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Landis et al.

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(54) **TECHNIQUES FOR REPORTING FREQUENCY CORRECTIONS**

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H04L 5/00 (2006.01)
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CPC ***H04W 24/08*** (2013.01); ***H04L 5/0048*** (2013.01); ***H04L 25/0228*** (2013.01); ***H04W 24/10*** (2013.01)

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CPC . H04W 24/08; H04W 24/10; H04W 56/0035; H04L 5/0048; H04L 25/0228;
(Continued)

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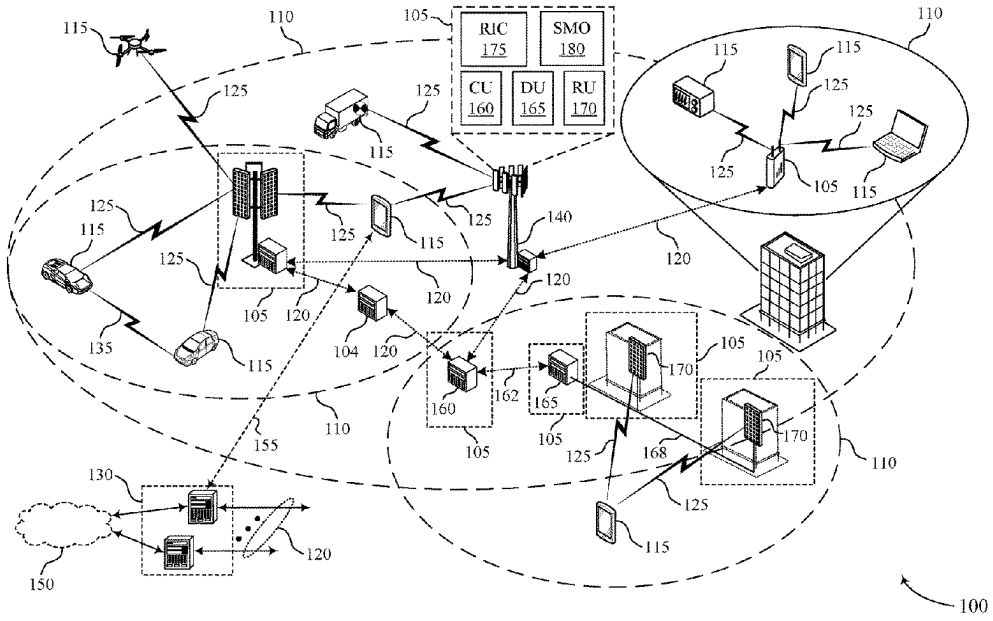
(57) **ABSTRACT**

Methods, systems, and devices for wireless communication are described. A user equipment (UE) may receive, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The network entity may transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The UE may monitor for the set of one or more reference signals and transmit, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. The UE may transmit the report according to a periodicity, according to a trigger, or both indicated in the one or more reporting parameters. The network entity may perform channel estimations based on the report indicating the one or more frequency corrections.

18 Claims, 15 Drawing Sheets



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H04L 25/02 (2006.01)
H04W 24/10 (2009.01)

(58) **Field of Classification Search**
CPC H04L 27/2675; H04L 25/0202; H04L 27/2657
See application file for complete search history.

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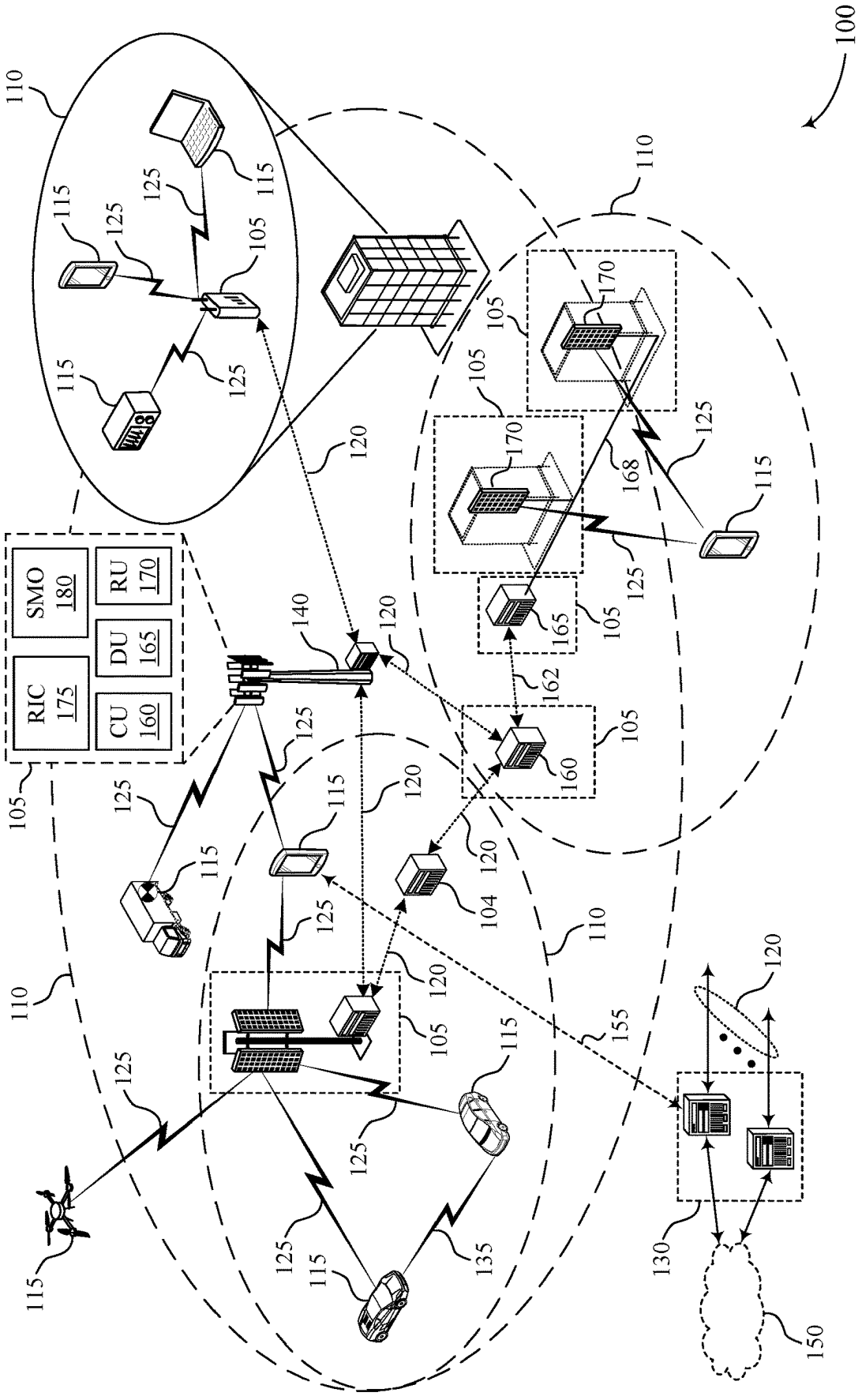
100
110
115
125
105
120
SMO 180
RU 170
RIC 175
DU 165
CU 160
140
170
168
165
162
160
104
155
130
135
150

FIG. 1

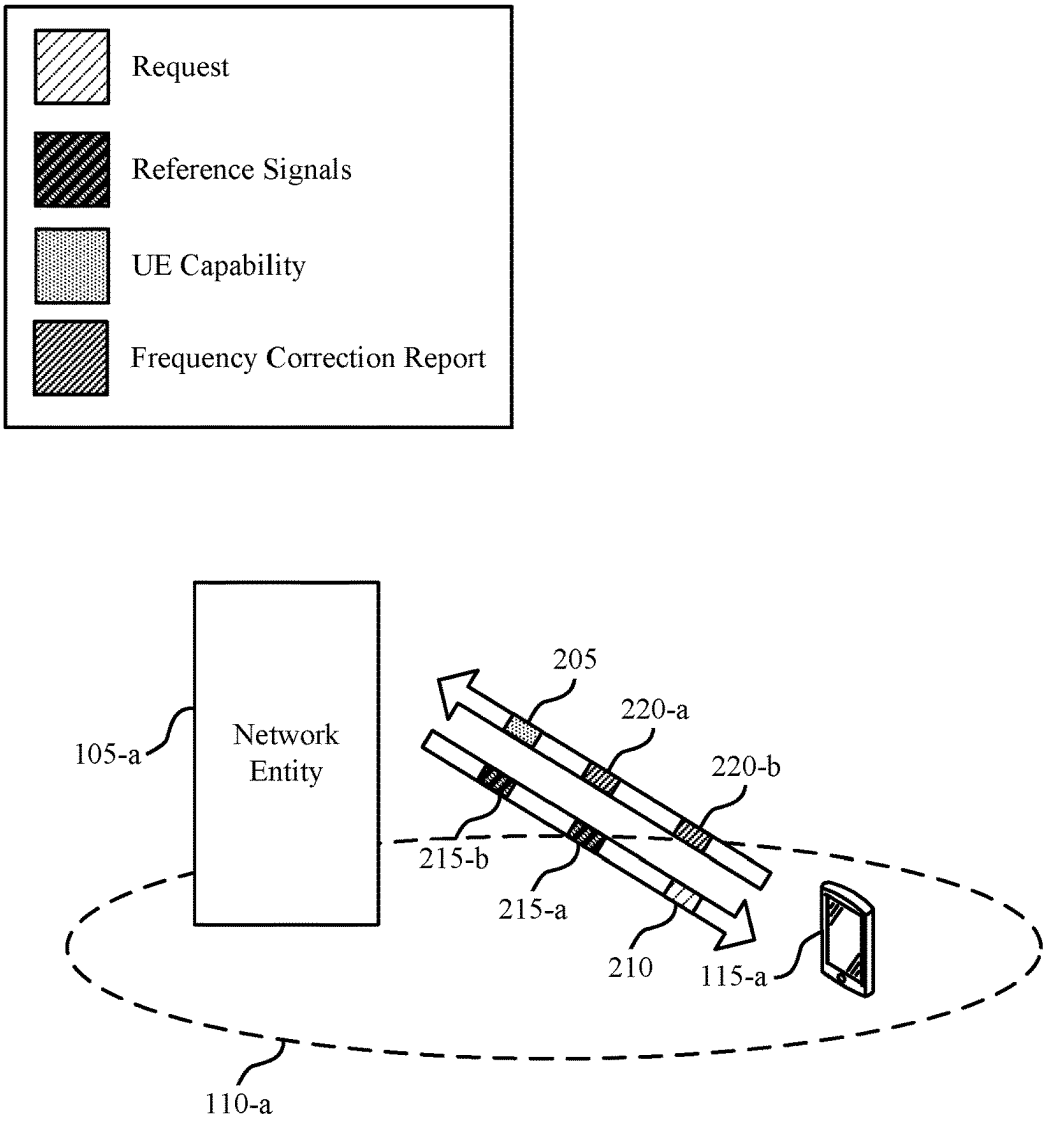
Request
Reference Signals
UE Capability
Frequency Correction Report
105-a
Network Entity
205
220-a
220-b
215-b
215-a
210
115-a
110-a
200

FIG. 2

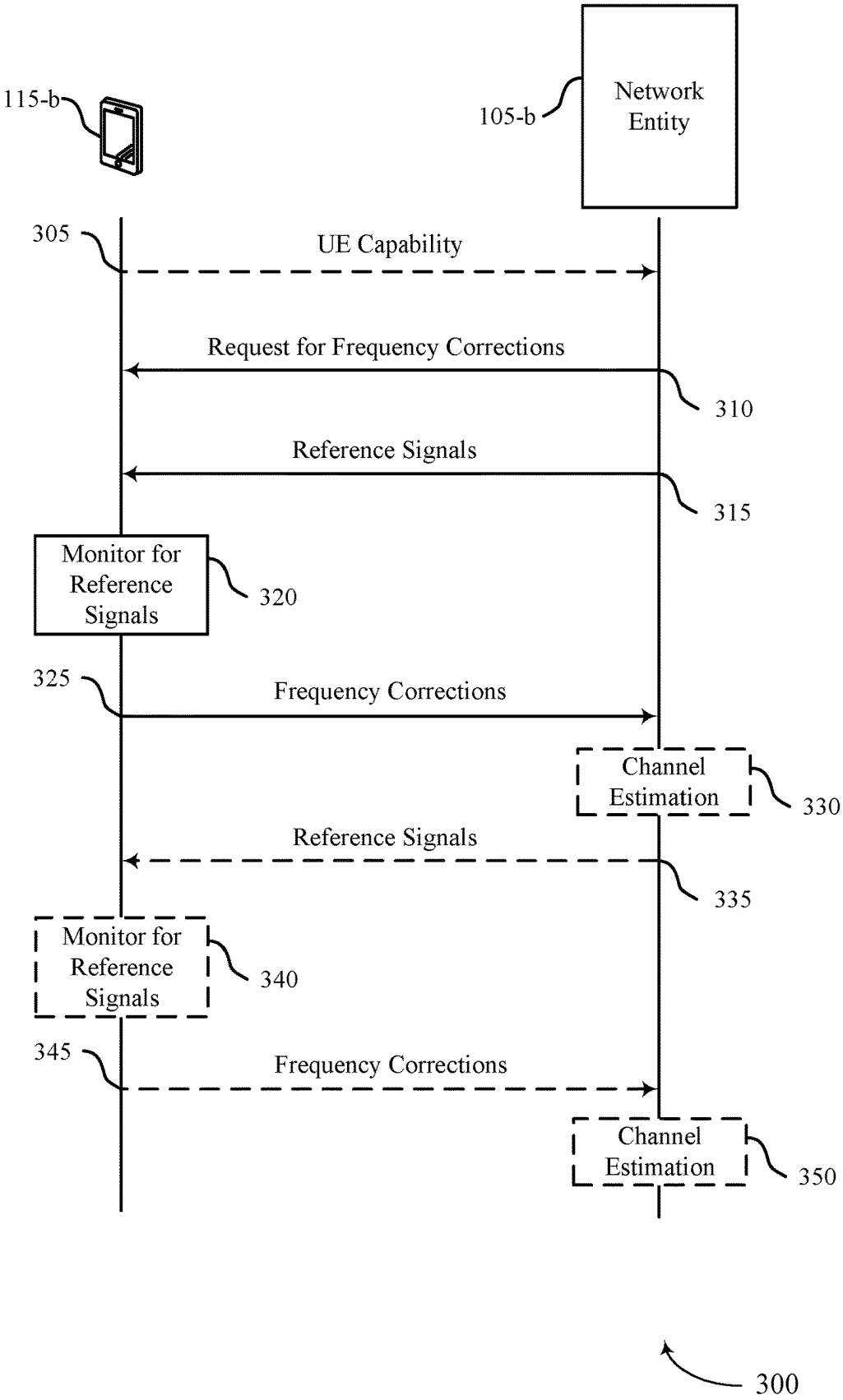
115-b
105-b
Network Entity
305
UE Capability
Request for Frequency Corrections
310
Reference Signals
315
Monitor for Reference Signals
320
325
Frequency Corrections
Channel Estimation
330
Reference Signals
335
Monitor for Reference Signals
340
345
Frequency Corrections
Channel Estimation
350
300

FIG. 3

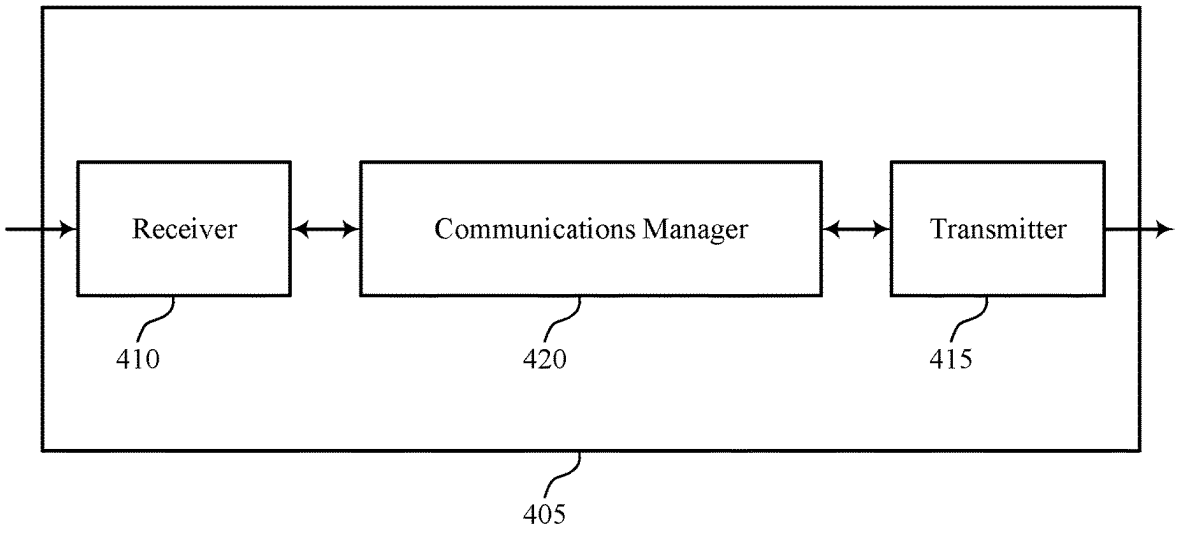
Receiver
Communications Manager
Transmitter
410
420
415
405
400

FIG. 4

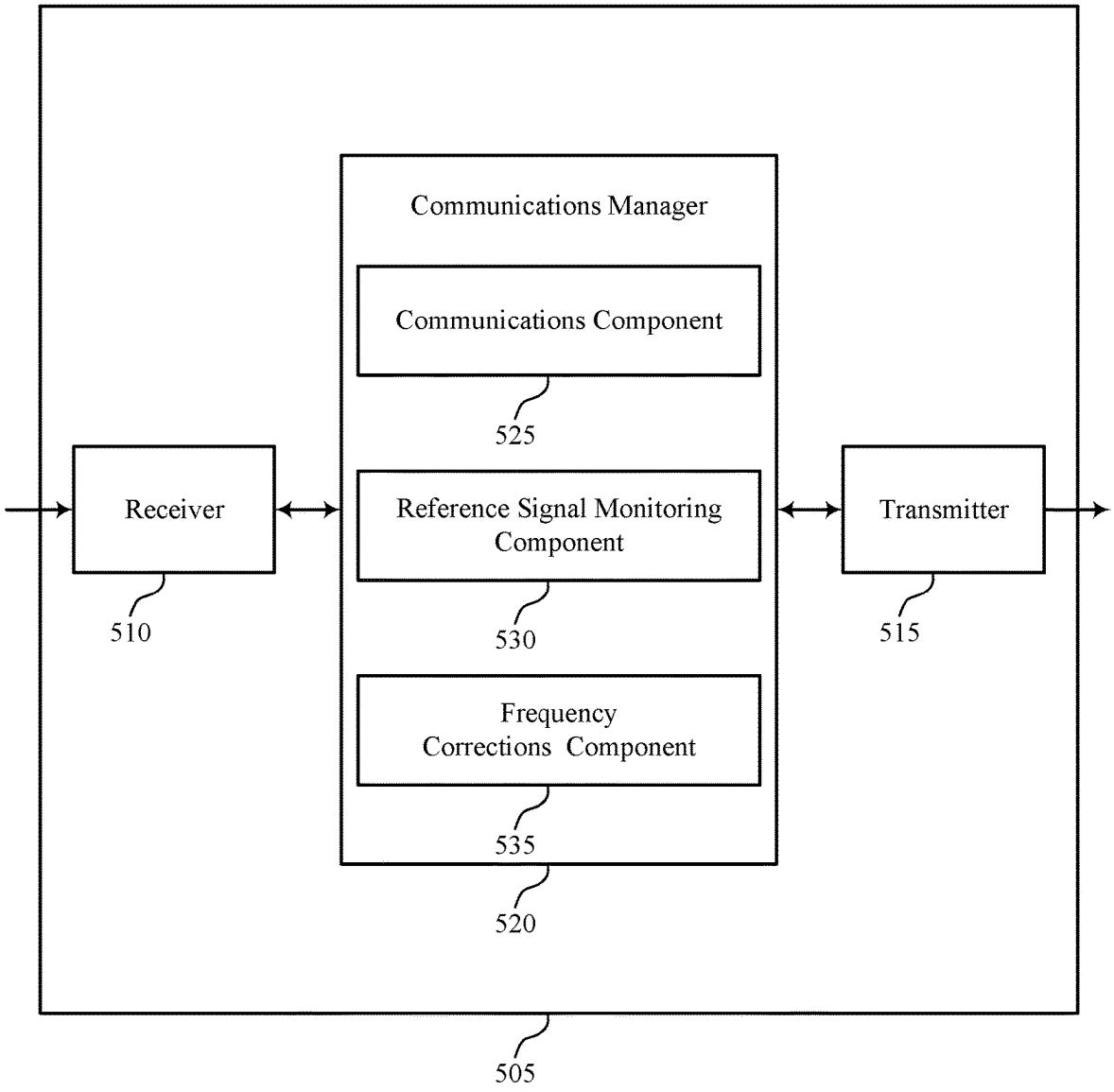
Communications Manager
Communications Component
525
Receiver
Reference Signal Monitoring Component
Transmitter
510
530
515
Frequency Corrections Component
535
520
505
500

FIG. 5

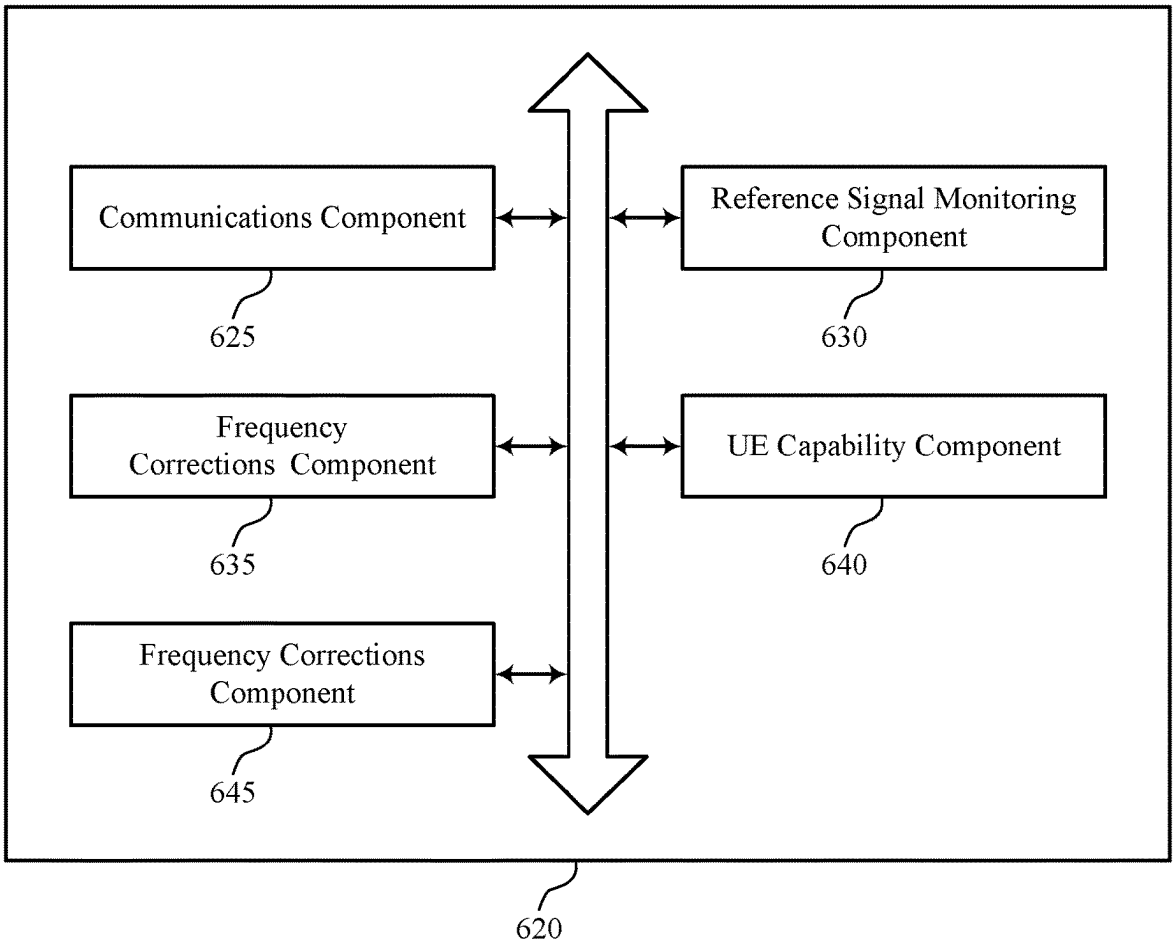
Communications Component
625
Reference Signal Monitoring Component
630
Frequency Corrections Component
635
UE Capability Component
640
Frequency Corrections Component
645
620
600

FIG. 6

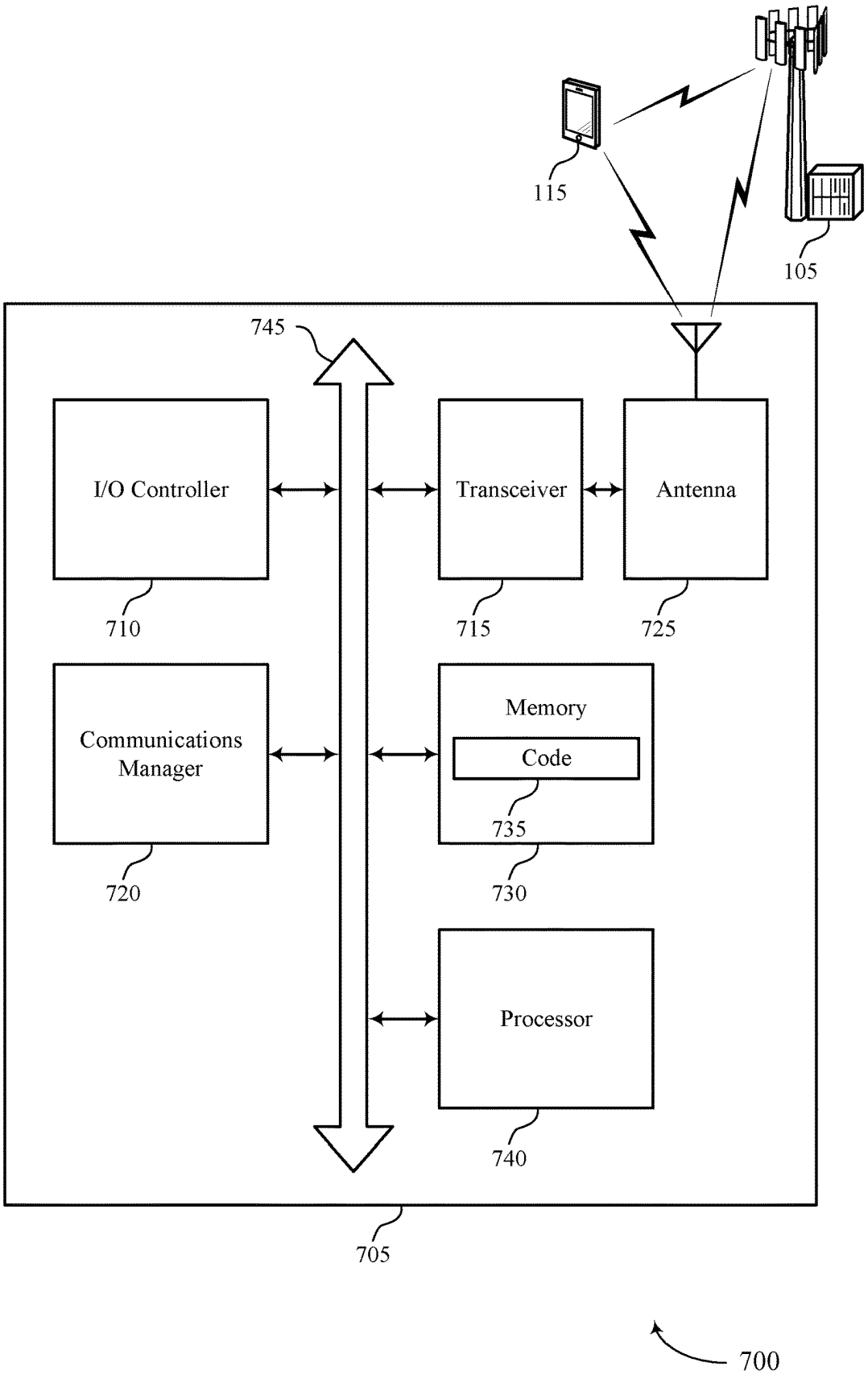
115
105
745
I/O Controller
Transceiver
Antenna
710
715
725
Communications Manager
Memory
Code
735
720
730
Processor
740
705
700

FIG. 7

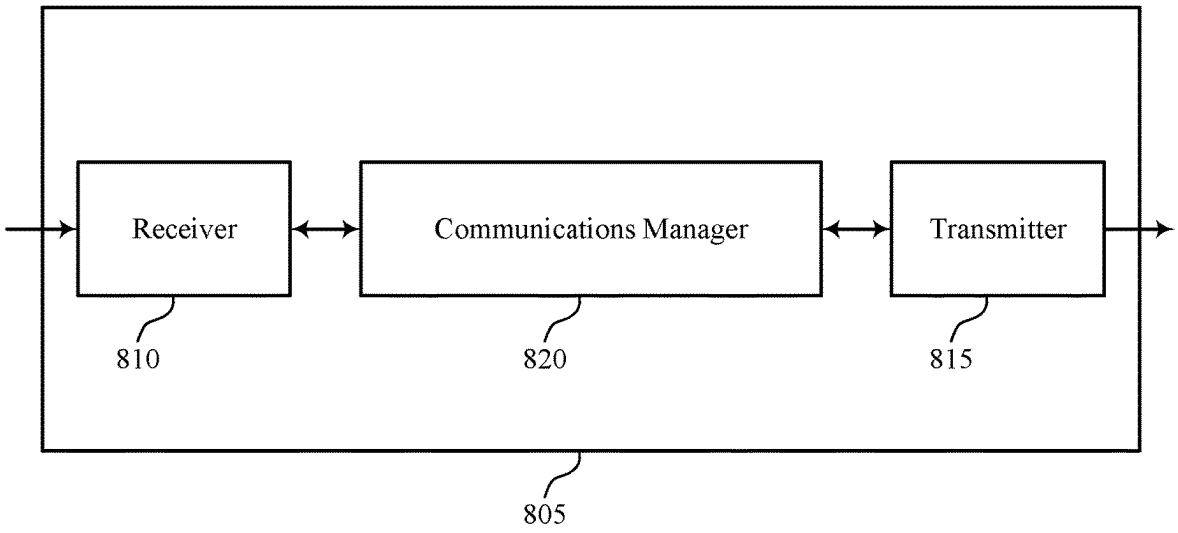
Receiver
Communications Manager
Transmitter
810
820
815
805
800

FIG. 8

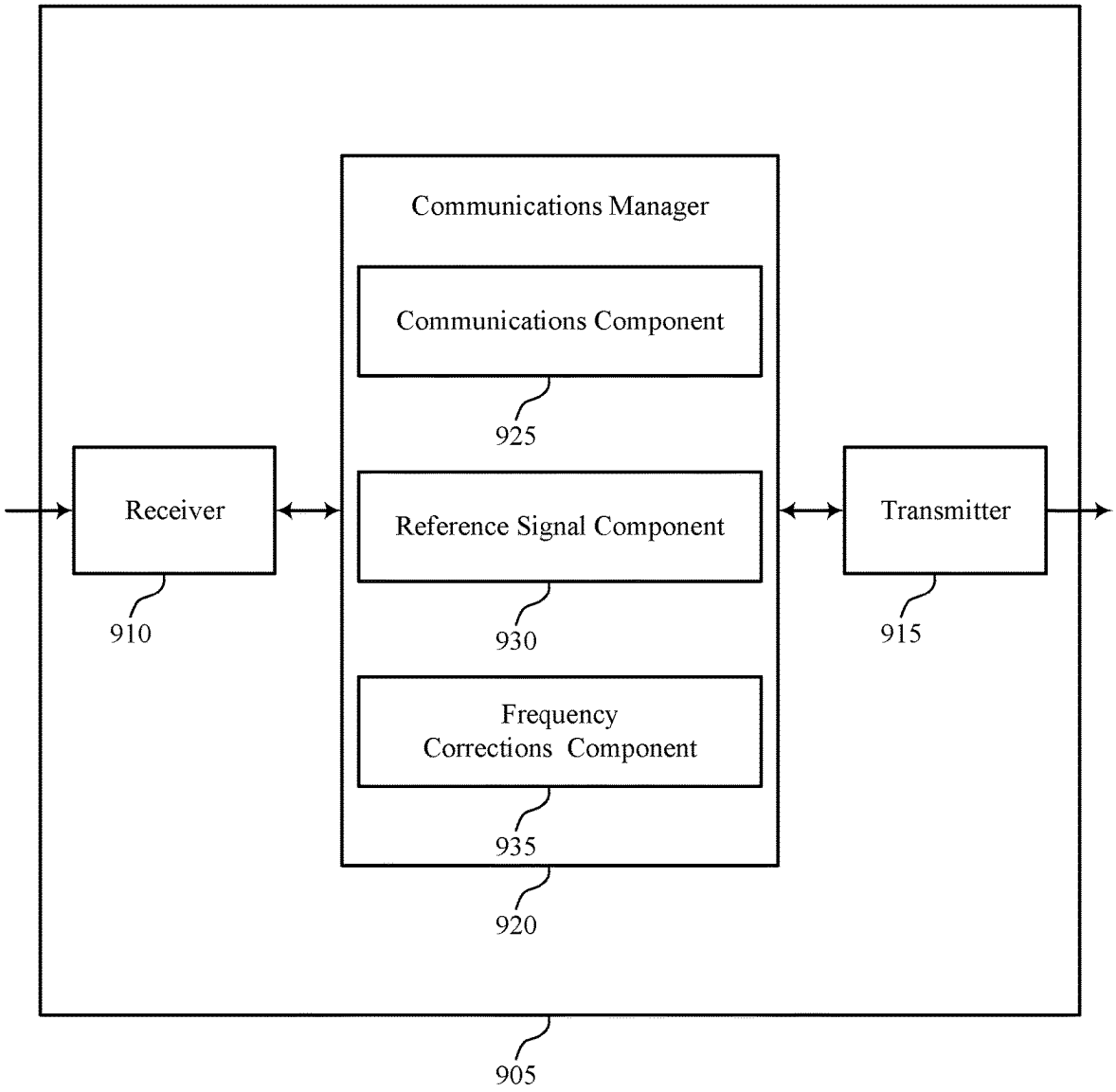
Communications Manager
Communications Component
925
Receiver
Reference Signal Component
Transmitter
910
930
915
Frequency
Corrections Component
935
920
905
900

FIG. 9

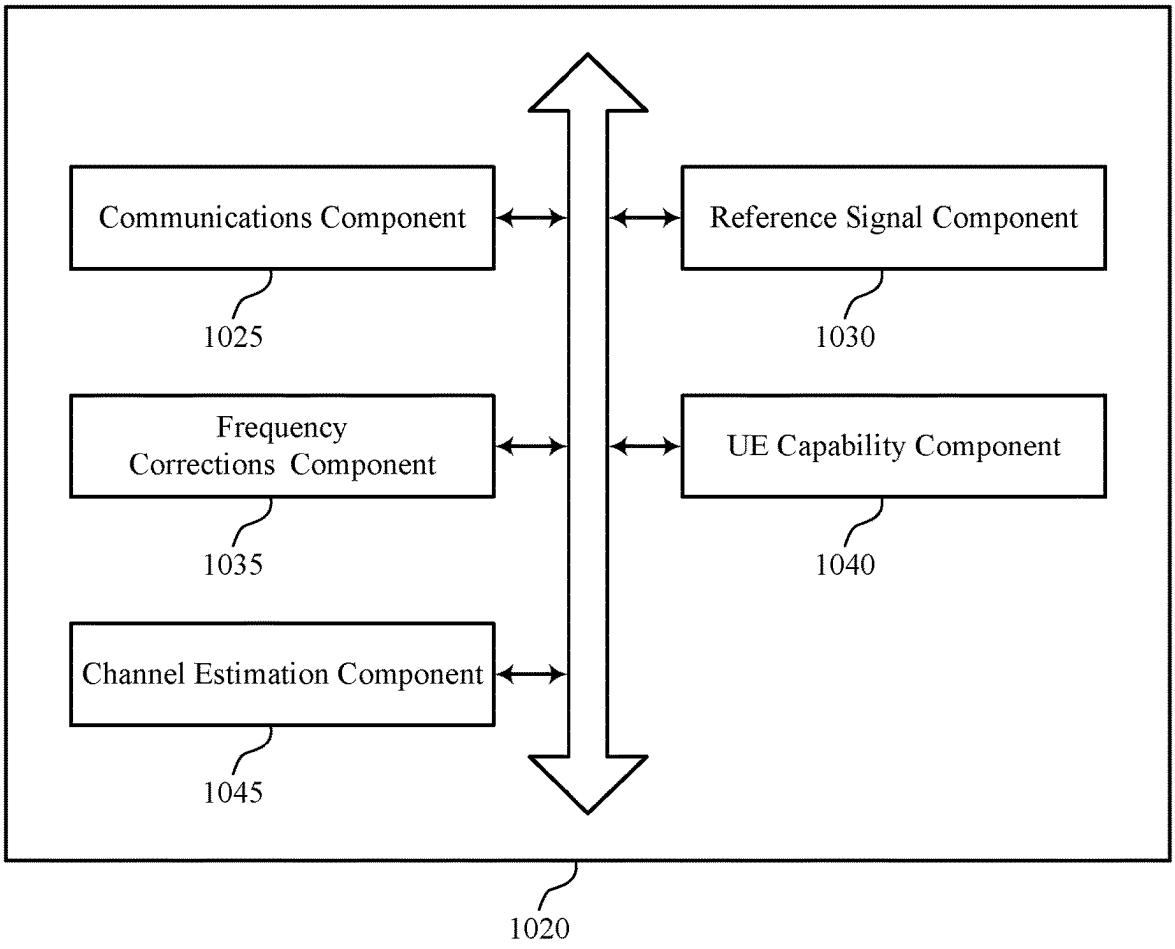
Communications Component
1025
Reference Signal Component
1030
Frequency Corrections Component
1035
UE Capability Component
1040
Channel Estimation Component
1045
1020
1000

FIG. 10

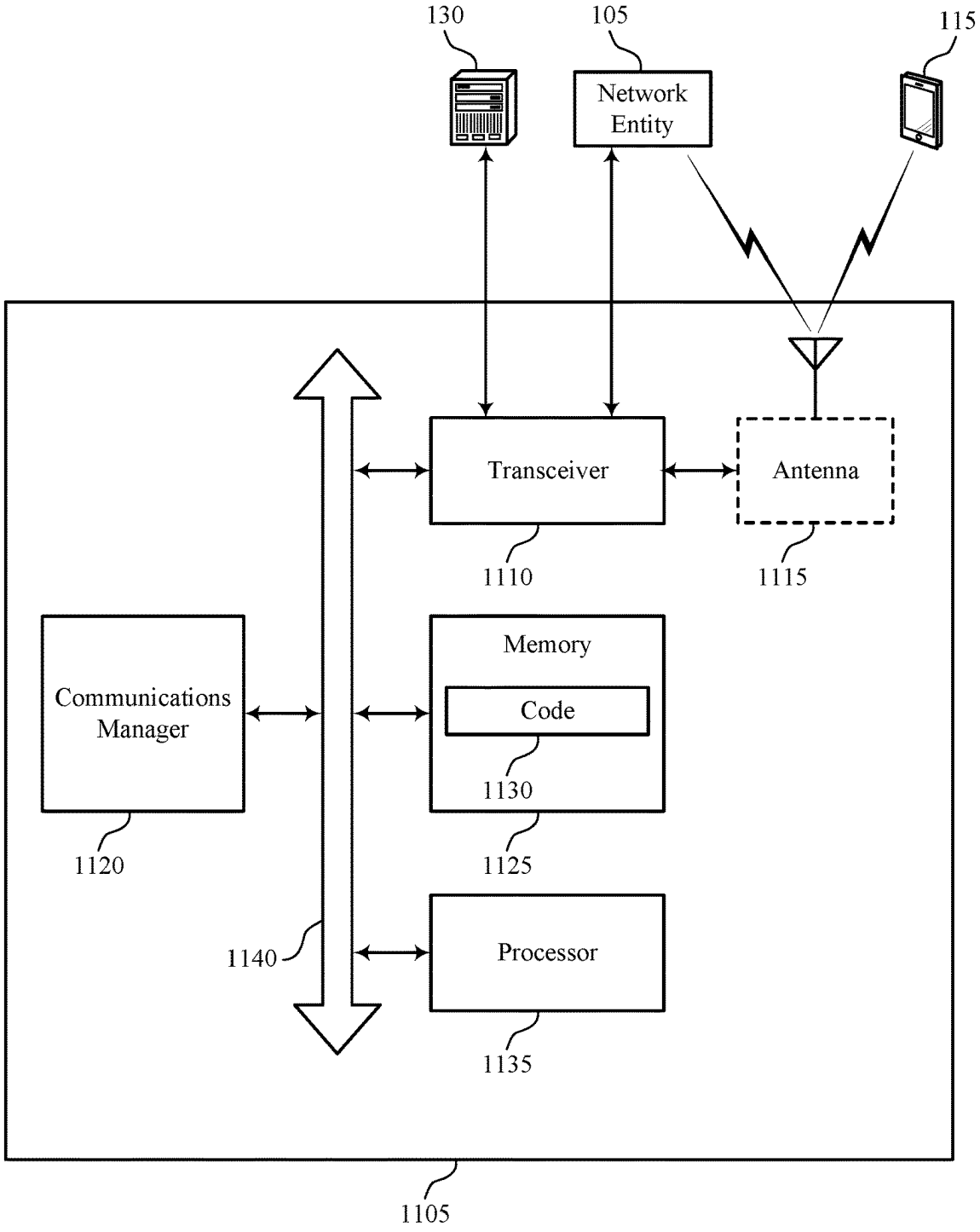
130
105
115
Network Entity
Transceiver
Antenna
1110
1115
Memory
Code
1130
Communications Manager
1120
1125
1140
Processor
1135
1105
1100

FIG. 11

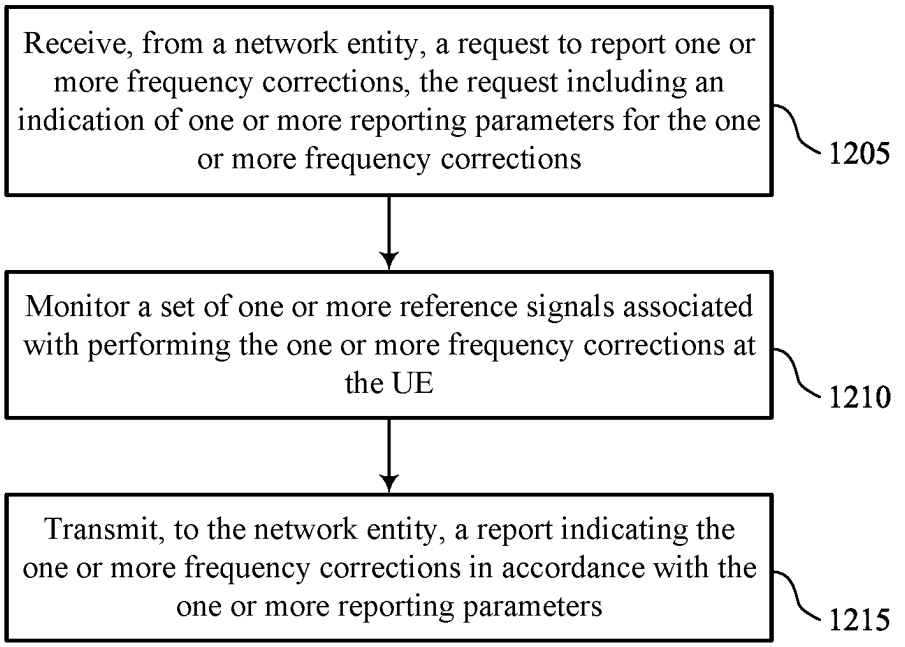
Receive, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections
1205
Monitor a set of one or more reference signals associated with performing the one or more frequency corrections at the UE
1210
Transmit, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters
1215
1200

FIG. 12

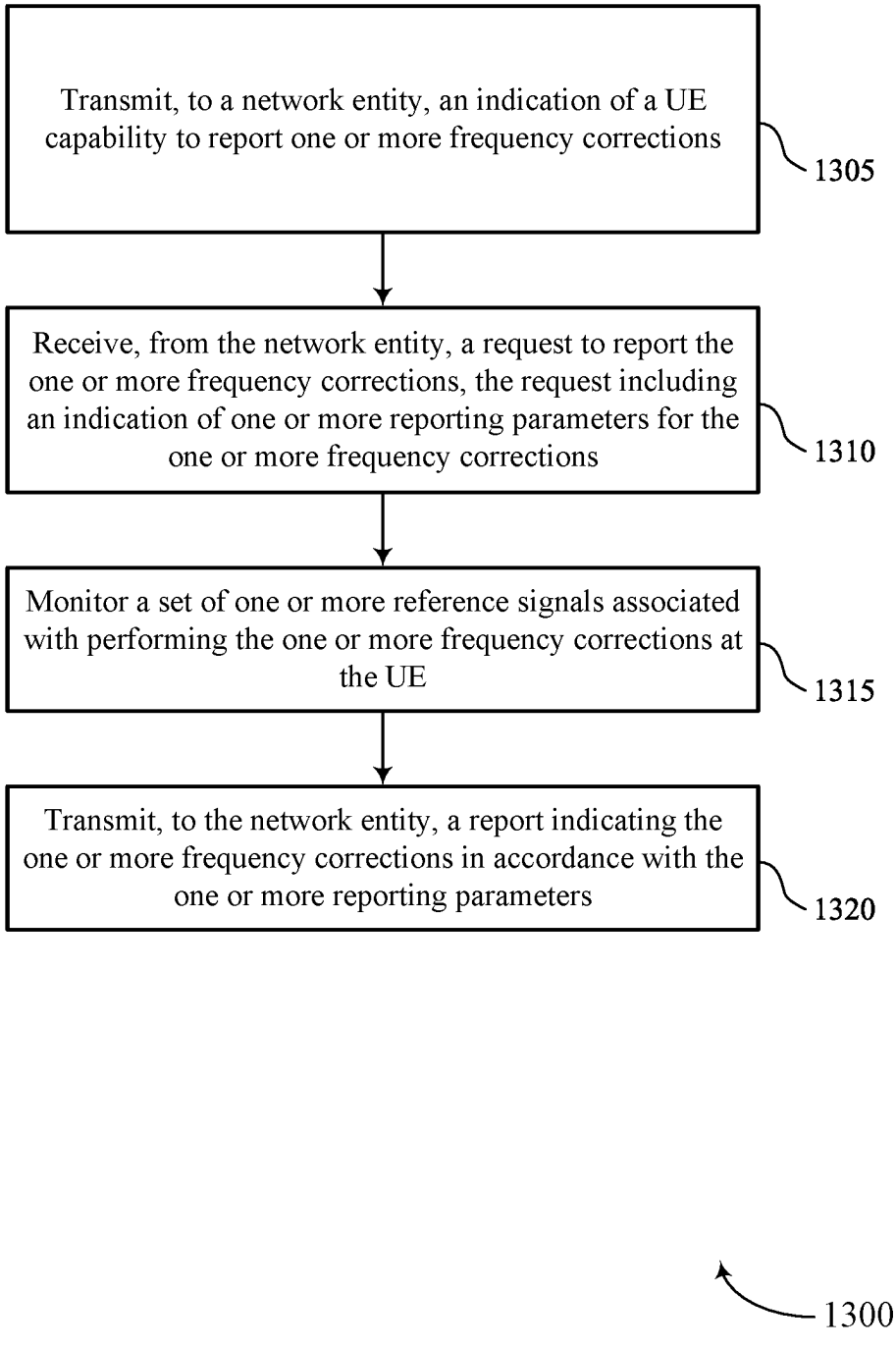
Transmit, to a network entity, an indication of a UE capability to report one or more frequency corrections
1305
Receive, from the network entity, a request to report the one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections
1310
Monitor a set of one or more reference signals associated with performing the one or more frequency corrections at the UE
1315
Transmit, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters
1320
1300

FIG. 13

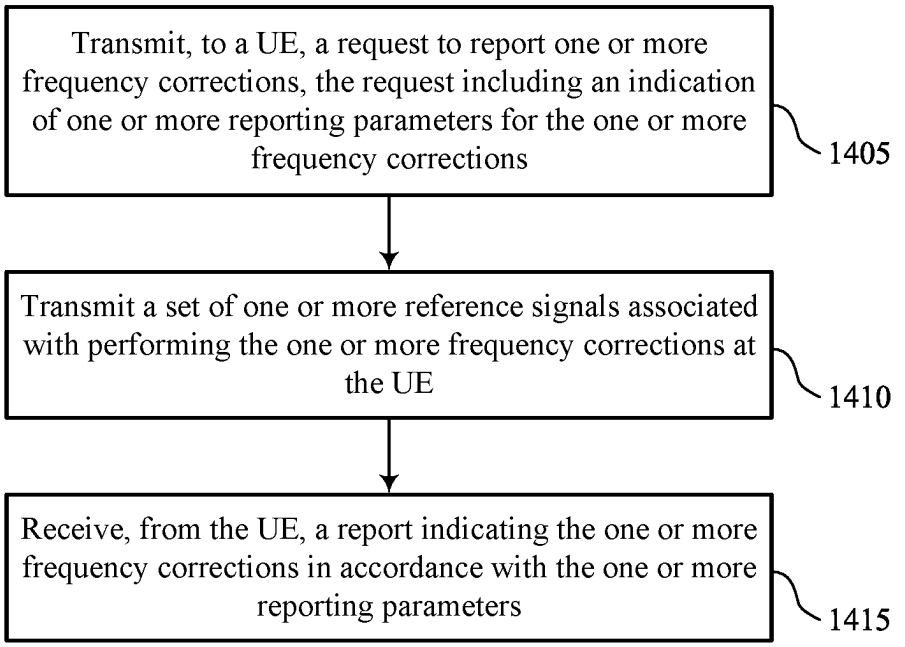
Transmit, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections
1405
Transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE
1410
Receive, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters
1415
1400

FIG. 14

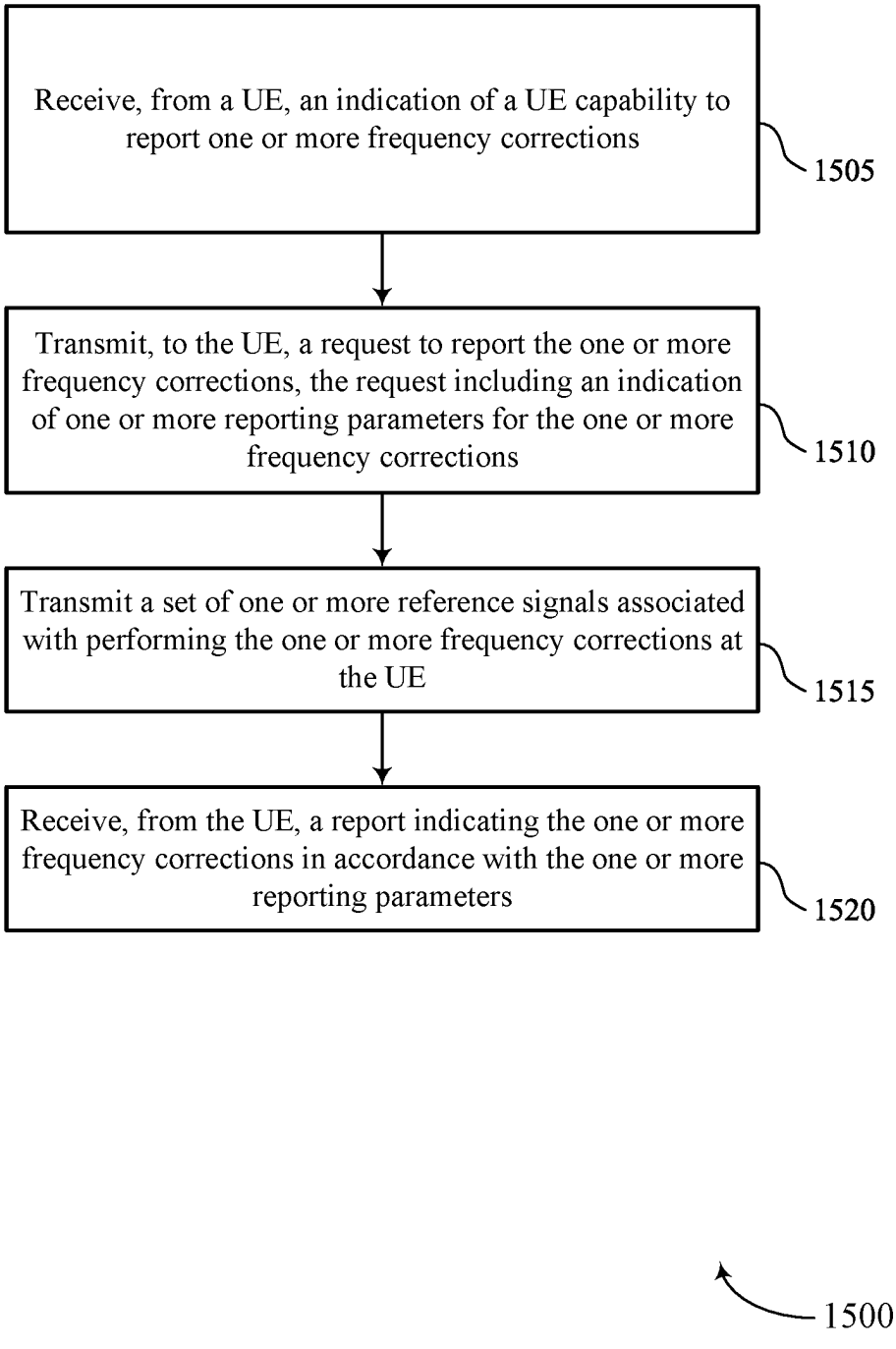
Receive, from a UE, an indication of a UE capability to report one or more frequency corrections
1505
Transmit, to the UE, a request to report the one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections
1510
Transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE
1515
Receive, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters
1520
1500

FIG. 15

TECHNIQUES FOR REPORTING FREQUENCY CORRECTIONS

FIELD OF TECHNOLOGY

The following relates to wireless communications, including techniques for reporting frequency corrections.

BACKGROUND

Wireless communications systems are widely deployed to provide various types of communication content such as voice, video, packet data, messaging, broadcast, and so on. These systems may be capable of supporting communication with multiple users by sharing the available system resources (e.g., time, frequency, and power). Examples of such multiple-access systems include fourth generation (4G) systems such as Long Term Evolution (LTE) systems, LTE-Advanced (LTE-A) systems, or LTE-A Pro systems, and fifth generation (5G) systems which may be referred to as New Radio (NR) systems. These systems may employ technologies such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal FDMA (OFDMA), or discrete Fourier transform spread orthogonal frequency division multiplexing (DFT-S-OFDM).

A wireless multiple-access communications system may include one or more base stations, each supporting wireless communication for communication devices, which may be known as user equipment (UEs). In some wireless communications systems, a network entity, such as one or more components of a base station, may perform channel estimations on a channel.

SUMMARY

The described techniques relate to improved methods, systems, devices, and apparatuses that support techniques for reporting frequency corrections. For example, the described techniques may enable a network entity to perform channel estimations on a channel. For instance, a network entity may use the techniques depicted herein to perform channel estimations on communication channels experiencing flat fading, thereby increasing performance in a flat channel, improving quality of communications, and decreasing latency. For example, the network entity may transmit a request to a user equipment (UE), for the UE to report one or more frequency corrections. The UE may monitor for a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The UE may transmit, to the network entity, the report indicating the one or more frequency corrections in accordance with one or more reporting parameters. In some examples, the network entity may receive the report via a channel experiencing flat fading. In such examples, the network entity may perform channel estimations on the flat channel based on the reported frequency corrections, thereby enabling the network entity to improve the accuracy of channel estimations in a channel experiencing flat fading.

A method for wireless communication at a UE is described. The method may include receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

An apparatus for wireless communication at a UE is described. The apparatus may include a processor, memory coupled with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to receive, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, monitor a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and transmit, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Another apparatus for wireless communication at a UE is described. The apparatus may include means for receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, means for monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and means for transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

A non-transitory computer-readable medium storing code for wireless communication at a UE is described. The code may include instructions executable by a processor to receive, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, monitor a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and transmit, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting, to the network entity, an indication of a UE capability to report the one or more frequency corrections, where receiving the request to report the one or more frequency corrections may be based on the indication of the UE capability.

Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for monitoring a second set of one or more reference signals after monitoring the set of one or more reference signals and transmitting, to the network entity, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the report and the second report may be periodic reports. In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the report and the second report may be aperiodic reports. In

some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the trigger includes reception of the set of one or more reference signals at the UE. In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the set of one or more reference signals includes at least one of a demodulation reference signal (DMRS), a tracking reference signal (TRS), or a combination thereof.

A method for wireless communication at a network entity is described. The method may include transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

An apparatus for wireless communication at a network entity is described. The apparatus may include a processor, memory coupled with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to transmit, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and receive, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Another apparatus for wireless communication at a network entity is described. The apparatus may include means for transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, means for transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and means for receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

A non-transitory computer-readable medium storing code for wireless communication at a network entity is described. The code may include instructions executable by a processor to transmit, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections, transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE, and receive, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving, from the UE, an indication of a UE capability to report the one or more frequency corrections, where transmitting the request to report the one or more frequency corrections may be based on the indication of the UE capability.

Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting a second set of one or more reference signals after transmitting the set of one or more reference signals and receiving, from the UE, a second report indicating the second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for performing a channel estimation for the UE based on the report indicating the one or more frequency corrections and the second report indicating the second set of frequency error corrections.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the report and the second report may be periodic reports. In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the report and the second report may be aperiodic reports. In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections.

In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the trigger includes reception of the set of one or more reference signals at the UE. In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the set of one or more reference signals includes at least one of a DMRS, a TRS, or a combination thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example of a wireless communications system that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **2** illustrates an example of a wireless communications system that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **3** illustrates an example of a process flow that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIGS. **4** and **5** illustrate block diagrams of devices that support techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **6** illustrates a block diagram of a communications manager that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **7** illustrates a diagram of a system including a device that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIGS. **8** and **9** illustrate block diagrams of devices that support techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **10** illustrates a block diagram of a communications manager that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIG. **11** illustrates a diagram of a system including a device that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

FIGS. **12** through **15** illustrate flowcharts showing methods that support techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure.

DETAILED DESCRIPTION

In some wireless communications systems, a network entity may communicate with a user equipment (UE) via one or more channels. In such systems, the network entity may perform channel estimations based on uplink signaling received from the UE, while the UE may perform channel estimations based on downlink signaling received from the network entity. In some cases, the network entity may receive uplink signaling from the UE in a channel that experiences flat fading. A channel may experience flat fading as a result of a frequency allocation for the channel being smaller than a coherent bandwidth (e.g., a measurement of the range of frequencies over which the channel is constant or flat) of the channel. In such cases, each frequency component (e.g., of a signal) transmitted in the channel may experience the same amplitude and phase fading. Additionally, the channel may experience flat fading in line-of-sight (LOS) communications (e.g., where the coherent bandwidth may be infinite, rendering the frequency allocation smaller than the coherent bandwidth).

In cases of flat fading, the network entity may not be able to accurately perform channel estimations on the received uplink signaling. For example, the network entity may receive uplink signaling that includes multiple demodulation reference signals (DMRSs). As part of channel estimations, the network entity may determine whether the frequency components of the channel are experiencing a Doppler spread or a Doppler shift based on measuring the correlation of two or more DMRSs received in different symbols in the uplink signaling. However, if the network entity receives the uplink signaling via a flat channel (e.g., a channel experiencing flat fading) the network entity may not be able to determine whether the flat channel is experiencing a Doppler shift or the Doppler spread, thereby increasing the error when performing channel estimations. Increased errors in channel estimations may lead to increased latency, poor channel quality, and decreased user experience.

The techniques described herein may enable a network entity to increase the accuracy for performing channel estimations. For example, the UE may receive, from the network entity, a request to report frequency corrections (e.g., frequency error corrections) performed during channel estimation. The UE may monitor for one or more reference signals (e.g., DMRSs, tracking reference signals (TRSs), or both) in downlink signaling from the network entity. To receive the one or more reference signals from the network entity, the UE may perform frequency corrections (e.g., adjust one or more timing or frequency parameters at the UE). Based on the time and frequency corrections used to receive the reference signals, the UE may adjust one or more frequency or time parameters for transmitting uplink signaling. In addition to transmitting the uplink signaling, the UE may transmit a report indicating the frequency corrections to the network entity. In some cases, the network entity may receive the uplink signaling via a flat channel. In such cases, the network entity may use the received frequency corrections to perform the channel estimations. Thus, based on received frequency corrections, the network entity may estimate the flat channel, thereby reducing the channel estimation errors, decreasing latency, and improving channel quality.

Aspects of the disclosure are initially described in the context of wireless communications systems. Aspects of the disclosure are illustrated in the context of a process flow. Aspects of the disclosure are further illustrated by and described with reference to apparatus diagrams, system diagrams, and flowcharts that relate to techniques for reporting frequency corrections.

FIG. **1** illustrates an example of a wireless communications system **100** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The wireless communications system **100** may include one or more network entities **105**, one or more UEs **115**, and a core network **130**. In some examples, the wireless communications system **100** may be a Long Term Evolution (LTE) network, an LTE-Advanced (LTE-A) network, an LTE-A Pro network, a New Radio (NR) network, or a network operating in accordance with other systems and radio technologies, including future systems and radio technologies not explicitly mentioned herein.

The network entities **105** may be dispersed throughout a geographic area to form the wireless communications system **100** and may include devices in different forms or having different capabilities. In various examples, a network entity **105** may be referred to as a network element, a mobility element, a radio access network (RAN) node, or network equipment, among other nomenclature. In some examples, network entities **105** and UEs **115** may wirelessly communicate via one or more communication links **125** (e.g., a radio frequency (RF) access link). For example, a network entity **105** may support a coverage area **110** (e.g., a geographic coverage area) over which the UEs **115** and the network entity **105** may establish one or more communication links **125**. The coverage area **110** may be an example of a geographic area over which a network entity **105** and a UE **115** may support the communication of signals according to one or more radio access technologies (RATs).

The UEs **115** may be dispersed throughout a coverage area **110** of the wireless communications system **100**, and each UE **115** may be stationary, or mobile, or both at different times. The UEs **115** may be devices in different forms or having different capabilities. Some example UEs **115** are illustrated in FIG. **1**. The UEs **115** described herein may be capable of supporting communications with various types of devices, such as other UEs **115** or network entities **105**, as shown in FIG. **1**.

As described herein, a node of the wireless communications system **100**, which may be referred to as a network node, or a wireless node, may be a network entity **105** (e.g., any network entity described herein), a UE **115** (e.g., any UE described herein), a network controller, an apparatus, a device, a computing system, one or more components, or another suitable processing entity configured to perform any of the techniques described herein. For example, a node may be a UE **115**. As another example, a node may be a network entity **105**. As another example, a first node may be config-

ured to communicate with a second node or a third node. In one aspect of this example, the first node may be a UE **115**, the second node may be a network entity **105**, and the third node may be a UE **115**. In another aspect of this example, the first node may be a UE **115**, the second node may be a network entity **105**, and the third node may be a network entity **105**. In yet other aspects of this example, the first, second, and third nodes may be different relative to these examples. Similarly, reference to a UE **115**, network entity **105**, apparatus, device, computing system, or the like may include disclosure of the UE **115**, network entity **105**, apparatus, device, computing system, or the like being a node. For example, disclosure that a UE **115** is configured to receive information from a network entity **105** also discloses that a first node is configured to receive information from a second node.

In some examples, network entities **105** may communicate with the core network **130**, or with one another, or both. For example, network entities **105** may communicate with the core network **130** via one or more backhaul communication links **120** (e.g., in accordance with an S1, N2, N3, or other interface protocol). In some examples, network entities **105** may communicate with one another via a backhaul communication link **120** (e.g., in accordance with an X2, Xn, or other interface protocol) either directly (e.g., directly between network entities **105**) or indirectly (e.g., via a core network **130**). In some examples, network entities **105** may communicate with one another via a midhaul communication link **162** (e.g., in accordance with a midhaul interface protocol) or a fronthaul communication link **168** (e.g., in accordance with a fronthaul interface protocol), or any combination thereof. The backhaul communication links **120**, midhaul communication links **162**, or fronthaul communication links **168** may be or include one or more wired links (e.g., an electrical link, an optical fiber link), one or more wireless links (e.g., a radio link, a wireless optical link), among other examples or various combinations thereof. A UE **115** may communicate with the core network **130** via a communication link **155**.

One or more of the network entities **105** described herein may include or may be referred to as a base station **140** (e.g., a base transceiver station, a radio base station, an NR base station, an access point, a radio transceiver, a NodeB, an eNodeB (eNB), a next-generation NodeB or a giga-NodeB (either of which may be referred to as a gNB), a 5G NB, a next-generation eNB (ng-eNB), a Home NodeB, a Home eNodeB, or other suitable terminology). In some examples, a network entity **105** (e.g., a base station **140**) may be implemented in an aggregated (e.g., monolithic, standalone) base station architecture, which may be configured to utilize a protocol stack that is physically or logically integrated within a single network entity **105** (e.g., a single RAN node, such as a base station **140**).

In some examples, a network entity **105** may be implemented in a disaggregated architecture (e.g., a disaggregated base station architecture, a disaggregated RAN architecture), which may be configured to utilize a protocol stack that is physically or logically distributed among two or more network entities **105**, such as an integrated access backhaul (IAB) network, an open RAN (O-RAN) (e.g., a network configuration sponsored by the O-RAN Alliance), or a virtualized RAN (vRAN) (e.g., a cloud RAN (C-RAN)). For example, a network entity **105** may include one or more of a central unit (CU) **160**, a distributed unit (DU) **165**, a radio unit (RU) **170**, a RAN Intelligent Controller (RIC) **175** (e.g., a Near-Real Time RIC (Near-RT RIC), a Non-Real Time RIC (Non-RT RIC)), a Service Management and Orchestration (SMO) **180** system, or any combination thereof. An RU **170** may also be referred to as a radio head, a smart radio head, a remote radio head (RRH), a remote radio unit (RRU), or a transmission reception point (TRP). One or more components of the network entities **105** in a disaggregated RAN architecture may be co-located, or one or more components of the network entities **105** may be located in distributed locations (e.g., separate physical locations). In some examples, one or more network entities **105** of a disaggregated RAN architecture may be implemented as virtual units (e.g., a virtual CU (VCU), a virtual DU (VDU), a virtual RU (VRU)).

The split of functionality between a CU **160**, a DU **165**, and an RU **170** is flexible and may support different functionalities depending on which functions (e.g., network layer functions, protocol layer functions, baseband functions, RF functions, and any combinations thereof) are performed at a CU **160**, a DU **165**, or an RU **170**. For example, a functional split of a protocol stack may be employed between a CU **160** and a DU **165** such that the CU **160** may support one or more layers of the protocol stack and the DU **165** may support one or more different layers of the protocol stack. In some examples, the CU **160** may host upper protocol layer (e.g., layer 3 (L3), layer 2 (L2)) functionality and signaling (e.g., Radio Resource Control (RRC), service data adaption protocol (SDAP), Packet Data Convergence Protocol (PDCP)). The CU **160** may be connected to one or more DUs **165** or RUs **170**, and the one or more DUs **165** or RUs **170** may host lower protocol layers, such as layer 1 (L1) (e.g., physical (PHY) layer) or L2 (e.g., radio link control (RLC) layer, medium access control (MAC) layer) functionality and signaling, and may each be at least partially controlled by the CU **160**. Additionally, or alternatively, a functional split of the protocol stack may be employed between a DU **165** and an RU **170** such that the DU **165** may support one or more layers of the protocol stack and the RU **170** may support one or more different layers of the protocol stack. The DU **165** may support one or multiple different cells (e.g., via one or more RUs **170**). In some cases, a functional split between a CU **160** and a DU **165**, or between a DU **165** and an RU **170** may be within a protocol layer (e.g., some functions for a protocol layer may be performed by one of a CU **160**, a DU **165**, or an RU **170**, while other functions of the protocol layer are performed by a different one of the CU **160**, the DU **165**, or the RU **170**). A CU **160** may be functionally split further into CU control plane (CU-CP) and CU user plane (CU-UP) functions. A CU **160** may be connected to one or more DUs **165** via a midhaul communication link **162** (e.g., F1, F1-c, F1-u), and a DU **165** may be connected to one or more RUs **170** via a fronthaul communication link **168** (e.g., open fronthaul (FH) interface). In some examples, a midhaul communication link **162** or a fronthaul communication link **168** may be implemented in accordance with an interface (e.g., a channel) between layers of a protocol stack supported by respective network entities **105** that are in communication via such communication links.

In wireless communications systems (e.g., wireless communications system **100**), infrastructure and spectral resources for radio access may support wireless backhaul link capabilities to supplement wired backhaul connections, providing an IAB network architecture (e.g., to a core network **130**). In some cases, in an IAB network, one or more network entities **105** (e.g., IAB nodes **104**) may be partially controlled by each other. One or more IAB nodes **104** may be referred to as a donor entity or an IAB donor. One or more DUs **165** or one or more RUs **170** may be

partially controlled by one or more CUs **160** associated with a donor network entity **105** (e.g., a donor base station **140**). The one or more donor network entities **105** (e.g., IAB donors) may be in communication with one or more additional network entities **105** (e.g., IAB nodes **104**) via supported access and backhaul links (e.g., backhaul communication links **120**). IAB nodes **104** may include an IAB mobile termination (IAB-MT) controlled (e.g., scheduled) by DUs **165** of a coupled IAB donor. An IAB-MT may include an independent set of antennas for relay of communications with UEs **115**, or may share the same antennas (e.g., of an RU **170**) of an IAB node **104** used for access via the DU **165** of the IAB node **104** (e.g., referred to as virtual IAB-MT (vIAB-MT)). In some examples, the IAB nodes **104** may include DUs **165** that support communication links with additional entities (e.g., IAB nodes **104**, UEs **115**) within the relay chain or configuration of the access network (e.g., downstream). In such cases, one or more components of the disaggregated RAN architecture (e.g., one or more IAB nodes **104** or components of IAB nodes **104**) may be configured to operate according to the techniques described herein.

In the case of the techniques described herein applied in the context of a disaggregated RAN architecture, one or more components of the disaggregated RAN architecture may be configured to support techniques for reporting frequency corrections as described herein. For example, some operations described as being performed by a UE **115** or a network entity **105** (e.g., a base station **140**) may additionally, or alternatively, be performed by one or more components of the disaggregated RAN architecture (e.g., IAB nodes **104**, DUs **165**, CUs **160**, RUs **170**, RIC **175**, SMO **180**).

A UE **115** may include or may be referred to as a mobile device, a wireless device, a remote device, a handheld device, or a subscriber device, or some other suitable terminology, where the "device" may also be referred to as a unit, a station, a terminal, or a client, among other examples. A UE **115** may also include or may be referred to as a personal electronic device such as a cellular phone, a personal digital assistant (PDA), a tablet computer, a laptop computer, or a personal computer. In some examples, a UE **115** may include or be referred to as a wireless local loop (WLL) station, an Internet of Things (IoT) device, an Internet of Everything (IoE) device, or a machine type communications (MTC) device, among other examples, which may be implemented in various objects such as appliances, or vehicles, meters, among other examples.

The UEs **115** described herein may be able to communicate with various types of devices, such as other UEs **115** that may sometimes act as relays as well as the network entities **105** and the network equipment including macro eNBs or gNBs, small cell eNBs or gNBs, or relay base stations, among other examples, as shown in FIG. **1**.

The UEs **115** and the network entities **105** may wirelessly communicate with one another via one or more communication links **125** (e.g., an access link) using resources associated with one or more carriers. The term "carrier" may refer to a set of RF spectrum resources having a defined physical layer structure for supporting the communication links **125**. For example, a carrier used for a communication link **125** may include a portion of a RF spectrum band (e.g., a bandwidth part (BWP)) that is operated according to one or more physical layer channels for a given radio access technology (e.g., LTE, LTE-A, LTE-A Pro, NR). Each physical layer channel may carry acquisition signaling (e.g., synchronization signals, system information), control signaling that coordinates operation for the carrier, user data, or other signaling. The wireless communications system **100** may support communication with a UE **115** using carrier aggregation or multi-carrier operation. A UE **115** may be configured with multiple downlink component carriers and one or more uplink component carriers according to a carrier aggregation configuration. Carrier aggregation may be used with both frequency division duplexing (FDD) and time division duplexing (TDD) component carriers. Communication between a network entity **105** and other devices may refer to communication between the devices and any portion (e.g., entity, sub-entity) of a network entity **105**. For example, the terms "transmitting," "receiving," or "communicating," when referring to a network entity **105**, may refer to any portion of a network entity **105** (e.g., a base station **140**, a CU **160**, a DU **165**, a RU **170**) of a RAN communicating with another device (e.g., directly or via one or more other network entities **105**).

Signal waveforms transmitted via a carrier may be made up of multiple subcarriers (e.g., using multi-carrier modulation (MCM) techniques such as orthogonal frequency division multiplexing (OFDM) or discrete Fourier transform spread OFDM (DFT-S-OFDM)). In a system employing MCM techniques, a resource element may refer to resources of one symbol period (e.g., a duration of one modulation symbol) and one subcarrier, in which case the symbol period and subcarrier spacing may be inversely related. The quantity of bits carried by each resource element may depend on the modulation scheme (e.g., the order of the modulation scheme, the coding rate of the modulation scheme, or both), such that a relatively higher quantity of resource elements (e.g., in a transmission duration) and a relatively higher order of a modulation scheme may correspond to a relatively higher rate of communication. A wireless communications resource may refer to a combination of an RF spectrum resource, a time resource, and a spatial resource (e.g., a spatial layer, a beam), and the use of multiple spatial resources may increase the data rate or data integrity for communications with a UE **115**.

The time intervals for the network entities **105** or the UEs **115** may be expressed in multiples of a basic time unit which may, for example, refer to a sampling period of $T_s=1/(\Delta f_{max} \cdot N_f)$ seconds, for which Δf_{max} may represent a supported subcarrier spacing, and N_f may represent a supported discrete Fourier transform (DFT) size. Time intervals of a communications resource may be organized according to radio frames each having a specified duration (e.g., 10 milliseconds (ms)). Each radio frame may be identified by a system frame number (SFN) (e.g., ranging from 0 to 1023).

Each frame may include multiple consecutively-numbered subframes or slots, and each subframe or slot may have the same duration. In some examples, a frame may be divided (e.g., in the time domain) into subframes, and each subframe may be further divided into a quantity of slots. Alternatively, each frame may include a variable quantity of slots, and the quantity of slots may depend on subcarrier spacing. Each slot may include a quantity of symbol periods (e.g., depending on the length of the cyclic prefix prepended to each symbol period). In some wireless communications systems **100**, a slot may further be divided into multiple mini-slots associated with one or more symbols. Excluding the cyclic prefix, each symbol period may be associated with one or more (e.g., N_f) sampling periods. The duration of a symbol period may depend on the subcarrier spacing or frequency band of operation.

A subframe, a slot, a mini-slot, or a symbol may be the smallest scheduling unit (e.g., in the time domain) of the

wireless communications system **100** and may be referred to as a transmission time interval (TTI). In some examples, the TTI duration (e.g., a quantity of symbol periods in a TTI) may be variable. Additionally, or alternatively, the smallest scheduling unit of the wireless communications system **100** may be dynamically selected (e.g., in bursts of shortened TTIs (sTTIs)).

Physical channels may be multiplexed for communication using a carrier according to various techniques. A physical control channel and a physical data channel may be multiplexed for signaling via a downlink carrier, for example, using one or more of time division multiplexing (TDM) techniques, frequency division multiplexing (FDM) techniques, or hybrid TDM-FDM techniques. A control region (e.g., a control resource set (CORESET)) for a physical control channel may be defined by a set of symbol periods and may extend across the system bandwidth or a subset of the system bandwidth of the carrier. One or more control regions (e.g., CORESETs) may be configured for a set of the UEs **115**. For example, one or more of the UEs **115** may monitor or search control regions for control information according to one or more search space sets, and each search space set may include one or multiple control channel candidates in one or more aggregation levels arranged in a cascaded manner. An aggregation level for a control channel candidate may refer to an amount of control channel resources (e.g., control channel elements (CCEs)) associated with encoded information for a control information format having a given payload size. Search space sets may include common search space sets configured for sending control information to multiple UEs **115** and UE-specific search space sets for sending control information to a specific UE **115**.

In some examples, a network entity **105** (e.g., a base station **140**, an RU **170**) may be movable and therefore provide communication coverage for a moving coverage area **110**. In some examples, different coverage areas **110** associated with different technologies may overlap, but the different coverage areas **110** may be supported by the same network entity **105**. In some other examples, the overlapping coverage areas **110** associated with different technologies may be supported by different network entities **105**. The wireless communications system **100** may include, for example, a heterogeneous network in which different types of the network entities **105** provide coverage for various coverage areas **110** using the same or different radio access technologies.

The wireless communications system **100** may be configured to support ultra-reliable communications or low-latency communications, or various combinations thereof. For example, the wireless communications system **100** may be configured to support ultra-reliable low-latency communications (URLLC). The UEs **115** may be designed to support ultra-reliable, low-latency, or critical functions. Ultra-reliable communications may include private communication or group communication and may be supported by one or more services such as push-to-talk, video, or data. Support for ultra-reliable, low-latency functions may include prioritization of services, and such services may be used for public safety or general commercial applications. The terms ultra-reliable, low-latency, and ultra-reliable low-latency may be used interchangeably herein.

In some examples, a UE **115** may be configured to support communicating directly with other UEs **115** via a device-to-device (D2D) communication link **135** (e.g., in accordance with a peer-to-peer (P2P), D2D, or sidelink protocol). In some examples, one or more UEs **115** of a group that are performing D2D communications may be within the coverage area **110** of a network entity **105** (e.g., a base station **140**, an RU **170**), which may support aspects of such D2D communications being configured by (e.g., scheduled by) the network entity **105**. In some examples, one or more UEs **115** of such a group may be outside the coverage area **110** of a network entity **105** or may be otherwise unable to or not configured to receive transmissions from a network entity **105**. In some examples, groups of the UEs **115** communicating via D2D communications may support a one-to-many (1:M) system in which each UE **115** transmits to each of the other UEs **115** in the group. In some examples, a network entity **105** may facilitate the scheduling of resources for D2D communications. In some other examples, D2D communications may be carried out between the UEs **115** without an involvement of a network entity **105**.

The core network **130** may provide user authentication, access authorization, tracking, Internet Protocol (IP) connectivity, and other access, routing, or mobility functions. The core network **130** may be an evolved packet core (EPC) or 5G core (5GC), which may include at least one control plane entity that manages access and mobility (e.g., a mobility management entity (MIME), an access and mobility management function (AMF)) and at least one user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a Packet Data Network (PDN) gateway (P-GW), or a user plane function (UPF)). The control plane entity may manage non-access stratum (NAS) functions such as mobility, authentication, and bearer management for the UEs **115** served by the network entities **105** (e.g., base stations **140**) associated with the core network **130**. User IP packets may be transferred through the user plane entity, which may provide IP address allocation as well as other functions. The user plane entity may be connected to IP services **150** for one or more network operators. The IP services **150** may include access to the Internet, Intranet(s), an IP Multimedia Subsystem (IMS), or a Packet-Switched Streaming Service.

The wireless communications system **100** may operate using one or more frequency bands, which may be in the range of 300 megahertz (MHz) to 300 gigahertz (GHz). Generally, the region from 300 MHz to 3 GHz is known as the ultra-high frequency (UHF) region or decimeter band because the wavelengths range from approximately one decimeter to one meter in length. UHF waves may be blocked or redirected by buildings and environmental features, which may be referred to as clusters, but the waves may penetrate structures sufficiently for a macro cell to provide service to the UEs **115** located indoors. Communications using UHF waves may be associated with smaller antennas and shorter ranges (e.g., less than 100 kilometers) compared to communications using the smaller frequencies and longer waves of the high frequency (HF) or very high frequency (VHF) portion of the spectrum below 300 MHz.

The wireless communications system **100** may utilize both licensed and unlicensed RF spectrum bands. For example, the wireless communications system **100** may employ License Assisted Access (LAA), LTE-Unlicensed (LTE-U) radio access technology, or NR technology using an unlicensed band such as the 5 GHz industrial, scientific, and medical (ISM) band. While operating using unlicensed RF spectrum bands, devices such as the network entities **105** and the UEs **115** may employ carrier sensing for collision detection and avoidance. In some examples, operations using unlicensed bands may be based on a carrier aggregation configuration in conjunction with component carriers operating using a licensed band (e.g., LAA). Operations

using unlicensed spectrum may include downlink transmissions, uplink transmissions, P2P transmissions, or D2D transmissions, among other examples.

A network entity **105** (e.g., a base station **140**, an RU **170**) or a UE **115** may be equipped with multiple antennas, which may be used to employ techniques such as transmit diversity, receive diversity, multiple-input multiple-output (MIMO) communications, or beamforming. The antennas of a network entity **105** or a UE **115** may be located within one or more antenna arrays or antenna panels, which may support MIMO operations or transmit or receive beamforming. For example, one or more base station antennas or antenna arrays may be co-located at an antenna assembly, such as an antenna tower. In some examples, antennas or antenna arrays associated with a network entity **105** may be located at diverse geographic locations. A network entity **105** may include an antenna array with a set of rows and columns of antenna ports that the network entity **105** may use to support beamforming of communications with a UE **115**. Likewise, a UE **115** may include one or more antenna arrays that may support various MIMO or beamforming operations. Additionally, or alternatively, an antenna panel may support RF beamforming for a signal transmitted via an antenna port.

Beamforming, which may also be referred to as spatial filtering, directional transmission, or directional reception, is a signal processing technique that may be used at a transmitting device or a receiving device (e.g., a network entity **105**, a UE **115**) to shape or steer an antenna beam (e.g., a transmit beam, a receive beam) along a spatial path between the transmitting device and the receiving device. Beamforming may be achieved by combining the signals communicated via antenna elements of an antenna array such that some signals propagating along particular orientations with respect to an antenna array experience constructive interference while others experience destructive interference. The adjustment of signals communicated via the antenna elements may include a transmitting device or a receiving device applying amplitude offsets, phase offsets, or both to signals carried via the antenna elements associated with the device. The adjustments associated with each of the antenna elements may be defined by a beamforming weight set associated with a particular orientation (e.g., with respect to the antenna array of the transmitting device or receiving device, or with respect to some other orientation).

In some examples of the wireless communications system **100**, the network entity **105** may communicate with the UE **115** via one or more channels. In such cases, the network entity **105** may communicate with the UE **115** via a channel that may experience flat fading (e.g., a flat channel or an almost flat channel), such that signals transmitted via the flat channel may experience the same amplitude and phase fading. A flat channel may occur due to the frequency allocation for the channel being smaller than the coherent bandwidth of the channel. Additionally, the flat channel may be due to LOS communications, where the coherent bandwidth is infinite, rendering the frequency allocation smaller than the coherent bandwidth.

In some cases, the network entity **105** may estimate channel statistics, such as delay spread, Doppler spread, and signal-to-noise ratio (SNR) based on one or more signals (e.g., DMRSs or TRSs) transmitted from the UE **115**. For example, the network entity **105** may estimate the Doppler spread of a channel based on measuring the empirical correlation between two or more DMRSs in different orthogonal frequency division multiplexed (OFDM) symbols of the uplink channel (e.g., physical uplink shared channel (PUSCH)). However, if the network entity **105** receives the DMRSs via a flat channel, the network entity **105** may not be able to estimate the Doppler spread correctly (e.g., due to a lack of statistics between the DMRSs). For example, if the amplitude and phase of the frequency components vary in the channel (e.g., non-flat channel), the network entity **105** may be able to estimate the Doppler spread due to differences in the DMRSs received in various OFDM symbols. But, in cases of a flat channel, the network entity **105** may not be able to estimate the Doppler spread due to similar amplitude and phase fading over the channel. Further, in some cases of flat channels, the phase of the DMRSs may change between OFDM symbols. In such cases, the network entity **105** or the UE **115** may not be able to distinguish whether the phase difference between DMRSs is due to flat fading of the channel or due to a Doppler shift of a LOS channel. Therefore, when communicating on a flat channel, the network entity **105** may not be able to determine whether there is a Doppler shift or Doppler spread occurring in the channel, thereby introducing errors in channel estimations, increasing latency, and degrading user experience.

In order for the network entity **105** to determine the cause of a flat channel and improve accuracy in channel estimations, the network entity **105** may request a frequency correction report from the UE **115** to assist in channel estimation of a flat channel. For example, the UE **115** may receive from the network entity **105**, a request to report frequency corrections implemented at the UE **115**. For example, the UE **115** may monitor for one or more DMRSs, TRSs, or both. To receive the DMRSs or TRSs, the UE **115** may perform frequency corrections (e.g., adjust one or more timing and frequency parameters at the UE **115**). The UE **115** may perform the frequency corrections prior to transmitting uplink signaling to the network entity **105**. In some instances, the uplink signaling may be based on the frequency corrections made to receive the DMRSs or TRSs. Additionally, the UE **115** may transmit a report indicating the frequency corrections to the network entity **105**. In some examples, the network entity **105** may receive the uplink signaling via a flat channel. In such cases, the network entity **105** may use the received frequency corrections to perform the channel estimations on the flat channel, thereby improving performance when encountering a flat channel (e.g., when the frequency allocation of a channel is smaller than the coherent bandwidth of the channel), increasing channel estimation accuracy, and improving user experience.

FIG. **2** illustrates an example of a wireless communications system **200** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The wireless communications system **200** may implement or be implemented by aspects of wireless communications system **100** as described with reference to FIG. **1**. For example, the wireless communications system **200** may include a UE **115**-*a* and a network entity **105**-*a*, which may be examples of the UE **115** and the network entity **105** as described herein with reference to FIG. **1**. The UE **115**-*a* and the network entity **105**-*a* may operate within a coverage area **110**-*a*, which may be an example of a coverage area **110**.

In some cases, the UE **115**-*a* may monitor for reference signals **215** from the network entity **105**-*a*. The reference signals **215** may include DMRSs, TRSs, or a combination thereof. In such cases, to successfully decode the reference signals **215**, the UE **115** may perform one or more frequency corrections (e.g., by adjusting the crystal or internal clock of the receiving chain at the UE **115**-*a*). For example, the UE **115**-*a* may continuously estimate timing and frequency

errors of a channel between the UE **115**-*a* and the network entity **105**-*a* based on the reference signals **215** (e.g., based on decoding the TRS and DMRSs received in a physical downlink shared channel (PDSCH)). Frequency errors of a channel may be caused by channel conditions, while timing errors may be caused by errors in the oscillating (XO) crystal (e.g., internal clocks) of the UE **115**-*a*. In some cases, the frequency changes due to channel conditions may be caused by a Doppler spread or a Doppler Shift. The Doppler shift may be a frequency change of the channel from a single source (e.g., single reflector), which results in slow changes to the frequency trend of a channel. The Doppler spread may be a combination of frequency changes of a channel due to one or more Doppler shifts from many reflectors having different speeds (e.g., objects in the path of communication between the network entity **105**-*a* and the UE **115**-*a*). In case of a Doppler spread, the frequency may vary in time relatively quickly even if the physical speed of the UE **115**-*a* remains unchanged. For example, an increased amount of reflectors in the communication channel between the UE **115**-*a* and the network entity **105**-*a* may cause multiple Doppler shifts (e.g., all with varying speeds) in channel. Thus, the Doppler spread of a channel may refer to one or more Doppler shifts, all with varying rates of change, occurring in the channel.

In some cases, the network entity **105**-*a* and the UE **115**-*a* may communicate via a flat channel. For example, the UE **115**-*a* may transmit one or more uplink signals via a channel where the frequency allocation for the channel is smaller than the coherent bandwidth of the channel. In such examples, the network entity **105**-*a* may receive the one or more uplink signals via the flat channel (e.g., the network entity encounters a flat channel). The network entity **105**-*a* may attempt to estimate the time correlation of the channel (e.g., the Doppler spread) empirically on two or more DMRSs of the channel (e.g., physical uplink shared channel) using Equation 1:

$$p_k = \frac{\Sigma_{i=0}^{P-1} p_i * p_{i+k}}{\sqrt{\Sigma_{i=0}^{P-k}|p_i|^2 \Sigma_{i=k}^{P}|p_i|^2 - \sigma^2}} \quad (1)$$

where k represents the time index offset between the DMRSs, p_i represents the samples from the first DMRS in resource element i, and p_{i+k} represents the samples from the second DMRS at resource element i.

However, in cases of flat fading (e.g., when the network entity **105**-*a* encounters a flat channel), the network entity **105**-*a* may not be able to estimate the time correlation accurately, as there may be no statistics due to variations in the DMRSs in a flat channel. For example, in a flat channel, the amplitude and phase fading of a signal may be similar across frequency components. In turn, the time correlation between DMRSs across multiple symbols may be similar. Thus, in cases of a flat channel, the estimation using Equation 1 may result in a value of '1' which may not represent the actual Doppler spread of the channel. Without accurate time correlation estimation, the network entity **105**-*a* may not be able to perform channel estimations accurately, resulting in decreased channel quality, increased latency, and poor user experience.

In some implementations of the wireless communications system **200**, in order to increase the accuracy of channel estimations of a flat channel, the network entity **105**-*a* may request a report of frequency corrections from the UE **115**-*a*. For example, the UE **115**-*a* may transmit a UE capability message **205** indicating that the UE **115**-*a* is capable of transmitting indication of frequency corrections to the network entity **105**-*a*. The UE capability message **205** may be included in uplink control information (UCI), a MAC control element (MAC-CE), RRC messaging, or a combination thereof. Based on receiving the UE capability message **205**, the network entity **105**-*a* may transmit a request message **210** requesting transmission of a frequency correction report **220**. The request message **210** may be included in downlink control information (DCI), RRC messaging, or a combination thereof. In some examples, the request message **210** may include one or more reporting parameters associated with reporting the frequency corrections.

For example, the one or more reporting parameters may include a periodicity at which the UE **115**-*a* is to report the frequency corrections (e.g., transmit the frequency correction report **220**), a trigger for transmitting the frequency correction report **220** (e.g., aperiodic frequency correction report), or both. In some implementations, the reporting parameters may include a threshold value configured by the network entity **105**-*a*, at which if the frequency corrections satisfy the threshold value, the UE **115**-*a* may transmit the frequency correction report **220**. Additionally, the network entity **105**-*a* may indicate to the UE **115**-*a* which DMRS or TRS (e.g., for example the last TRS or DMRS) to use when reporting the frequency corrections. For instance, the network entity **105**-*a* may indicate that the UE **115**-*a* is to report the frequency corrections associated with decoding the last (most recent) DMRS or TRS.

The network entity **105**-*a* may transmit reference signals **215**-*a*, which may include one or more DMRSs, one or more TRSs, or a both, to the UE **115**-*a* via a downlink channel (e.g., PDSCH). The UE **115**-*a* may monitor for the reference signals **215**-*a* and decode the reference signals **215**-*a* using one or more frequency corrections. In response to the request message **210**, the UE **115**-*a* may transmit uplink signaling to the network entity **105**-*a* in accordance with the one or more frequency corrections (e.g., by applying the same or similar frequency corrections to decode the DMRSs for transmission at the UE **115**-*a*). In addition to transmitting the uplink signaling, the UE **115**-*a* may transmit the frequency correction report **220**-*a* indicating the one or more frequency corrections to the network entity **105**-*a* via a PUSCH. The frequency correction report **220** may be included in UCI, MAC-CE, RRC messaging, as a payload of a PUSCH, or a combination thereof. The network entity **105**-*a* may perform channel estimations using the frequency corrections received in the frequency correction report **220**-*a*.

In some examples, the network entity **105**-*a* may compare the frequency corrections received in the frequency correction report **220**-*a* with frequency corrections performed by the network entity **105**-*a*. If the frequency corrections of the UE **115**-*a* have a relatively low correlation with those of the network entity **105**-*a*, the network entity **105**-*a* may determine that the channel is experiencing flat fading due to a Doppler spread (e.g., the frequencies of the channel are varying quickly at the UE **115**-*a*) and may assume a low time correlation between the time at the UE **115**-*a* and the time at the network entity **105**-*a* for performing channel estimations. Alternatively, if the frequency corrections of the UE **115**-*a* have a relatively high correlation with those of the network entity **105**-*a*, the network entity **105**-*a* may determine that the channel is experiencing flat fading due to a Doppler shift (e.g., the frequencies of the channel are varying slowly at the UE **115**-*a*) and assume a relatively high

time correlation between the UE **115**-*a* and the network entity **105**-*a* for performing channel estimates.

Further, the UE **115**-*a* may transmit a frequency correction report **220**-*b* according to one or more operational parameters (e.g., operational parameters indicated by the network entity **105**-*a*). For example, the UE **115**-*a* may receive reference signals **215**-*b* and decode the reference signals **215**-*b* using one or more frequency corrections. In such examples, the UE **115**-*a* may transmit the frequency correction report **220**-*b* to the network entity **105**-*a*. In some examples, the one or more operational parameters may indicate the periodicity at which the UE **115**-*a* is to transmit the frequency correction report **220**-*b*. In some examples, the one or more operational parameters may indicate the trigger at which the UE **115**-*a* is to transmit the frequency correction report. In such examples, the trigger may be based on the UE **115**-*a* receiving the reference signals **215**-*b* or one of the reference signals **215**-*b*. For example, based on receiving the reference signals **215**-*b*, the UE **115**-*a* may decode the reference signals **215**-*b* using frequency corrections and transmit the frequency correction report **220**-*b* to the network entity **105**-*a*. In some examples, the UE **115**-*a* may receive the reference signals **215**-*b* and decode the reference signals **215**-*b* using frequency corrections. In such examples, the UE **115**-*a* may determine that the frequency corrections used to decode the reference signals **215**-*b* satisfy the indicated frequency threshold. The UE **115**-*b* may transmit the frequency correction report **220**-*b* based on the frequency corrections satisfying the frequency threshold. The network entity **105**-*a* may receive the frequency correction report **220**-*b* via a PUSCH experiencing flat fading. The network entity **105**-*a* may use the indicated frequency corrections to perform channel estimations, thereby improving communication quality in channels that experience flat fading.

FIG. **3** illustrates an example of a process flow **300** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The process flow **300** may implement or be implemented by aspects of wireless communications system **100** and the wireless communications system **200** with reference to FIGS. **1** and **2**. For example, the process flow **300** may include a UE **115**-*b* and a network entity **105**-*b*, which may be examples of corresponding devices as described herein with reference to FIGS. **1** and **2**. In the following description of the process flow **300**, the operations may be performed in a different order than the order shown. Specific operations also may be left out of the process flow **300**, or other operations may be added to the process flow **300**. Further, although some operations or signaling may be shown to occur at different times for discussion purposes, these operations may actually occur at the same time.

At **305**, the UE **115**-*b* may optionally transmit to the network entity **105**-*b*, an indication of a UE capability to report one or more frequency corrections. The indication of a UE capability may be an example of a UE capability message **205** as described herein with reference to FIG. **2**.

At **310**, the UE **115**-*b* may receive, and the network entity **105**-*b* transmit, a request to report the one or more frequency corrections. The request may include an indication of one or more reporting parameters for the one or more frequency corrections. The one or more reporting parameters may indicate a periodicity of transmitting the report of the one or more frequency corrections. Additionally, the one or more reporting parameters may indicate a trigger for transmitting the report, where the trigger includes reception of one or more reference signals at the UE **115**-*b*. In some examples, the one or more reporting parameters may include a threshold value, such that if the frequency corrections at the UE **115**-*b* are greater than the indicated threshold value, the UE **115**-*b* may transmit the report the one or more frequency corrections.

At **315**, the network entity **105**-*b* may transmit a set of one or more reference signals associated with performing the one or more frequency corrections. The set of one or more reference signals may include at least one of a DMRS, a TRS, or a combination thereof. At **320**, the UE **115**-*b* may monitor for the set of one or more reference signals. For example, to monitor and decode the set of one or more reference signals, the UE **115**-*b* may perform the one or more frequency corrections.

At **325**, the UE **115**-*b* may transmit, the network entity **105**-*b*, the report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. For example, the UE **115**-*b* may transmit the report (e.g., a periodic report) according to the periodicity indicated in the reporting parameters. In some examples, the UE **115**-*b* may transmit the report (e.g., aperiodic report) based on receiving the one or more reference signals according to the trigger indicated in the one or more reporting parameters. In some examples, the UE **115**-*b* may determine that the one or more frequency corrections satisfy the indicated threshold value, where the report is transmitted based on the one or more frequency correction satisfying the indicated threshold value.

At **330**, the network entity **105**-*b*, may optionally perform channel estimations based on the report indicating the one or more frequency corrections. For example, the network entity **105**-*b* may receive the report in a channel experiencing flat fading. In such examples, the network entity **105**-*b* may determine whether a Doppler shift or a Doppler spread is affecting the channel and estimate the channel based on the one or more frequency corrections.

At **335**, the network entity **105**-*b*, may optionally transmit a second set of one or more reference signals after transmitting the set of one or more reference signals. At **340**, the UE **115**-*b*, may optionally monitor the second set of one or more reference signals, and decode the second set of one or more reference signals using a second set of frequency error corrections.

At **345**, the UE **115**-*b*, may optionally transmit a second report indicating the second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals. At **350**, the network entity **105**-*b*, may optionally perform channel estimations based on the report indicating the one or more frequency corrections and the second report indicating the second set of frequency error corrections.

FIG. **4** illustrates a block diagram **400** of a device **405** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **405** may be an example of aspects of a UE **115** as described herein. The device **405** may include a receiver **410**, a transmitter **415**, and a communications manager **420**. The device **405** may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses).

The receiver **410** may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to techniques for reporting frequency corrections). Information may be passed on to other

components of the device **405**. The receiver **410** may utilize a single antenna or a set of multiple antennas.

The transmitter **415** may provide a means for transmitting signals generated by other components of the device **405**. For example, the transmitter **415** may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to techniques for reporting frequency corrections). In some examples, the transmitter **415** may be co-located with a receiver **410** in a transceiver module. The transmitter **415** may utilize a single antenna or a set of multiple antennas.

The communications manager **420**, the receiver **410**, the transmitter **415**, or various combinations thereof or various components thereof may be examples of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **420**, the receiver **410**, the transmitter **415**, or various combinations or components thereof may support a method for performing one or more of the functions described herein.

In some examples, the communications manager **420**, the receiver **410**, the transmitter **415**, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include a processor, a digital signal processor (DSP), a central processing unit (CPU), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA) or other programmable logic device, a microcontroller, discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure. In some examples, a processor and memory coupled with the processor may be configured to perform one or more of the functions described herein (e.g., by executing, by the processor, instructions stored in the memory).

Additionally, or alternatively, in some examples, the communications manager **420**, the receiver **410**, the transmitter **415**, or various combinations or components thereof may be implemented in code (e.g., as communications management software or firmware) executed by a processor. If implemented in code executed by a processor, the functions of the communications manager **420**, the receiver **410**, the transmitter **415**, or various combinations or components thereof may be performed by a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, a microcontroller, or any combination of these or other programmable logic devices (e.g., configured as or otherwise supporting a means for performing the functions described in the present disclosure).

In some examples, the communications manager **420** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **410**, the transmitter **415**, or both. For example, the communications manager **420** may receive information from the receiver **410**, send information to the transmitter **415**, or be integrated in combination with the receiver **410**, the transmitter **415**, or both to obtain information, output information, or perform various other operations as described herein.

The communications manager **420** may support wireless communication at a UE in accordance with examples as disclosed herein. For example, the communications manager **420** may be configured as or otherwise support a means for receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The communications manager **420** may be configured as or otherwise support a means for monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The communications manager **420** may be configured as or otherwise support a means for transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

By including or configuring the communications manager **420** in accordance with examples as described herein, the device **405** (e.g., a processor controlling or otherwise coupled with the receiver **410**, the transmitter **415**, the communications manager **420**, or a combination thereof) may support techniques for a network entity to use frequency error corrections in channel estimation, which may provide for more efficient utilization of communication resources.

FIG. **5** illustrates a block diagram **500** of a device **505** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **505** may be an example of aspects of a device **405** or a UE **115** as described herein. The device **505** may include a receiver **510**, a transmitter **515**, and a communications manager **520**. The device **505** may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses).

The receiver **510** may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to techniques for reporting frequency corrections). Information may be passed on to other components of the device **505**. The receiver **510** may utilize a single antenna or a set of multiple antennas.

The transmitter **515** may provide a means for transmitting signals generated by other components of the device **505**. For example, the transmitter **515** may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to techniques for reporting frequency corrections). In some examples, the transmitter **515** may be co-located with a receiver **510** in a transceiver module. The transmitter **515** may utilize a single antenna or a set of multiple antennas.

The device **505**, or various components thereof, may be an example of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **520** may include a communications component **525**, a reference signal monitoring component **530**, a frequency corrections component **535**, or any combination thereof. The communications manager **520** may be an example of aspects of a communications manager **420** as described herein. In some examples, the communications manager **520**, or various components thereof, may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **510**, the transmitter **515**, or both. For example, the communications manager **520** may receive information from the receiver **510**, send information to the transmitter **515**, or be integrated in combination with the receiver **510**, the transmitter **515**, or both to obtain information, output information, or perform various other operations as described herein.

The communications manager **520** may support wireless communication at a UE in accordance with examples as disclosed herein. The communications component **525** may be configured as or otherwise support a means for receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The reference signal monitoring component **530** may be configured as or otherwise support a means for monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The frequency corrections component **535** may be configured as or otherwise support a means for transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

FIG. **6** illustrates a block diagram **600** of a communications manager **620** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The communications manager **620** may be an example of aspects of a communications manager **420**, a communications manager **520**, or both, as described herein. The communications manager **620**, or various components thereof, may be an example of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **620** may include a communications component **625**, a reference signal monitoring component **630**, a frequency corrections component **635**, a UE capability component **640**, a frequency corrections component **645**, or any combination thereof. Each of these components may communicate, directly or indirectly, with one another (e.g., via one or more buses).

The communications manager **620** may support wireless communication at a UE in accordance with examples as disclosed herein. The communications component **625** may be configured as or otherwise support a means for receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The reference signal monitoring component **630** may be configured as or otherwise support a means for monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The frequency corrections component **635** may be configured as or otherwise support a means for transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

In some examples, the UE capability component **640** may be configured as or otherwise support a means for transmitting, to the network entity, an indication of a UE capability to report the one or more frequency corrections, where receiving the request to report the one or more frequency corrections is based on the indication of the UE capability.

In some examples, the reference signal monitoring component **630** may be configured as or otherwise support a means for monitoring a second set of one or more reference signals after monitoring the set of one or more reference signals. In some examples, the frequency corrections component **645** may be configured as or otherwise support a means for transmitting, to the network entity, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

In some examples, the report and the second report are periodic reports. In some examples, the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections. In some examples, the report and the second report are aperiodic reports.

In some examples, the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections. In some examples, the trigger includes reception of the set of one or more reference signals at the UE. In some examples, the set of one or more reference signals includes at least one of a DMRS, a TRS, or a combination thereof.

FIG. **7** illustrates a diagram of a system **700** including a device **705** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **705** may be an example of or include the components of a device **405**, a device **505**, or a UE **115** as described herein. The device **705** may communicate (e.g., wirelessly) with one or more network entities **105**, one or more UEs **115**, or any combination thereof. The device **705** may include components for bi-directional voice and data communications including components for transmitting and receiving communications, such as a communications manager **720**, an input/output (I/O) controller **710**, a transceiver **715**, an antenna **725**, a memory **730**, code **735**, and a processor **740**. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more buses (e.g., a bus **745**).

The I/O controller **710** may manage input and output signals for the device **705**. The I/O controller **710** may also manage peripherals not integrated into the device **705**. In some cases, the I/O controller **710** may represent a physical connection or port to an external peripheral. In some cases, the I/O controller **710** may utilize an operating system such as iOS®, ANDROID®, MS-DOS®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. Additionally or alternatively, the I/O controller **710** may represent or interact with a modem, a keyboard, a mouse, a touchscreen, or a similar device. In some cases, the I/O controller **710** may be implemented as part of a processor, such as the processor **740**. In some cases, a user may interact with the device **705** via the I/O controller **710** or via hardware components controlled by the I/O controller **710**.

In some cases, the device **705** may include a single antenna **725**. However, in some other cases, the device **705** may have more than one antenna **725**, which may be capable of concurrently transmitting or receiving multiple wireless transmissions. The transceiver **715** may communicate bi-directionally, via the one or more antennas **725**, wired, or wireless links as described herein. For example, the transceiver **715** may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver **715** may also include a modem to modulate the packets, to provide the modulated packets to one or more antennas **725** for transmission, and to demodulate packets received from the one or more antennas **725**. The transceiver **715**, or the transceiver **715** and one or more antennas **725**, may be an example of a transmitter **415**, a transmitter **515**, a receiver **410**, a receiver **510**, or any combination thereof or component thereof, as described herein.

The memory **730** may include random access memory (RAM) and read-only memory (ROM). The memory **730** may store computer-readable, computer-executable code **735** including instructions that, when executed by the processor **740**, cause the device **705** to perform various functions described herein. The code **735** may be stored in a

non-transitory computer-readable medium such as system memory or another type of memory. In some cases, the code **735** may not be directly executable by the processor **740** but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some cases, the memory **730** may contain, among other things, a basic I/O system (BIOS) which may control basic hardware or software operation such as the interaction with peripheral components or devices.

The processor **740** may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some cases, the processor **740** may be configured to operate a memory array using a memory controller. In some other cases, a memory controller may be integrated into the processor **740**. The processor **740** may be configured to execute computer-readable instructions stored in a memory (e.g., the memory **730**) to cause the device **705** to perform various functions (e.g., functions or tasks supporting techniques for reporting frequency corrections). For example, the device **705** or a component of the device **705** may include a processor **740** and memory **730** coupled with or to the processor **740**, the processor **740** and memory **730** configured to perform various functions described herein.

The communications manager **720** may support wireless communication at a UE in accordance with examples as disclosed herein. For example, the communications manager **720** may be configured as or otherwise support a means for receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The communications manager **720** may be configured as or otherwise support a means for monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The communications manager **720** may be configured as or otherwise support a means for transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

By including or configuring the communications manager **720** in accordance with examples as described herein, the device **705** may support techniques for a network entity to use frequency error corrections in channel estimation, which may provide for improved communication reliability, reduced latency, and improved user experience related to reduced processing, reduced power consumption.

In some examples, the communications manager **720** may be configured to perform various operations (e.g., receiving, monitoring, transmitting) using or otherwise in cooperation with the transceiver **715**, the one or more antennas **725**, or any combination thereof. Although the communications manager **720** is illustrated as a separate component, in some examples, one or more functions described with reference to the communications manager **720** may be supported by or performed by the processor **740**, the memory **730**, the code **735**, or any combination thereof. For example, the code **735** may include instructions executable by the processor **740** to cause the device **705** to perform various aspects of techniques for reporting frequency corrections as described herein, or the processor **740** and the memory **730** may be otherwise configured to perform or support such operations.

FIG. **8** illustrates a block diagram **800** of a device **805** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **805** may be an example of aspects of a network entity **105** as described herein. The device **805** may include a receiver **810**, a transmitter **815**, and a communications manager **820**. The device **805** may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses).

The receiver **810** may provide a means for obtaining (e.g., receiving, determining, identifying) information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). Information may be passed on to other components of the device **805**. In some examples, the receiver **810** may support obtaining information by receiving signals via one or more antennas. Additionally, or alternatively, the receiver **810** may support obtaining information by receiving signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof.

The transmitter **815** may provide a means for outputting (e.g., transmitting, providing, conveying, sending) information generated by other components of the device **805**. For example, the transmitter **815** may output information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). In some examples, the transmitter **815** may support outputting information by transmitting signals via one or more antennas. Additionally, or alternatively, the transmitter **815** may support outputting information by transmitting signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof. In some examples, the transmitter **815** and the receiver **810** may be co-located in a transceiver, which may include or be coupled with a modem.

The communications manager **820**, the receiver **810**, the transmitter **815**, or various combinations thereof or various components thereof may be examples of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **820**, the receiver **810**, the transmitter **815**, or various combinations or components thereof may support a method for performing one or more of the functions described herein.

In some examples, the communications manager **820**, the receiver **810**, the transmitter **815**, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include a processor, a DSP, a CPU, an ASIC, an FPGA or other programmable logic device, a microcontroller, discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure. In some examples, a processor and memory coupled with the processor may be configured to perform one or more of the functions described herein (e.g., by executing, by the processor, instructions stored in the memory).

Additionally, or alternatively, in some examples, the communications manager **820**, the receiver **810**, the transmitter **815**, or various combinations or components thereof may be implemented in code (e.g., as communications management software or firmware) executed by a processor. If implemented in code executed by a processor, the functions of the communications manager **820**, the receiver **810**, the trans-

mitter **815**, or various combinations or components thereof may be performed by a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, a microcontroller, or any combination of these or other programmable logic devices (e.g., configured as or otherwise supporting a means for performing the functions described in the present disclosure).

In some examples, the communications manager **820** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **810**, the transmitter **815**, or both. For example, the communications manager **820** may receive information from the receiver **810**, send information to the transmitter **815**, or be integrated in combination with the receiver **810**, the transmitter **815**, or both to obtain information, output information, or perform various other operations as described herein.

The communications manager **820** may support wireless communication at a network entity in accordance with examples as disclosed herein. For example, the communications manager **820** may be configured as or otherwise support a means for transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The communications manager **820** may be configured as or otherwise support a means for transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The communications manager **820** may be configured as or otherwise support a means for receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

By including or configuring the communications manager **820** in accordance with examples as described herein, the device **805** (e.g., a processor controlling or otherwise coupled with the receiver **810**, the transmitter **815**, the communications manager **820**, or a combination thereof) may support techniques for a network entity to use frequency error corrections in channel estimation, which may provide for more efficient utilization of communication resources.

FIG. **9** illustrates a block diagram **900** of a device **905** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **905** may be an example of aspects of a device **805** or a network entity **105** as described herein. The device **905** may include a receiver **910**, a transmitter **915**, and a communications manager **920**. The device **905** may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses).

The receiver **910** may provide a means for obtaining (e.g., receiving, determining, identifying) information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). Information may be passed on to other components of the device **905**. In some examples, the receiver **910** may support obtaining information by receiving signals via one or more antennas. Additionally, or alternatively, the receiver **910** may support obtaining information by receiving signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof.

The transmitter **915** may provide a means for outputting (e.g., transmitting, providing, conveying, sending) information generated by other components of the device **905**. For example, the transmitter **915** may output information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). In some examples, the transmitter **915** may support outputting information by transmitting signals via one or more antennas. Additionally, or alternatively, the transmitter **915** may support outputting information by transmitting signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof. In some examples, the transmitter **915** and the receiver **910** may be co-located in a transceiver, which may include or be coupled with a modem.

The device **905**, or various components thereof, may be an example of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **920** may include a communications component **925**, a reference signal component **930**, a frequency corrections component **935**, or any combination thereof. The communications manager **920** may be an example of aspects of a communications manager **820** as described herein. In some examples, the communications manager **920**, or various components thereof, may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **910**, the transmitter **915**, or both. For example, the communications manager **920** may receive information from the receiver **910**, send information to the transmitter **915**, or be integrated in combination with the receiver **910**, the transmitter **915**, or both to obtain information, output information, or perform various other operations as described herein.

The communications manager **920** may support wireless communication at a network entity in accordance with examples as disclosed herein. The communications component **925** may be configured as or otherwise support a means for transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The reference signal component **930** may be configured as or otherwise support a means for transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The frequency corrections component **935** may be configured as or otherwise support a means for receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

FIG. **10** illustrates a block diagram **1000** of a communications manager **1020** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The communications manager **1020** may be an example of aspects of a communications manager **820**, a communications manager **920**, or both, as described herein. The communications manager **1020**, or various components thereof, may be an example of means for performing various aspects of techniques for reporting frequency corrections as described herein. For example, the communications manager **1020** may include a communications component **1025**, a reference signal component **1030**, a frequency corrections component **1035**, a UE capability component **1040**, a channel estimation component **1045**, or any combination thereof. Each of these components may communicate, directly or indirectly, with one another (e.g.,

via one or more buses) which may include communications within a protocol layer of a protocol stack, communications associated with a logical channel of a protocol stack (e.g., between protocol layers of a protocol stack, within a device, component, or virtualized component associated with a network entity **105**, between devices, components, or virtualized components associated with a network entity **105**), or any combination thereof.

The communications manager **1020** may support wireless communication at a network entity in accordance with examples as disclosed herein. The communications component **1025** may be configured as or otherwise support a means for transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The reference signal component **1030** may be configured as or otherwise support a means for transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The frequency corrections component **1035** may be configured as or otherwise support a means for receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

In some examples, the UE capability component **1040** may be configured as or otherwise support a means for receiving, from the UE, an indication of a UE capability to report the one or more frequency corrections, where transmitting the request to report the one or more frequency corrections is based on the indication of the UE capability.

In some examples, the reference signal component **1030** may be configured as or otherwise support a means for transmitting a second set of one or more reference signals after transmitting the set of one or more reference signals. In some examples, the frequency corrections component **1035** may be configured as or otherwise support a means for receiving, from the UE, a second report indicating the second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

In some examples, the channel estimation component **1045** may be configured as or otherwise support a means for performing a channel estimation for the UE based on the report indicating the one or more frequency corrections and the second report indicating the second set of frequency error corrections.

In some examples, the report and the second report are periodic reports.

In some examples, the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections. In some examples, the report and the second report are aperiodic reports. In some examples, the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections.

In some examples, the trigger includes reception of the set of one or more reference signals at the UE. In some examples, the set of one or more reference signals includes at least one of a DMRS, a TRS, or a combination thereof.

FIG. **11** illustrates a diagram of a system **1100** including a device **1105** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The device **1105** may be an example of or include the components of a device **805**, a device **905**, or a network entity **105** as described herein. The device **1105** may communicate with one or more network entities **105**, one or more UEs **115**, or any combination thereof, which may include communications over one or more wired interfaces, over one or more wireless interfaces, or any combination thereof. The device **1105** may include components that support outputting and obtaining communications, such as a communications manager **1120**, a transceiver **1110**, an antenna **1115**, a memory **1125**, code **1130**, and a processor **1135**. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more buses (e.g., a bus **1140**).

The transceiver **1110** may support bi-directional communications via wired links, wireless links, or both as described herein. In some examples, the transceiver **1110** may include a wired transceiver and may communicate bi-directionally with another wired transceiver. Additionally, or alternatively, in some examples, the transceiver **1110** may include a wireless transceiver and may communicate bi-directionally with another wireless transceiver. In some examples, the device **1105** may include one or more antennas **1115**, which may be capable of transmitting or receiving wireless transmissions (e.g., concurrently). The transceiver **1110** may also include a modem to modulate signals, to provide the modulated signals for transmission (e.g., by one or more antennas **1115**, by a wired transmitter), to receive modulated signals (e.g., from one or more antennas **1115**, from a wired receiver), and to demodulate signals. In some implementations, the transceiver **1110** may include one or more interfaces, such as one or more interfaces coupled with the one or more antennas **1115** that are configured to support various receiving or obtaining operations, or one or more interfaces coupled with the one or more antennas **1115** that are configured to support various transmitting or outputting operations, or a combination thereof. In some implementations, the transceiver **1110** may include or be configured for coupling with one or more processors or memory components that are operable to perform or support operations based on received or obtained information or signals, or to generate information or other signals for transmission or other outputting, or any combination thereof. In some implementations, the transceiver **1110**, or the transceiver **1110** and the one or more antennas **1115**, or the transceiver **1110** and the one or more antennas **1115** and one or more processors or memory components (for example, the processor **1135**, or the memory **1125**, or both), may be included in a chip or chip assembly that is installed in the device **1105**. In some examples, the transceiver may be operable to support communications via one or more communications links (e.g., a communication link **125**, a backhaul communication link **120**, a midhaul communication link **162**, a fronthaul communication link **168**).

The memory **1125** may include RAM and ROM. The memory **1125** may store computer-readable, computer-executable code **1130** including instructions that, when executed by the processor **1135**, cause the device **1105** to perform various functions described herein. The code **1130** may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some cases, the code **1130** may not be directly executable by the processor **1135** but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some cases, the memory **1125** may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices.

The processor **1135** may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, an ASIC, a CPU, an FPGA, a microcontroller, a programmable logic

device, discrete gate or transistor logic, a discrete hardware component, or any combination thereof). In some cases, the processor **1135** may be configured to operate a memory array using a memory controller. In some other cases, a memory controller may be integrated into the processor **1135**. The processor **1135** may be configured to execute computer-readable instructions stored in a memory (e.g., the memory **1125**) to cause the device **1105** to perform various functions (e.g., functions or tasks supporting techniques for reporting frequency corrections). For example, the device **1105** or a component of the device **1105** may include a processor **1135** and memory **1125** coupled with the processor **1135**, the processor **1135** and memory **1125** configured to perform various functions described herein. The processor **1135** may be an example of a cloud-computing platform (e.g., one or more physical nodes and supporting software such as operating systems, virtual machines, or container instances) that may host the functions (e.g., by executing code **1130**) to perform the functions of the device **1105**. The processor **1135** may be any one or more suitable processors capable of executing scripts or instructions of one or more software programs stored in the device **1105** (such as within the memory **1125**). In some implementations, the processor **1135** may be a component of a processing system. A processing system may generally refer to a system or series of machines or components that receives inputs and processes the inputs to produce a set of outputs (which may be passed to other systems or components of, for example, the device **1105**). For example, a processing system of the device **1105** may refer to a system including the various other components or subcomponents of the device **1105**, such as the processor **1135**, or the transceiver **1110**, or the communications manager **1120**, or other components or combinations of components of the device **1105**. The processing system of the device **1105** may interface with other components of the device **1105**, and may process information received from other components (such as inputs or signals) or output information to other components. For example, a chip or modem of the device **1105** may include a processing system and one or more interfaces to output information, or to obtain information, or both. The one or more interfaces may be implemented as or otherwise include a first interface configured to output information and a second interface configured to obtain information, or a same interface configured to output information and to obtain information, among other implementations. In some implementations, the one or more interfaces may refer to an interface between the processing system of the chip or modem and a transmitter, such that the device **1105** may transmit information output from the chip or modem. Additionally, or alternatively, in some implementations, the one or more interfaces may refer to an interface between the processing system of the chip or modem and a receiver, such that the device **1105** may obtain information or signal inputs, and the information may be passed to the processing system. A person having ordinary skill in the art will readily recognize that a first interface also may obtain information or signal inputs, and a second interface also may output information or signal outputs.

In some examples, a bus **1140** may support communications of (e.g., within) a protocol layer of a protocol stack. In some examples, a bus **1140** may support communications associated with a logical channel of a protocol stack (e.g., between protocol layers of a protocol stack), which may include communications performed within a component of the device **1105**, or between different components of the device **1105** that may be co-located or located in different locations (e.g., where the device **1105** may refer to a system in which one or more of the communications manager **1120**, the transceiver **1110**, the memory **1125**, the code **1130**, and the processor **1135** may be located in one of the different components or divided between different components).

In some examples, the communications manager **1120** may manage aspects of communications with a core network **130** (e.g., via one or more wired or wireless backhaul links). For example, the communications manager **1120** may manage the transfer of data communications for client devices, such as one or more UEs **115**. In some examples, the communications manager **1120** may manage communications with other network entities **105**, and may include a controller or scheduler for controlling communications with UEs **115** in cooperation with other network entities **105**. In some examples, the communications manager **1120** may support an X2 interface within an LTE/LTE-A wireless communications network technology to provide communication between network entities **105**.

The communications manager **1120** may support wireless communication at a network entity in accordance with examples as disclosed herein. For example, the communications manager **1120** may be configured as or otherwise support a means for transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The communications manager **1120** may be configured as or otherwise support a means for transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The communications manager **1120** may be configured as or otherwise support a means for receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

By including or configuring the communications manager **1120** in accordance with examples as described herein, the device **1105** may support techniques for a network entity to improve channel estimation accuracy, which may improve communication reliability, reduce latency and improve user experience.

In some examples, the communications manager **1120** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the transceiver **1110**, the one or more antennas **1115** (e.g., where applicable), or any combination thereof. Although the communications manager **1120** is illustrated as a separate component, in some examples, one or more functions described with reference to the communications manager **1120** may be supported by or performed by the transceiver **1110**, the processor **1135**, the memory **1125**, the code **1130**, or any combination thereof. For example, the code **1130** may include instructions executable by the processor **1135** to cause the device **1105** to perform various aspects of techniques for reporting frequency corrections as described herein, or the processor **1135** and the memory **1125** may be otherwise configured to perform or support such operations.

FIG. **12** illustrates a flowchart illustrating a method **1200** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The operations of the method **1200** may be implemented by a UE or its components as described herein. For example, the operations of the method **1200** may be performed by a UE **115** as described with reference to FIGS. **1** through **7**. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to

perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

At **1205**, the method may include receiving, from a network entity, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The operations of **1205** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1205** may be performed by a communications component **625** as described with reference to FIG. **6**.

At **1210**, the method may include monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The operations of **1210** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1210** may be performed by a reference signal monitoring component **630** as described with reference to FIG. **6**.

At **1215**, the method may include transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. The operations of **1215** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1215** may be performed by a frequency corrections component **635** as described with reference to FIG. **6**.

FIG. **13** illustrates a flowchart illustrating a method **1300** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The operations of the method **1300** may be implemented by a UE or its components as described herein. For example, the operations of the method **1300** may be performed by a UE **115** as described with reference to FIGS. **1** through **7**. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

At **1305**, the method may include transmitting, to the network entity, an indication of a UE capability to report one or more frequency corrections. The operations of **1305** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1305** may be performed by a UE capability component **640** as described with reference to FIG. **6**.

At **1310**, the method may include receiving, from a network entity, a request to report the one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The operations of **1310** may be performed in accordance with examples as disclosed herein.

In some examples, aspects of the operations of **1310** may be performed by a communications component **625** as described with reference to FIG. **6**.

At **1315**, the method may include monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The operations of **1315** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1315** may be performed by a reference signal monitoring component **630** as described with reference to FIG. **6**.

At **1320**, the method may include transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. The operations of **1320** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1320** may be performed by a frequency corrections component **635** as described with reference to FIG. **6**.

FIG. **14** illustrates a flowchart illustrating a method **1400** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The operations of the method **1400** may be implemented by a network entity or its components as described herein. For example, the operations of the method **1400** may be performed by a network entity as described with reference to FIGS. **1** through **3** and **8** through **11**. In some examples, a network entity may execute a set of instructions to control the functional elements of the network entity to perform the described functions. Additionally, or alternatively, the network entity may perform aspects of the described functions using special-purpose hardware.

At **1405**, the method may include transmitting, to a UE, a request to report one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The operations of **1405** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1405** may be performed by a communications component **1025** as described with reference to FIG. **10**.

At **1410**, the method may include transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The operations of **1410** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1410** may be performed by a reference signal component **1030** as described with reference to FIG. **10**.

At **1415**, the method may include receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. The operations of **1415** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1415** may be performed by a frequency corrections component **1035** as described with reference to FIG. **10**.

FIG. **15** illustrates a flowchart illustrating a method **1500** that supports techniques for reporting frequency corrections in accordance with one or more aspects of the present disclosure. The operations of the method **1500** may be implemented by a network entity or its components as described herein. For example, the operations of the method **1500** may be performed by a network entity as described with reference to FIGS. **1** through **3** and **8** through **11**. In some examples, a network entity may execute a set of instructions to control the functional elements of the network entity to perform the described functions. Additionally, or alternatively, the network entity may perform aspects of the described functions using special-purpose hardware.

At **1505**, the method may include receiving, from the UE, an indication of a UE capability to report one or more frequency corrections. The operations of **1505** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1505** may be performed by a UE capability component **1040** as described with reference to FIG. **10**.

At **1510**, the method may include transmitting, to a UE, a request to report the one or more frequency corrections, the request including an indication of one or more reporting parameters for the one or more frequency corrections. The operations of **1510** may be performed in accordance with

examples as disclosed herein. In some examples, aspects of the operations of **1510** may be performed by a communications component **1025** as described with reference to FIG. **10**.

At **1515**, the method may include transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE. The operations of **1515** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1515** may be performed by a reference signal component **1030** as described with reference to FIG. **10**.

At **1520**, the method may include receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters. The operations of **1520** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1520** may be performed by a frequency corrections component **1035** as described with reference to FIG. **10**.

The following provides an overview of aspects of the present disclosure:

Aspect 1: A method for wireless communication at a UE, comprising: receiving, from a network entity, a request to report one or more frequency corrections, the request comprising an indication of one or more reporting parameters for the one or more frequency corrections; monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE; and transmitting, to the network entity, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Aspect 2: The method of aspect 1, further comprising: transmitting, to the network entity, an indication of a UE capability to report the one or more frequency corrections, wherein receiving the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

Aspect 3: The method of any of aspects 1 through 2, further comprising: monitoring a second set of one or more reference signals after monitoring the set of one or more reference signals; transmitting, to the network entity, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

Aspect 4: The method of aspect 3, wherein the report and the second report are periodic reports.

Aspect 5: The method of aspect 4, wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

Aspect 6: The method of any of aspects 3, wherein the report and the second report are aperiodic reports.

Aspect 7: The method of any of aspects 1 through 6, wherein the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections.

Aspect 8: The method of aspect 7, wherein the trigger comprises reception of the set of one or more reference signals at the UE.

Aspect 9: The method of any of aspects 1 through 8, wherein the set of one or more reference signals comprises at least one of a DMRS, a TRS, or a combination thereof.

Aspect 10: A method for wireless communication at a network entity, comprising: transmitting, to a UE, a request to report one or more frequency corrections, the request comprising an indication of one or more reporting parameters for the one or more frequency corrections; transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE; and receiving, from the UE, a report indicating the one or more frequency corrections in accordance with the one or more reporting parameters.

Aspect 11: The method of aspect 10, further comprising: receiving, from the UE, an indication of a UE capability to report the one or more frequency corrections, wherein transmitting the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

Aspect 12: The method of any of aspects 10 through 11, further comprising: transmitting a second set of one or more reference signals after transmitting the set of one or more reference signals; receiving, from the UE, a second report indicating the second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals.

Aspect 13: The method of aspect 12, further comprising: performing a channel estimation for the UE based at least in part on the report indicating the one or more frequency corrections and the second report indicating the second set of frequency error corrections.

Aspect 14: The method of any of aspects 12 through 13, wherein the report and the second report are periodic reports.

Aspect 15: The method of aspect 14, wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

Aspect 16: The method of any of aspects 12, wherein the report and the second report are aperiodic reports.

Aspect 17: The method of any of aspects 10 through 16, wherein the one or more reporting parameters indicate a trigger for transmitting the report indicating the one or more frequency corrections.

Aspect 18: The method of aspect 17, wherein the trigger comprises reception of the set of one or more reference signals at the UE.

Aspect 19: The method of any of aspects 10 through 18, wherein the set of one or more reference signals comprises at least one of a DMRS, a TRS, or a combination thereof.

Aspect 20: An apparatus for wireless communication at a UE, comprising a processor; memory coupled with the processor; and instructions stored in the memory and executable by the processor to cause the apparatus to perform a method of any of aspects 1 through 9.

Aspect 21: An apparatus for wireless communication at a UE, comprising at least one means for performing a method of any of aspects 1 through 9.

Aspect 22: A non-transitory computer-readable medium storing code for wireless communication at a UE, the code comprising instructions executable by a processor to perform a method of any of aspects 1 through 9.

Aspect 23: An apparatus for wireless communication at a network entity, comprising a processor; memory coupled with the processor; and instructions stored in the memory and executable by the processor to cause the apparatus to perform a method of any of aspects 10 through 19.

Aspect 24: An apparatus for wireless communication at a network entity, comprising at least one means for performing a method of any of aspects 10 through 19.

Aspect 25: A non-transitory computer-readable medium storing code for wireless communication at a network entity, the code comprising instructions executable by a processor to perform a method of any of aspects 10 through 19.

It should be noted that the methods described herein describe possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

Although aspects of an LTE, LTE-A, LTE-A Pro, or NR system may be described for purposes of example, and LTE, LTE-A, LTE-A Pro, or NR terminology may be used in much of the description, the techniques described herein are applicable beyond LTE, LTE-A, LTE-A Pro, or NR networks. For example, the described techniques may be applicable to various other wireless communications systems such as Ultra Mobile Broadband (UMB), Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM, as well as other systems and radio technologies not explicitly mentioned herein.

Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

The various illustrative blocks and components described in connection with the disclosure herein may be implemented or performed using a general-purpose processor, a DSP, an ASIC, a CPU, an FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor but, in the alternative, the processor may be any processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices (e.g., a combination of a DSP and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration).

The functions described herein may be implemented using hardware, software executed by a processor, firmware, or any combination thereof. If implemented using software executed by a processor, the functions may be stored as or transmitted using one or more instructions or code of a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described herein may be implemented using software executed by a processor, hardware, firmware, hardwiring, or combinations of any of these. Features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations.

Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one location to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer. By way of example, and not limitation, non-transitory computer-readable media may include RAM, ROM, electrically erasable programmable ROM (EEPROM), flash memory, compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other non-transitory medium that may be used to carry or store desired program code means in the form of instructions or data structures and that may be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of computer-readable medium. Disk and disc, as used herein, include CD, laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc. Disks may reproduce data magnetically, and discs may reproduce data optically using lasers. Combinations of the above are also included within the scope of computer-readable media.

As used herein, including in the claims, "or" as used in a list of items (e.g., a list of items prefaced by a phrase such as "at least one of" or "one or more of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on."

The term "determine" or "determining" encompasses a variety of actions and, therefore, "determining" can include calculating, computing, processing, deriving, investigating, looking up (such as via looking up in a table, a database or another data structure), ascertaining and the like. Also, "determining" can include receiving (e.g., receiving information), accessing (e.g., accessing data stored in memory) and the like. Also, "determining" can include resolving, obtaining, selecting, choosing, establishing, and other such similar actions.

In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label, or other subsequent reference label.

The description set forth herein, in connection with the appended drawings, describes example configurations and does not represent all the examples that may be implemented or that are within the scope of the claims. The term "example" used herein means "serving as an example, instance, or illustration," and not "preferred" or "advantageous over other examples." The detailed description includes specific details for the purpose of providing an understanding of the described techniques. These techniques, however, may be practiced without these specific details. In some instances, known structures and devices are shown in block diagram form in order to avoid obscuring the concepts of the described examples.

The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the

disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

What is claimed is:

1. A user equipment (UE), comprising:

one or more memories storing processor-executable code; and

one or more processors coupled with the one or more memories and operable to execute the code to cause the UE to:

receive, from a network entity, a request to report one or more frequency corrections, the request further comprising an indication of one or more reporting parameters that trigger the UE to transmit a report indicating the one or more frequency corrections performed at the UE during a channel estimation procedure;

monitor a set of one or more reference signals associated with performing the one or more frequency corrections at the UE during the channel estimation procedure;

transmit, to the network entity, the report indicating the one or more frequency corrections performed at the UE during the channel estimation procedure in accordance with the one or more reporting parameters;

monitor a second set of one or more reference signals after monitoring the set of one or more reference signals;

transmit, to the network entity, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals;

wherein the report and the second report are periodic reports; and

wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

2. The UE of claim **1**, wherein the one or more processors are further operable to execute the code to cause the UE to:

transmit, to the network entity, an indication of a UE capability to report the one or more frequency corrections, wherein receiving the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

3. The UE of claim **1**, wherein:

the report and the second report are aperiodic reports.

4. The UE of claim **1**, wherein the trigger comprises reception of the set of one or more reference signals at the UE.

5. The UE of claim **1**, wherein the set of one or more reference signals comprises at least one of a demodulation reference signal, a tracking reference signal, or a combination thereof.

6. A network entity, comprising:

one or more memories storing processor-executable code; and

one or more processors coupled with the one or more memories and operable to execute the code to cause the network entity to:

transmit, to a user equipment (UE), a request to report one or more frequency corrections, the request further comprising an indication of one or more reporting parameters that trigger the UE to transmit a report indicating the one or more frequency corrections performed at the UE during a channel estimation procedure;

transmit a set of one or more reference signals associated with performing the one or more frequency corrections at the UE during the channel estimation procedure;

receive, from the UE, the report indicating the one or more frequency corrections performed at the UE during the channel estimation procedure in accordance with the one or more reporting parameters;

transmit a second set of one or more reference signals after transmitting the set of one or more reference signals;

receive, from the UE, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals;

wherein the report and the second report are periodic reports; and

wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

7. The network entity of claim **6**, wherein the one or more processors are further operable to execute the code to cause the network entity to:

receive, from the UE, an indication of a UE capability to report the one or more frequency corrections, wherein transmitting the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

8. The network entity of claim **6**, wherein the one or more processors are further operable to execute the code to cause the network entity to:

perform a second channel estimation for the UE based at least in part on the report indicating the one or more frequency corrections and the second report indicating the second set of frequency error corrections.

9. The network entity of claim **6**, wherein:

the report and the second report are aperiodic reports.

10. The network entity of claim **6**, wherein the trigger comprises reception of the set of one or more reference signals at the UE.

11. The network entity of claim **6**, wherein the set of one or more reference signals comprises at least one of a demodulation reference signal, a tracking reference signal, or a combination thereof.

12. A method for wireless communication at a user equipment (UE), comprising:

receiving, from a network entity, a request to report one or more frequency corrections, the request further comprising an indication of one or more reporting parameters that trigger the UE to transmit a report indicating the one or more frequency corrections performed at the UE during a channel estimation procedure;

monitoring a set of one or more reference signals associated with performing the one or more frequency corrections at the UE during the channel estimation procedure;

transmitting, to the network entity, the report indicating the one or more frequency corrections performed at the UE during the channel estimation procedure in accordance with the one or more reporting parameters;

monitoring a second set of one or more reference signals after monitoring the set of one or more reference signals;

transmitting, to the network entity, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals;

wherein the report and the second report are periodic reports; and

wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

13. The method of claim **12**, further comprising:

transmitting, to the network entity, an indication of a UE capability to report the one or more frequency corrections, wherein receiving the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

14. The method of claim **12**, wherein the report and the second report are aperiodic reports.

15. The method of claim **12**, wherein the trigger comprises reception of the set of one or more reference signals at the UE.

16. The method of claim **12**, wherein the set of one or more reference signals comprises at least one of a demodulation reference signal, a tracking reference signal, or a combination thereof.

17. A method for wireless communication at a network entity, comprising:

transmitting, to a user equipment (UE), a request to report one or more frequency corrections, the request further comprising an indication of one or more reporting parameters that trigger the UE to transmit a report indicating the one or more frequency corrections performed at the UE during a channel estimation procedure;

transmitting a set of one or more reference signals associated with performing the one or more frequency corrections at the UE during the channel estimation procedure;

receiving, from the UE, the report indicating the one or more frequency corrections performed at the UE during the channel estimation procedure in accordance with the one or more reporting parameters;

transmitting a second set of one or more reference signals after transmitting the set of one or more reference signals;

receiving, from the UE, a second report indicating a second set of frequency error corrections in accordance with the one or more reporting parameters and the second set of one or more reference signals;

wherein the report and the second report are periodic reports; and

wherein the one or more reporting parameters indicate a periodicity of transmitting the report indicating the one or more frequency corrections.

18. The method of claim **17**, further comprising:

receiving, from the UE, an indication of a UE capability to report the one or more frequency corrections, wherein transmitting the request to report the one or more frequency corrections is based at least in part on the indication of the UE capability.

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