 402 and the one or more UE-Bs, including the UE-B 404 may communicate (e.g., transmit, receive) information (e.g., SL messages, including inter-UE coordination messages), using a same or different spatial filter.

[0052] In the example of Figure 4B, the UE-A 402 may be configured with a many-to-one mapping between destination IDs of UE-Bs, including the UE-B 404 to Tx beams, Rx beams, and/or spatial filters. Accordingly, the UE-A 402 may indicate a preferred resource set indicating usage of its PSSCH and/or PSSCH TX and/or RX beam and/or spatial filter slots to one or more UE-Bs, including the UE-B 404 that may be associated with one or more destination IDs where the UE-A 402 receives one or more transport blocks ("TBs").

[0053] In some embodiments, the UE-A 402 may simultaneously support a number of analog beams (e.g., $n > 1$) during a slot based on a UE capability of the UE-A 402. The UE-A 402 may receive, from a plurality of UE-Bs (including the UE-B 404) associated with a plurality of destination IDs one or more PSCCHs and/or one or more PSSCHs, and the UE-A 402 may attempt
5 to align reception of the one or more PSCCHs and/or the one or more PSSCHs during one or more slots using a same or similar Rx beam and/or spatial filter (which may trigger the SL message 412).

[0054] Figure 5 illustrates an example of a resource usage method 500 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present
10 disclosure. The resource usage method 500 may implement or be implemented by aspects of the wireless communications system 100, the apparatus 200, or the apparatus 300, the system 400, the system 410, or any combination thereof as described with reference to Figures 1 through 4B. For example, the resource usage method 500 may be implemented by a UE-3 502 (e.g., UE-A) and one or more UE-Bs 504, which may be examples of a remote unit as described herein. The resource
15 usage method 500 may include preferred resource sets and/or non-preferred resource sets associated with a same Rx beam of the UE-3 502 (e.g., UE-A) or the one or more UE-Bs 504, or any combination thereof.

[0055] The preferred resource sets are associated with one or more subchannels 506 (Subchannel#N+1) and subchannels 508 (Subchannel#N), and one or more PSSCH slots,
20 including a PSSCH slot 510 (PSSCH slot#N-10), a PSSCH slot 512 (PSSCH slot#N), a PSSCH slot 514 (PSSCH slot#N+1), and a PSSCH slot 516 (PSSCH slot#N+2).

[0056] In the example of Figure 5, the UE-3 502 operating as UE-A may send the preferred resource set, which includes the PSSCH slot 514 (PSSCH slot#N+1) to one or more UE-Bs 504 (e.g., UE-2 and UE-5 so that UE-2 and UE-5 transmit PSCCH and/or PSSCH to UE-3). While
25 UE-3 502 uses the same receive RX beam and/or spatial filter (Beam 2) to receive PSCCH and/or PSSCHs from UE-2 and UE-5. In another example, when multiple resource pool are configured within a sidelink bandwidth part ("BWP"), same/similar analog Tx/Rx spatial filter needs to be applied for BWP which means the availability of Tx/Rx beams within multiple resource pool present in a BWP is restricted. Preferred resource set may also transmit availability of Tx/Rx
30 beams in multiple resource pool to the peer UE or group of UEs.

[0057] In certain embodiments, when a UE-A needs to receive more than one PSCCH and/or PSSCH using more than one RX beam and/or spatial filter in a slot from more than one UE-B, then the UE-A may select the RX beam and/or spatial filter to receive PSCCHs and/or PSSCHs in a slot from a UE-B according to a receive priority of PSCCH and/or PSSCH.

[0058] In some embodiments, a UE-A may indicate a non-preferred resource set containing timeslots about the non-availability of PSCCH and/or PSSCH TX and/or RX beams and/or spatial filters to one or more UE-Bs that may be part of one or more destination IDs of UE-A, where UE-A is transmitting and/or receiving one or more TBs to and/or from UE-Bs.

5 [0059] In one example, UE-B makes a reservation of resources for future TB transmission to UE-A so that UE-A uses beam#2 to receive the PSSCH in the reserved resource. Hence, UE-A, after receiving the reservation information, may transmit inter-UE coordination information containing slots within a non-preferred resource set due to non-availability of an RX beam and/or spatial filter to other UE-Bs belonging to the destination IDs. A non-preferred resource set may
10 also indicate the non-availability of Tx/Rx beam in a slot to peer UE according to transmission and reception in multiple resource pools. For example, when makes transmission or reception in a slot in resource pool #A, then at the same time the availability of beam is limited to UE transmission or reception in resource pool#B. The preferred resource set and/or non-preferred resource set may be transmitted to gNB using medium access control ("MAC") control element
15 ("CE") ("MAC-CE") or semi-static assistance signaling to help gNB selecting the Tx/Rx beam for Mode 1 scheduling.

[0060] In a second embodiment, a UE-B may exclude a TX beam from sensing. According to the second embodiment, the UE-B may be transmitting PSCCH and/or PSSCH in an initial resource or reserved resource of a slot to other UEs using a TX beam and/or spatial filter due to
20 the limited availability of the analog beam, and the UE-B may need to exclude a slot for transmission to UE-A. The UE-B may be provided with an input parameter from a higher layer as part of a resource selection or reselection trigger, where a TX beam ID, spatial filter, synchronization signal block ("SSB") ID, CSI-RS ID, and/or a physical layer ("PHY") selects a set of resources according to an RSRP of a provided beam and excludes any resource that may be
25 reserved with the beam.

[0061] In another implementation of the second embodiment, a UE-A may report a set of resources (e.g., inter-UE coordination information) using a legacy procedure to a UE-B, the UE-B may report a set of resources to a MAC, the UE-B may perform legacy logical channel prioritization ("LCP") procedure, the UE-B may select a highest priority logical channel ("LCH")
30 and destination IDs associated with the highest priority LCHs and after selecting the LCHs and destination IDs, the MAC may select one of the resources for transmission that may be preferred and/or non-preferred after receiving inter-UE coordination information from UE-A excludes slots where beams are not available and the UE-B may select the corresponding TX beam and/or spatial filter associated with it for transmitting PSCCH and/or PSSCH.

[0062] In a third embodiment there may be a conflict indication. According to the third embodiment, a UE-A may transmit a conflict indication using PSFCH when UEs reserve resource in the same slot with different spatial filters and/or beams to the same RX UE which can be determined using the source-destination ID. Then, the UE-A may transmit a conflict indication as the UE-A may be able to receive PSCCH and/or PSSCH using more than one beam in the same slot.

[0063] Figure 6 illustrates a flowchart of a method 600 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure. The operations of the method 600 may be implemented by an apparatus, such as a remote unit 102 or its components as described herein. For example, the operations of the method 600 may be performed by a remote unit 102 as described with reference to Figure 1 through 5. Additionally, or alternatively, the operations of the method 600 may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[0064] In various embodiments, the method 600 includes receiving 602, from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. In some embodiments, the method 600 includes determining 604 a transmit beam and a resource set based at least in part on the inter-UE coordination information. In certain embodiments, the method 600 includes performing 606 SL communication using the determined transmit beam and on the determined resource set.

[0065] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot. In some embodiments, the method 600 further comprises determining the resource set for the SL communication based at least in part on a result of a sensing operation (e.g., an operation where a UE senses beams and/or resources and their corresponding quality). In various embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof.

[0066] In one embodiment, the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof. In certain embodiments, the determined resource set comprises preferred resources for the UE to receive the SL communication from a plurality of

peer UEs using a same receive beam, a same spatial filter, or a combination thereof. In some embodiments, the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.

[0067] In various embodiments, to determine the resource set, the method further comprises determining the resource set for the SL communication based at least in part on conflict information (e.g., conflicting beams, conflicting resources, conflicting transmissions and/or receptions). In one embodiment, the first UE comprises a peer UE.

[0068] Figure 7 is a flowchart of a method 700 that supports wireless communication based on inter-UE coordination in accordance with aspects of the present disclosure. The operations of the method 700 may be implemented by an apparatus, such as a remote unit 102 or its components as described herein. For example, the operations of the method 700 may be performed by a remote unit 102 as described with reference to Figure 1 through 5. Additionally, or alternatively, the operations of the method 700 may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[0069] In various embodiments, the method 700 includes transmitting 702, to a second UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE. In some embodiments, the method 700 includes performing 704 SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

[0070] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot. In some embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof. In various embodiments, the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof.

[0071] In one embodiment, the determined resource set comprises preferred resources for the second UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof. In certain embodiments, the determined resource set comprises non-preferred resources for the second UE to not receive the SL communication due to a non-availability of the non-preferred resources. In some embodiments, the second UE comprises a peer UE.

[0072] In one embodiment, an apparatus for sidelink communication comprises: a processor; and a memory coupled to the processor, the memory comprising instructions executable by the processor to cause the apparatus to: receive, from a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a
5 respective receive beam, a respective spatial filter, or any combination thereof associated with the UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the UE; determine a transmit beam and a resource set based at least in part on the inter-UE coordination information; and perform SL communication using the determined transmit
10 beam and on the determined resource set.

[0073] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot.

[0074] In some embodiments, the instructions are further executable by the processor to
15 cause the apparatus to determine the resource set for the SL communication based at least in part on a result of a sensing operation.

[0075] In various embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof.

[0076] In one embodiment, the determined resource set comprises a transmit beam, a
20 subchannel, a slot, or any combination thereof.

[0077] In certain embodiments, the apparatus comprises a second UE.

[0078] In some embodiments, the determined resource set comprises preferred resources for the UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.

25 [0079] In various embodiments, the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.

[0080] In one embodiment, to determine the resource set, the instructions are further executable by the processor to cause the apparatus to determine the resource set for the SL
30 communication based at least in part on conflict information.

[0081] In certain embodiments, the UE comprises a peer UE.

[0082] In one embodiment, a method for sidelink communication at a second UE comprises: receiving, from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam,

a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE; determining a transmit beam and a resource set based at least in part on the inter-UE coordination information; and performing SL communication using the determined transmit beam and on the determined resource set.

[0083] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot.

[0084] In some embodiments, the method further comprises determining the resource set for the SL communication based at least in part on a result of a sensing operation.

[0085] In various embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof.

[0086] In one embodiment, the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof.

[0087] In certain embodiments, the determined resource set comprises preferred resources for the UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.

[0088] In some embodiments, the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.

[0089] In various embodiments, to determine the resource set, the method further comprises determining the resource set for the SL communication based at least in part on conflict information.

[0090] In one embodiment, the first UE comprises a peer UE.

[0091] In one embodiment, an apparatus for sidelink communication comprises: a processor; and a memory coupled to the processor, the memory comprising instructions executable by the processor to cause the apparatus to: transmit, to a UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the apparatus, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the apparatus; and perform SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

[0092] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot.

[0093] In some embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof.

[0094] In various embodiments, the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof.

[0095] In one embodiment, the apparatus comprises a first UE.

[0096] In certain embodiments, the determined resource set comprises preferred resources for the UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.

[0097] In some embodiments, the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.

[0098] In various embodiments, the UE comprises a peer UE.

[0099] In one embodiment, a method for sidelink communication at a first UE comprises: transmitting, to a second UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE; and performing SL communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

[0100] In certain embodiments, the inter-UE coordination information indicates information pertaining to a slot indicating availability and unavailability of a set of resources in a slot.

[0101] In some embodiments, the SL communication comprises a PSCCH transmission, a PSSCH transmission, or a combination thereof.

[0102] In various embodiments, the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof.

[0103] In one embodiment, the determined resource set comprises preferred resources for the second UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.

[0104] In certain embodiments, the determined resource set comprises non-preferred resources for the second UE to not receive the SL communication due to a non-availability of the non-preferred resources.

[0105] In some embodiments, the second UE comprises a peer UE.

5 [0106] Embodiments may be practiced in other specific forms. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

10 [0107] As will be appreciated by one skilled in the art, aspects of the embodiments may be embodied as a system, apparatus, method, or program product. Accordingly, embodiments may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a “circuit,” “module” or “system.”
15 Furthermore, embodiments may take the form of a program product embodied in one or more computer readable storage devices storing machine readable code, computer readable code, and/or program code, referred hereafter as code. The storage devices may be tangible, non-transitory, and/or non-transmission. The storage devices may not embody signals. In a certain embodiment, the storage devices only employ signals for accessing code.

20 [0108] Certain of the functional units described in this specification may be labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module may be implemented as a hardware circuit comprising custom very-large-scale integration (“VLSI”) circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable
25 hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

[0109] Modules may also be implemented in code and/or software for execution by various types of processors. An identified module of code may, for instance, include one or more physical or logical blocks of executable code which may, for instance, be organized as an object, procedure,
30 or function. Nevertheless, the executables of an identified module need not be physically located together, but may include disparate instructions stored in different locations which, when joined logically together, include the module and achieve the stated purpose for the module.

[0110] Indeed, a module of code may be a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and

across several memory devices. Similarly, operational data may be identified and illustrated herein within modules, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different computer readable storage devices. Where a
5 module or portions of a module are implemented in software, the software portions are stored on one or more computer readable storage devices.

[0111] Any combination of one or more computer readable medium may be utilized. The computer readable medium may be a computer readable storage medium. The computer readable storage medium may be a storage device storing the code. The storage device may be, for example,
10 but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, holographic, micromechanical, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing.

[0112] More specific examples (a non-exhaustive list) of the storage device would include the following: an electrical connection having one or more wires, a portable computer diskette, a
15 hard disk, a random access memory ("RAM"), a read-only memory ("ROM"), an erasable programmable read-only memory ("EPROM" or Flash memory), a portable compact disc read-only memory ("CD-ROM"), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain, or store a program for use by or in
20 connection with an instruction execution system, apparatus, or device.

[0113] Code for carrying out operations for embodiments may be any number of lines and may be written in any combination of one or more programming languages including an object oriented programming language such as Python, Ruby, Java, Smalltalk, C++, or the like, and conventional procedural programming languages, such as the "C" programming language, or the
25 like, and/or machine languages such as assembly languages. The code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network ("LAN") or a wide area network ("WAN"), or the
30 connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

[0114] Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, appearances of the

phrases “in one embodiment,” “in an embodiment,” and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment, but mean “one or more but not all embodiments” unless expressly specified otherwise. The terms “including,” “comprising,” “having,” and variations thereof mean “including but not limited to,” unless
5 expressly specified otherwise. An enumerated listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms “a,” “an,” and “the” also refer to “one or more” unless expressly specified otherwise.

[0115] Furthermore, the described features, structures, or characteristics of the embodiments may be combined in any suitable manner. In the following description, numerous
10 specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments. One skilled in the relevant art will recognize, however, that embodiments may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances,
15 well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of an embodiment.

[0116] Aspects of the embodiments are described below with reference to schematic flowchart diagrams and/or schematic block diagrams of methods, apparatuses, systems, and program products according to embodiments. It will be understood that each block of the schematic
20 flowchart diagrams and/or schematic block diagrams, and combinations of blocks in the schematic flowchart diagrams and/or schematic block diagrams, can be implemented by code. The code may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create
25 means for implementing the functions/acts specified in the schematic flowchart diagrams and/or schematic block diagrams block or blocks.

[0117] The code may also be stored in a storage device that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the storage device produce an article of manufacture including
30 instructions which implement the function/act specified in the schematic flowchart diagrams and/or schematic block diagrams block or blocks.

[0118] The code may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such

that the code which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

[0119] The schematic flowchart diagrams and/or schematic block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of apparatuses, systems, methods and program products according to various embodiments. In this regard, each block in the schematic flowchart diagrams and/or schematic block diagrams may represent a module, segment, or portion of code, which includes one or more executable instructions of the code for implementing the specified logical function(s).

[0120] It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the Figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more blocks, or portions thereof, of the illustrated Figures.

[0121] Although various arrow types and line types may be employed in the flowchart and/or block diagrams, they are understood not to limit the scope of the corresponding embodiments. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the depicted embodiment. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted embodiment. It will also be noted that each block of the block diagrams and/or flowchart diagrams, and combinations of blocks in the block diagrams and/or flowchart diagrams, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and code.

[0122] The description of elements in each figure may refer to elements of proceeding figures. Like numbers refer to like elements in all figures, including alternate embodiments of like elements.

CLAIMS

1. An apparatus for sidelink communication, the apparatus comprising:
at least one memory; and
at least one processor coupled with the at least one memory and configured to cause the
5 apparatus to:
receive, from a user equipment (UE), inter-UE coordination information
comprising a preferred resource set corresponding to availability of
a respective transmit beam, a respective receive beam, a respective
spatial filter, or any combination thereof associated with the UE,
10 and a non-preferred resource set corresponding to unavailability of
the respective transmit beam, the respective receive beam, the
respective spatial filter, or any combination thereof associated with
the UE;
determine a transmit beam and a resource set based at least in part on the
15 inter-UE coordination information; and
perform sidelink (SL) communication using the determined transmit beam
and on the determined resource set.
2. The apparatus of claim 1, wherein the inter-UE coordination information indicates
information pertaining to a slot indicating availability and unavailability of a set of
20 resources in a slot.
3. The apparatus of claim 1, wherein the at least one processor is configured to cause the
apparatus to determine the resource set for the SL communication based at least in part
on a result of a sensing operation.
4. The apparatus of claim 1, wherein the SL communication comprises a physical SL
25 control channel (PSCCH) transmission, a physical SL shared channel (PSSCH)
transmission, or a combination thereof.
5. The apparatus of claim 1, wherein the determined resource set comprises a transmit
beam, a subchannel, a slot, or any combination thereof.

6. The apparatus of claim 1, wherein the apparatus comprises a second UE.
7. The apparatus of claim 1, wherein the determined resource set comprises preferred resources for the UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.
- 5 8. The apparatus of claim 1, wherein the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.
9. The apparatus of claim 1, wherein, to determine the resource set, the at least one processor is configured to cause the apparatus to determine the resource set for the SL
10 communication based at least in part on conflict information.
10. The apparatus of claim 1, wherein the apparatus comprises a peer UE.
11. A processor for sidelink wireless communication, comprising:
at least one controller coupled with at least one memory and configured to cause the processor to:
15 receive, from a first UE, inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the first UE, and a non-preferred resource set corresponding to unavailability of the respective transmit
20 beam, the respective receive beam, the respective spatial filter, or any combination thereof associated with the first UE;
determine a transmit beam and a resource set based at least in part on the inter-UE coordination information; and
perform sidelink (SL) communication using the determined transmit beam and on
25 the determined resource set.
12. An apparatus for sidelink communication, the apparatus comprising:
at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the apparatus to:

5 transmit, to a user equipment (UE), inter-UE coordination information comprising a preferred resource set corresponding to availability of a respective transmit beam, a respective receive beam, a respective spatial filter, or any combination thereof associated with the apparatus, and a non-preferred resource set corresponding to unavailability of the respective transmit beam, the respective receive beam, the respective spatial filter, or any combination
10 thereof associated with the apparatus; and
 perform sidelink (SL) communication using a transmit beam and on a resource set determined based at least in part on the inter-UE coordination information.

13. The apparatus of claim 12, wherein the inter-UE coordination information indicates
15 information pertaining to a slot indicating availability and unavailability of a set of resources in a slot.
14. The apparatus of claim 12, wherein the SL communication comprises a physical SL control channel (PSCCH) transmission, a physical SL shared channel (PSSCH) transmission, or a combination thereof.
- 20 15. The apparatus of claim 12, wherein the determined resource set comprises a transmit beam, a subchannel, a slot, or any combination thereof.
16. The apparatus of claim 12, wherein the apparatus comprises a first UE.
17. The apparatus of claim 12, wherein the determined resource set comprises preferred
25 resources for the UE to receive the SL communication from a plurality of peer UEs using a same receive beam, a same spatial filter, or a combination thereof.

18. The apparatus of claim 12, wherein the determined resource set comprises non-preferred resources for the UE to not receive the SL communication due to a non-availability of the non-preferred resources.
19. The apparatus of claim 12, wherein the apparatus comprises a peer UE.
- 5 20. A processor for sidelink wireless communication, comprising:
at least one controller coupled with at least one memory and configured to cause the processor to:
transmit, to a second UE, inter-UE coordination information comprising a
preferred resource set corresponding to availability of a respective
10 transmit beam, a respective receive beam, a respective spatial filter, or any
combination thereof associated with the first UE, and a non-preferred
resource set corresponding to unavailability of the respective transmit
beam, the respective receive beam, the respective spatial filter, or any
combination thereof associated with the first UE; and
15 perform sidelink (SL) communication using a transmit beam and on a resource set
determined based at least in part on the inter-UE coordination information.

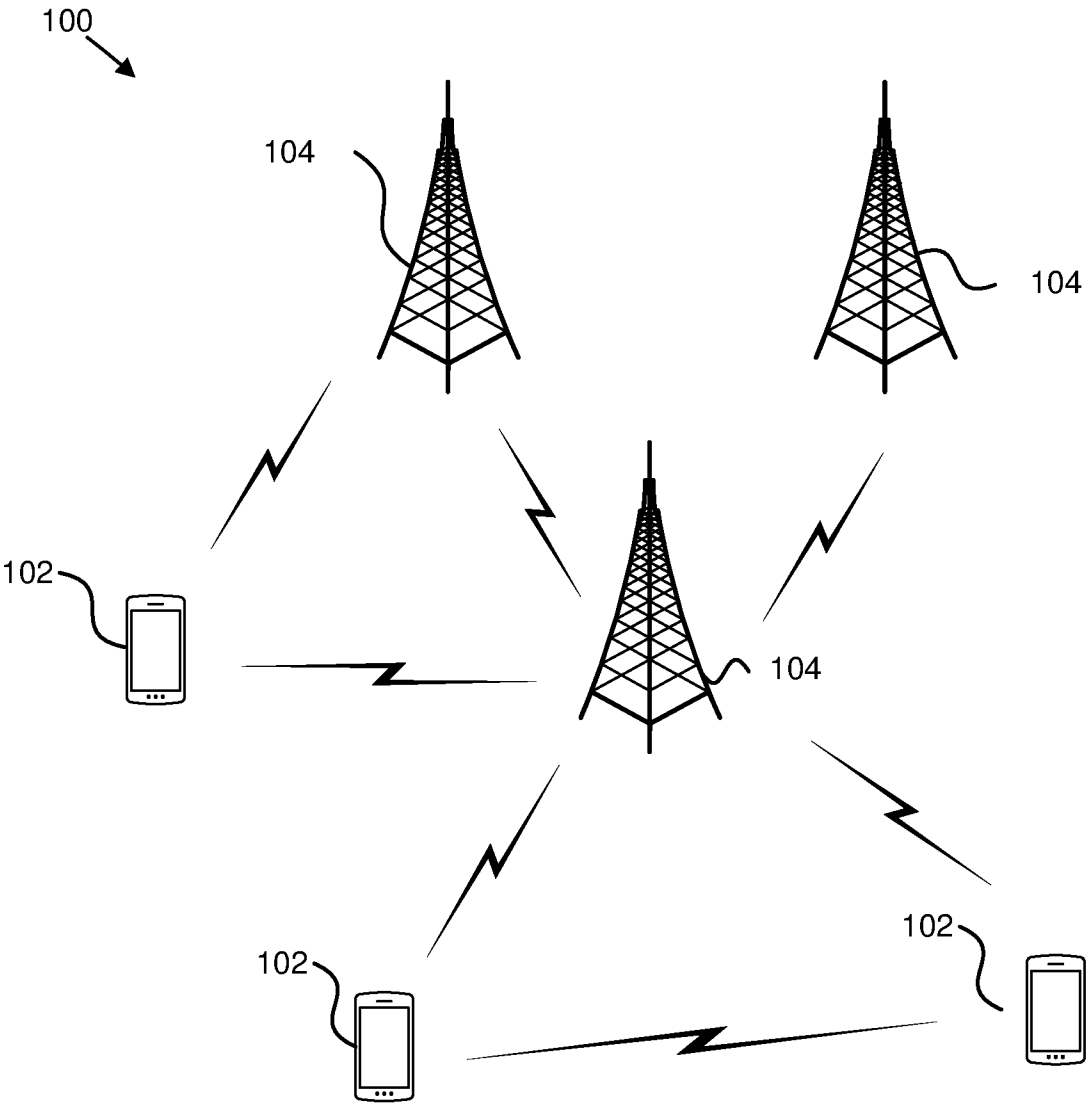


FIG. 1

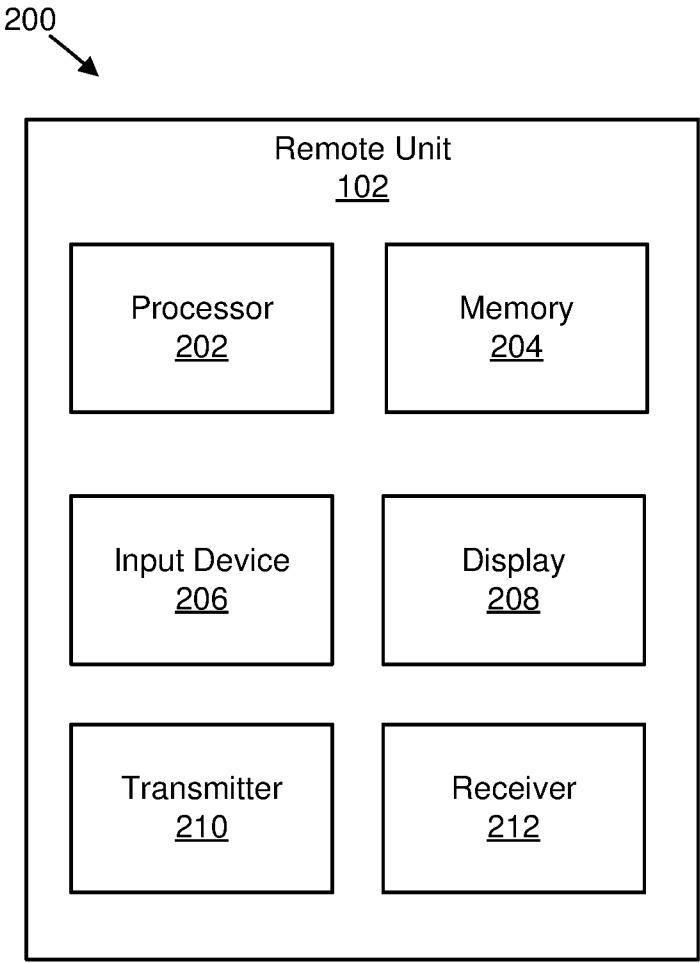


FIG. 2

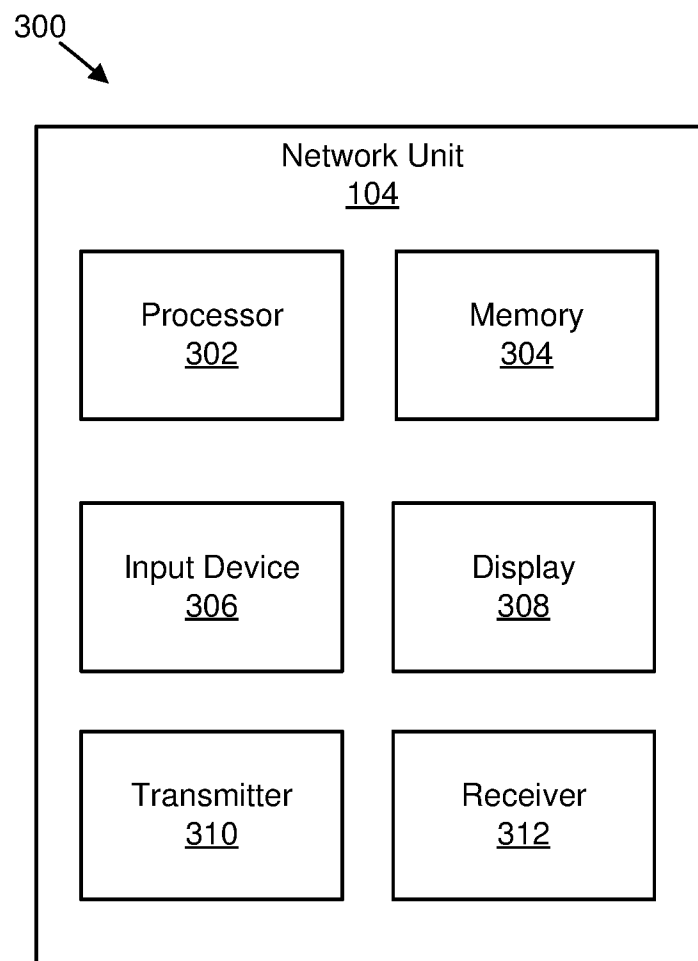


FIG. 3

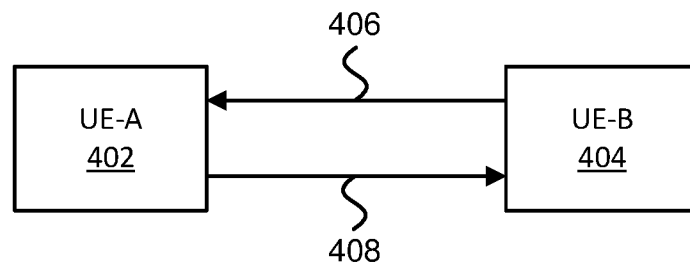
400


FIG. 4A

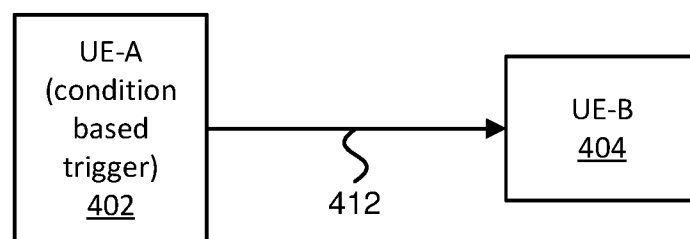
410


FIG. 4B

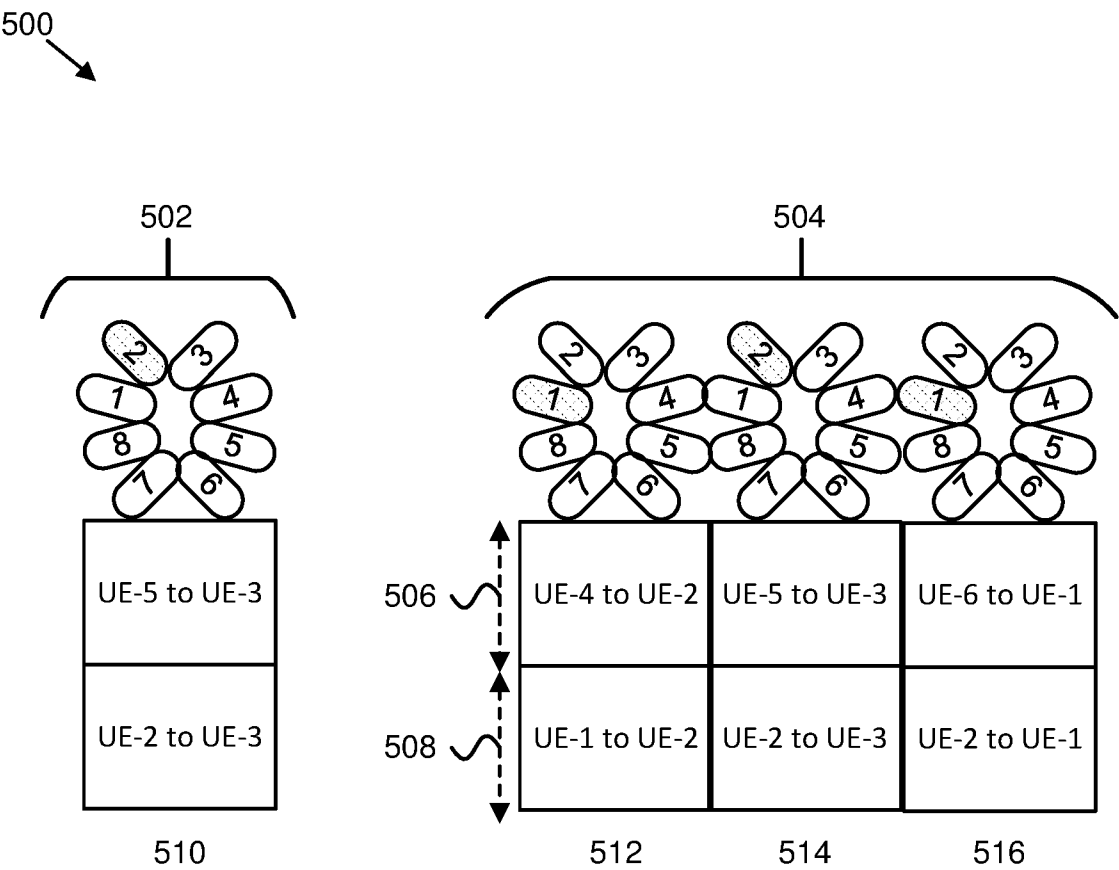


FIG. 5

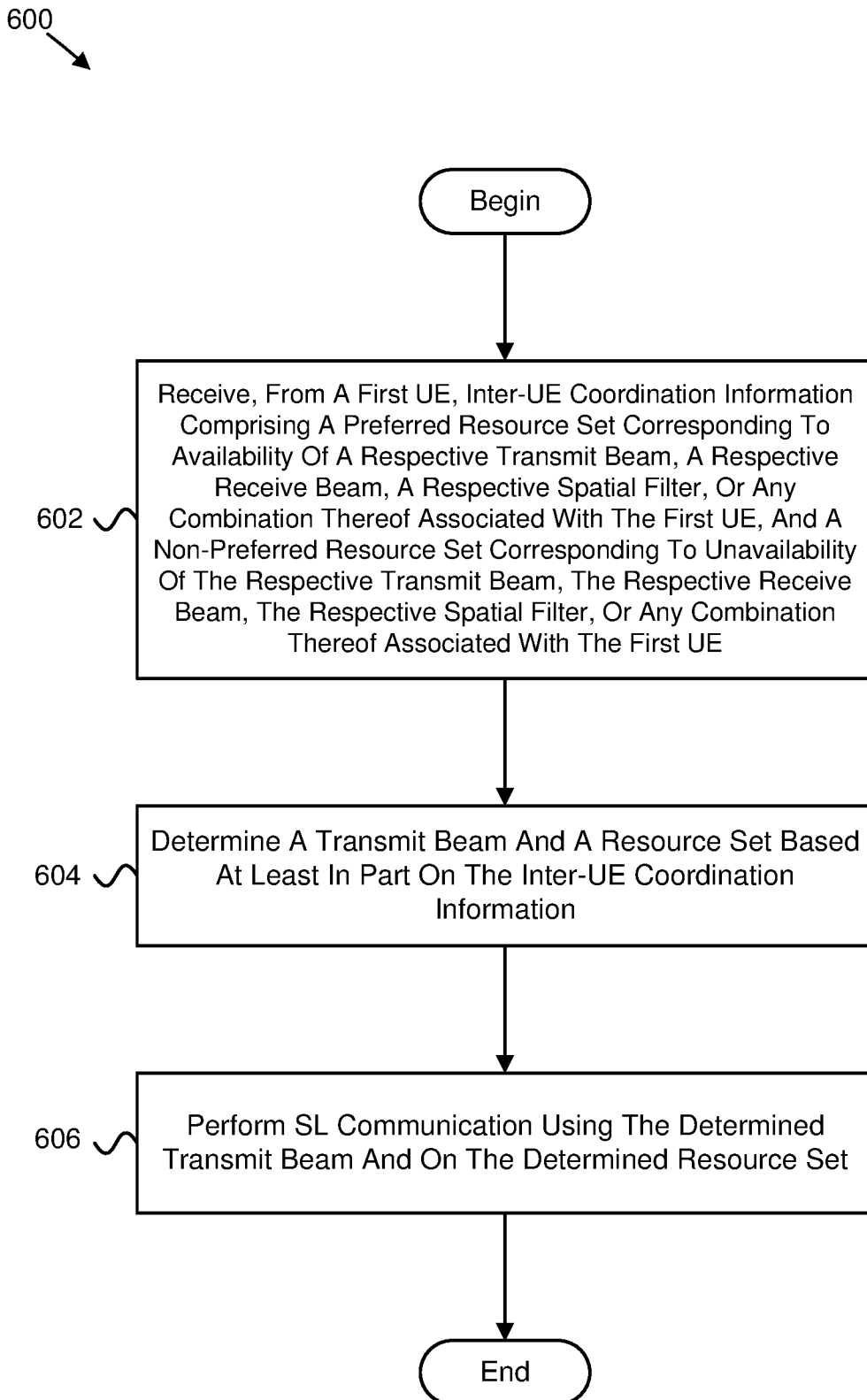


FIG. 6

700

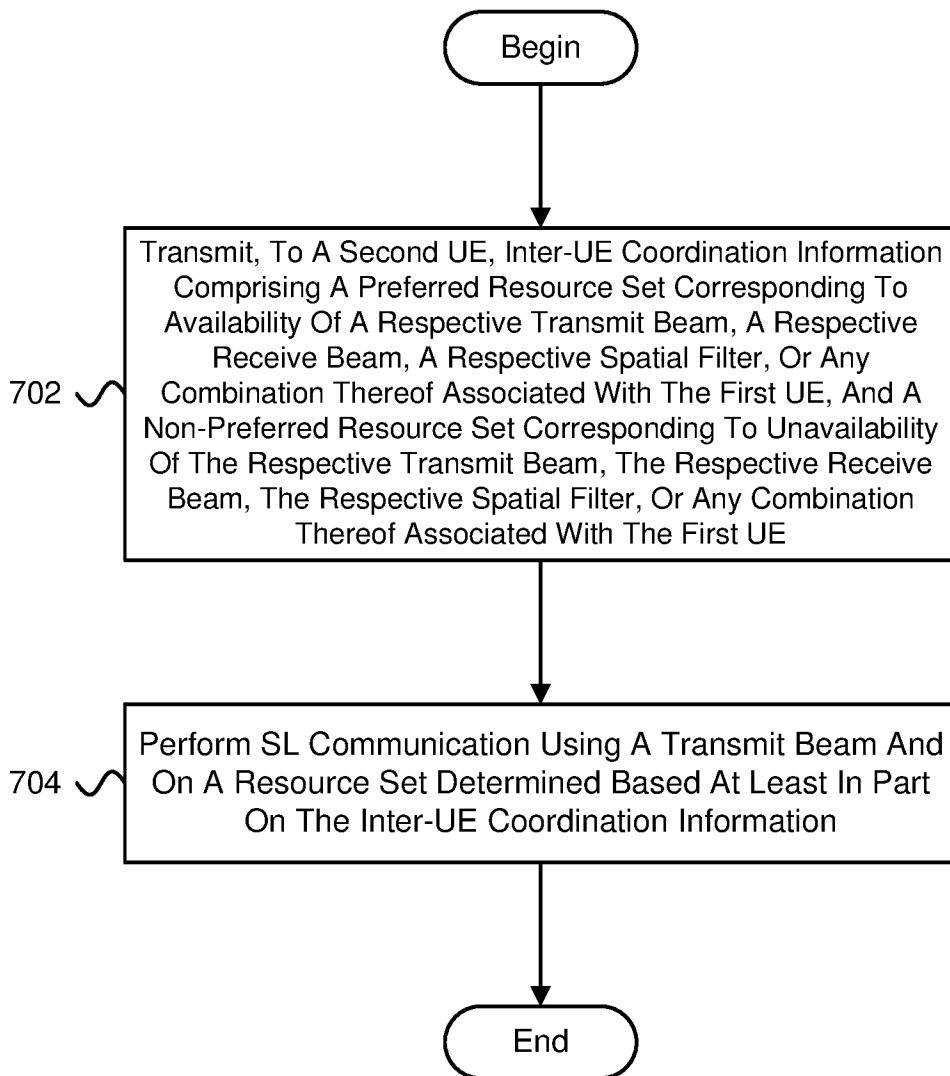


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/052787

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	H04B7/06	H04W76/14
ADD.	H04W72/02	H04W72/044 H04W92/18
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H04B H04W		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GIWON PARK ET AL: "Discussion on RAN2 aspects on SL-FR2", 3GPP DRAFT; R2-2301720; TYPE DISCUSSION; NR_SL_ENH2, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE vol. 3GPP RAN 2, no. Athens, GR; 20230227 - 20230303 17 February 2023 (2023-02-17), XP052246346, Retrieved from the Internet: URL:https://www.3gpp.org/ftp/TSG_RAN/WG2_R L2/TSGR2_121/Docs/R2-2301720.zip R2-2301720 Discussion on RAN2 aspects on SL-FR2.DOCX [retrieved on 2023-02-17] section 2.7 - / - -	1 - 20
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 24 May 2024		Date of mailing of the international search report 11/06/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Torrea Duran, R

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2024/052787

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	section 2.1 ----- TORSTEN WILDSCHKE ET AL: "On Beam Management for Sidelink in FR2", 3GPP DRAFT; R1-2300039; TYPE DISCUSSION; NR_SL_ENH2-CORE, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. 3GPP RAN 1, no. Athens, GR; 20230227 - 20230303 17 February 2023 (2023-02-17), XP052247193, Retrieved from the Internet: URL:https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_112/Docs/R1-2300039.zip R1-2300039-FR2.docx [retrieved on 2023-02-17] paragraph before Observation 6 -----	1, 11, 12, 20