METHODS AND SYSTEMS FOR PROVIDING ENHANCED POSITION LOCATION IN WIRELESS COMMUNICATIONS

BACKGROUND

Field

[0001] This disclosure relates generally to wireless communications. More specifically, embodiments disclosed herein relate to providing improved time-of-arrival measurement and enhanced position location in wireless communication systems.

Background

[0002] Wireless communication systems are widely deployed to provide various types of communications (such as voice and data) to multiple users. Such systems may be based on code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), or other multiple access techniques. A wireless communication system may be designed to implement one or more standards, such as IS-95, cdma2000, IS-856, W-CDMA, TD-SCDMA, and other standards.

[0003] Presence detection and location-based services have long been sought after in wireless communications. In addition to supporting emergency services (e.g., E911 calls), wireless operators are striving to provide a wide range of new applications targeted for the everyday consumer and enterprise user, such as child locators, turn-by-turn navigation, directory services, voice concierge, roadside assistance, and many others. A challenge hence lies in providing accurate and reliable position location to enable such applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 illustrates an embodiment of a wireless communication system;

[0005] FIG. 2 illustrates an embodiment of forward link slot structure in an IS-856 type system;

[0006] FIGs. 3A-3B illustrate embodiments of forward link slot structure for reference transmission;

[0007] FIG. 4A illustrates an embodiment of forward link structure in an IS-95 type system;

[0008] FIG. 4B illustrates an embodiment of forward link structure for reference transmission;

[0009] FIG. 5 illustrates a flow diagram of a process, which may be used to implement some disclosed embodiments;

[0010] FIG. 6 illustrates a flow diagram of a process, which may be used to implement some disclosed embodiments;

[0011] FIG. 7 illustrates a flow diagram of a process, which may be used to implement some disclosed embodiments;

[0012] FIG. 8 illustrates a flow diagram of a process, which may be used to implement some disclosed embodiments;

[0013] FIG. 9 illustrates a block diagram of an apparatus, in which some disclosed embodiments may be implemented; and

[0014] FIG. 10 illustrates a block diagram of an apparatus, in which some disclosed embodiments may be implemented.

DETAILED DESCRIPTION

[0015] Embodiments disclosed herein relate to methods and systems for providing enhanced position location in wireless communication systems.

[0016] An access point (AP) disclosed herein may include and/or implement functions of a base-station transceiver system (BTS), an access network transceiver (ANT), a modem pool transceiver (MPT), or a Node B (e.g., in a W-CDMA type system), etc. A cell may refer to a coverage area serviced by an AP. A cell may further include one or more sectors. For simplicity and clarity, the term "sector" may be used herein to refer a cell, or a section of a cell, serviced by an AP. Further, an access network controller (ANC) may refer to the portion of a communication system configured to interface with a core network (e.g., a packet data network) and route data packets between access terminals (ATs) and the core network, perform various radio access and link maintenance functions (such as soft handoff), control radio transmitters and receivers, and so on. An ANC may include and/or implement the functions of a base station

controller (BSC), such as found in a 2nd, 3rd, or 4th generation wireless network. An ANC and one or more APs may constitute part of an access network (AN).

[0017] An access terminal (AT) described herein may refer to various types of devices, including (but not limited to) a wireless phone, a cellular phone, a laptop computer, a multimedia wireless device, a wireless communication personal computer (PC) card, a personal digital assistant (PDA), an external or internal modem, etc. An AT may be any data device that communicates through a wireless channel and/or through a wired channel (e.g., by way of fiber optic or coaxial cables). An AT may have various names, such as access unit, access node, subscriber unit, mobile station, mobile device, mobile unit, mobile phone, mobile, remote station, remote terminal, remote unit, user device, user equipment, handheld device, etc. Different ATs may be incorporated into a system. ATs may be mobile or stationary, and may be dispersed throughout a communication system. An AT may communicate with one or more APs on a forward link and/or a reverse link at a given moment. The forward link (or downlink) refers to transmission from an AP to an AT. The reverse link (or uplink) refers to transmission from the AT to the AP.

[0018] Locating a person or an object wirelessly may be achieved in a number of ways. Time-of-arrival (TOA) measurement, which uses time it takes for a signal to travel as an indirect method of calculating distance, is commonly involved in a number of network-based methods. For example, in some wireless networks, position location services require TOA measurement of the pilot signal (e.g., the earliest path of the pilot).

[0019] FIG. 1 illustrates a wireless communication system 100 configured to support a number of users, in which various disclosed embodiments and aspects may be implemented, as further described below. By way of example, system 100 provides communication for a number of cells 102, including cells 102a-102g, with each cell being serviced by a corresponding AP 104 (such as APs 104a-104g). Each cell may be further divided into one or more sectors. Various ATs 106, including ATs 106a-106k, are dispersed throughout the system. Each AT 106 may communicate with one or more APs 104 on a forward link and/or a reverse link at a given moment, depending upon whether the AT is active and whether it is in soft handoff, for example.

[0020] In FIG. 1, a solid line with an arrow may indicate information (e.g., data) transmission from an AP to an AT. A broken line with an arrow may indicate that the

AT is receiving the pilot and other signaling/reference signals, but no data transmission, from the AP, as further described below. For clarity and simplicity, the reverse link communication is not explicitly shown in FIG. 1.

[0021] In a high rate packet data (HRPD) system (e.g., as specified in "cdma2000 High Rate Packet Data Air Interface Specification," 3GPP2 C.S0024-A, Version 2, July 2005, referred to as "1xEV-DO" (or "IS-856") herein), for example, transmission on forward link is partitioned into a sequence of frames; each frame is further divided into time slots (e.g., 16 slots each with a duration of 1.667 msec); and each slot includes a plurality of time-division-multiplexed channels.

[0022] By way of example, FIG. 2 illustrates an embodiment of a forward link slot structure 200, such as employed in a 1xEV-DO type system. Time slot 200 is divided into two half-slots, with each half-slot having the following channel assignments: pilot channel 210, forward medium access control (MAC) channel 220, and forward traffic (or control) channel 230. Pilot channel 210 carries the pilot signal (also commonly termed as the pilot) used by an AT (such as AT 106 in FIG. 1) for initial acquisition, phase recovery, timing recovery, radio combining, as well as estimating the channel conditions on forward link (e.g., by way of the signal-to-noise-and-interference (SINR) measurement). MAC channel 220 sets forth the procedures used to receive and transmit over the physical layer (which provides the channel structure, frequency, power output, modulation, encoding specifications for forward and reverse links). Traffic channel 230 may carry information or data (e.g., by way of physical layer packets), e.g., unicast data specific to a particular AT (or user), or broadcast/multicast data to a group of users (e.g., as specified in "cdma2000 High Rate Broadcast-Multicast Packet Data Air Interface Specification," 3GPP2 C.S0054-0, Version 2.0, July 2005, referred to as "BCMCS specification" herein). Traffic channel 230 may also be used to carry control messages. Further, pilot channel 210, MAC channel 220, and traffic channel 230 are time-division-multiplexed within time slot 200. When there is no traffic on traffic channel 230, an idle slot including pilot channel 210 and MAC channel 220 may be sent. Transmission of idle slots serves to decrease interference to other cells on forward link.

[0023] As illustrated in FIG. 2, pilot channel 210 is transmitted in discrete bursts (as opposed to being continuous in time), hence having limited power. In some systems, for example, pilot channel 210 may comprise 96 chips of a particular digital pattern

(e.g., all zeros). MAC channel 220 may comprise 64 chips, and each half-slot may comprise 1024 chips. Thus, only a small fraction (e.g., 96/1024) of the available forward link power is allotted to the pilot channel in such systems. As a result, TOA measurement based on such pilot channel may be susceptible to errors (e.g., particularly when the forward link channel conditions are poor), hence, compromising the accuracy and reliability of associated position location. A need therefore exists for a strong and clear signal to assist position location.

[0024] Embodiments disclosed herein relate to methods and systems for providing improved TOA measurement and enhanced position location in wireless communication systems.

[0025] In an embodiment, an AP may replace normal information (e.g., data) transmission by a "known" transmission (termed "reference transmission" herein) at a predetermined time known to ATs in sectors serviced by the AP. The ATs may use the received reference transmission to assist or facilitate position location (e.g., TOA and/or other position-location measurements). The AP may also send a reference transmission on demand, e.g., in response to a request from an AT (which may be in need for a location-based service).

[0026] In some embodiments, the reference transmission may include a time slot having a pilot signal and a reference signal in a time-division-multiplexed format. In other embodiments, the reference transmission may include a time slot having a pilot signal and a reference in a code-division-multiplexed format. The reference signal may be similar or substantially identical to the pilot, such that the entire time slot is nearly filled with the pilot, thereby providing a strong signal for TOA and other position-location measurements. The reference signal may also be different from the pilot, e.g., configured to assist the pilot in position location. The ensuing description provides further embodiments and examples.

[0027] The term "reference signal" disclosed herein may include any signal that is unmodulated (e.g., carrying no information or data) and known to a receiving AT. For example, the reference signal may comprise a digital pattern (e.g., a sequence of symbols) that is "known" in advance to the receiving AT, whereby the AT does not need to decode the reference signal. The reference may carry a unique sector ID (e.g., spread with a pseudorandom (PN) code with a unique offset specific to the sector). The

reference signal may be transmitted at substantially the maximum power available to the sector (or "full sector power"). In some embodiments, the reference signal may be a spread-spectrum or other wideband signal (e.g., to occupy the entire traffic channel). A "reference transmission" disclosed herein may refer to a forward link transmission including a reference signal. Further, the term "position-location measurement" may broadly refer to a measurement associated with position location, including (but not limited to) TOA, time difference of arrival (TDOA), angle of arrival (AOA), advanced forward link trilateration (AFLT), enhanced observed time difference (EOTD), and others.

[0028] Various aspects, features, and embodiments are described in further detail below.

[0029] FIG. 3A illustrates an embodiment of a reference transmission including a time slot 300, which may be used to implement some disclosed embodiments. Time slot 300 is shown in two half-slots, each having pilot channel 310, MAC channel 320, and traffic channel 330 in a time-division-multiplexed format. Pilot channel 310 carries the pilot. Pilot channel 310 and MAC channel 320 may for example be substantially as described above with respect to the embodiment of FIG. 2. Traffic channel 330 carries a reference signal, in lieu of data.

[0030] In some embodiments, the reference signal may be similar or substantially identical to the pilot, as time slot 350 of FIG. 3B illustrates. As a result, the entire slot 350 is nearly filled with the pilot, as graphically illustrated by the hatched area in the figure, and the full power of the entire sector may be substantially devoted to the pilot transmission during this time period. This strong pilot allows the receiving ATs to carry out more accurate and reliable TOA and other position-location measurements. The timing and signaling for such "pilot slot" may for example be according to the broadcast/multicast channel structure in a 1xEV-DO type system (e.g., as specified in the BCMCS specification). Further, implementation of such "pilot slot" imposes minimal changes to the existing network infrastructures and devices.

[0031] In other embodiments, the reference signal may be different from the pilot. The timing and signaling for the reference transmission may for example be according to the broadcast/multicast channel structure in a 1xEV-DO type system (e.g., as specified in the BCMCS specification). In one embodiment, for example, the pilot may comprise a

sequence of symbols having all zeros (0's), whereas the reference signal may comprise a sequence of symbols having all ones (1's). In another embodiment, the pilot may comprise the pilot symbols used in a 1xEV-DO type system, whereas the reference signal may comprise the pilot symbols used in an IS-95 type system. In yet another embodiment, the pilot may comprise a particular sequence of symbols, while the reference signal may comprise the sequence configured in reverse. In an alternative embodiment, a known data packet may be transmitted as the reference signal, e.g., using the broadcast/multicast channel structure and signaling in a 1xEV-DO type system (e.g., as specified in the BCMCS specification). A receiving AT may use this reference signal to search for the (weaker) pilot, estimate TOA (and/or perform other position-location measurements), and report back the measured information.

[0032] In an embodiment, the reference transmission may be carried out by an AP according to a predetermined schedule (e.g., on a regular or periodic basis), so that at known times, ATs in the corresponding sectors may be prepared to perform TOA and/or other position-location measurements, and report back the measured information.

[0033] In an embodiment, an AP may carry out the reference transmission on demand, e.g., upon receiving a request from an AT (which may be in need for a location-based service).

[0034] In an embodiment, an AP may make use of idle slots for reference transmission (e.g., filing an idle slot substantially with the pilot, such as described above with respect to the embodiment of FIG. 3B), so as to make efficient use of the network resources. For example, the signaling associated with such time slot may indicate to a receiving AT the reference signal carried by the traffic channel, so that the AT may accordingly perform TOA and/or other position-location measurements.

[0035] FIGs. 3A-3B provide some examples of transmitting a reference signal along the pilot in a time-division-multiplexed format. In other systems (e.g., as specified in "Physical Layer Standard for cdma2000 Spectrum Systems," 3GPP2 C.S0002-D, Version 2.0, September 2005, referred to as "CDMA2000 1x" herein, or as specified in "Mobile Station-Base Station Compatibility Standard for Wideband Spread Spectrum Cellular Systems," ANSI/TIA/EIA-95-B-99, referred to as "IS-95" herein), a reference signal may be transmitted along with the pilot in a code-division-multiplexed format, such as described below.

[0036] FIG. 4A illustrates an embodiment of forward link structure in the form of sector power usage vs. time, such as in an IS-95 or CDMA2000 1x type system. Forward link channels, including pilot channel 410, sync channel 420, paging channel 430, and traffic channels 440, are transmitted in a code-division-multiplexed format, each with a certain fraction of the total sector power. For example, pilot channel 410 may be allotted approximately 15-20% of the maximum sector power, denoted as $P_{TX}(max)$. To augment the pilot (e.g., for position location purposes), some or all of the power allotted to traffic channels 440 may be used to transmit a reference signal (in lieu of information transmission) in a specific period of time, such as illustrated in FIG. 4B below.

[0037] For illustration and clarity, FIG. 4B depicts an embodiment in which the power allotted to traffic channels 440 may be substantially devoted to transmit a reference signal 460 in a time slot 450. For example, such may occur in situations where an AP sends a reference transmission to the corresponding ATs according to a predetermined schedule (e.g., on a regular or periodical basis), so that at known times, the ATs may be prepared to perform position-location measurements and report back the measured information. In some embodiments, the reference signal may be similar or substantially identical to the pilot; as a result, the entire time slot 450 may be nearly filled with the pilot, thereby providing a strong signal for position-location measurements. In other embodiments, the reference may also be different from the pilot, such as described above.

[0038] In alternative embodiments, a fraction of the power allotted to traffic channels 440 may be used to transmit reference signal 460 in time slot 450. For example, such may occur in situations where an AP carries out a reference transmission on demand, e.g., in response to request(s) from one or more ATs in the corresponding sectors (which may be in need for position-location services).

[0039] In addition to replacing information transmission by a reference transmission according to a predetermined schedule or on demand (such as described above), a portion of the control channel (e.g., the preamble), or other existing (or known) signals, may be used to assist the pilot in position location. For example, in some systems, the control channel may be transmitted on a regular or periodic basis. The preamble of the control channel may be known to a receiving AT (e.g., after the initial set-up), and

therefore, used to assist the pilot in position location (such as in a manner described above with respect to the reference signal).

[0040] FIG. 5 illustrates a flow diagram of a process 500, which may be used to implement some disclosed embodiments (such as described above). Step 510 generates a pilot signal and a reference signal, the reference signal comprising a sequence of symbols known to an access terminal. Step 520 transmits the pilot signal and the reference signal in a time slot.

[0041] In process 500, the pilot signal and the reference signal may be transmitted in a time-division-multiplexed format or code-division-multiplexed format, such as described above. In some embodiments, the reference signal may be similar or substantially identical to the pilot signal. In other embodiments, the reference signal may be different from the pilot signal, e.g., configured to assist the pilot signal in position location (e.g., TOA and other position-location measurements), such as described above. Further, in a multi-carrier wireless communication system, the time slot may be transmitted on a subset (e.g., some, all, or any combination) of carriers.

[0042] FIG. 6 illustrates a flow diagram of a process 600, which may be used to implement some disclosed embodiments (such as described above). Process 600 starts at step 610. Step 620 determines (e.g., based on a predetermined schedule) whether it is time for carrying out a reference transmission to ATs in sectors serviced by an AP. If the outcome of step 620 is "YES," step 630 follows and generates a pilot signal and a reference signal. Step 640 transmits the pilot signal and the reference signal in a time slot (e.g., in a time-division-multiplexed or code-division-multiplexed format, such as described above). Subsequently, process 600 returns to step 620.

[0043] In process 600, if the outcome of step 620 is "NO," step 650 follows and determines if there is a request for a location-based service from an AT. If the outcome of step 650 is "YES," process 600 returns to step 630. If the outcome of step 650 is "NO," step 660 follows and proceeds with information (e.g., data) transmission. Process 600 subsequently returns to step 620.

[0044] FIG. 7 illustrates a flow diagram of a process 700, which may be used to implement some disclosed embodiments. Step 710 receives a pilot signal and a reference signal in a time slot (e.g., in a time-division-multiplexed or code-division-

multiplexed format, such as described above). Step 730 performs a position-location measurement based on the pilot signal and the reference signal.

[0045] Process 700 may further include searching for the pilot signal. In some instances, the reference signal may be similar or substantially identical to the pilot signal, effectively providing a strong pilot for position-location measurements. In other instances, a receiving AT may use the reference signal to search for the (weaker) pilot, estimate TOA (and/or perform other position-location measurements), and report back the measured information.

[0046] FIG. 8 illustrates a flow diagram of a process 800, which may be used to implement some disclosed embodiments (such as described above). Process 800 starts at step 810. Step 820 receives a time slot having a pilot channel and a reference channel (e.g., in a time-division-multiplexed format, such as described above), the pilot channel carrying a pilot signal. Step 830 determines if the traffic channel carries a reference signal. If the outcome of step 830 is "YES," step 840 follows and performs a position-location (e.g., TOA) measurement based on the pilot signal and the reference signal. Process 800 subsequently returns to step 820. If the outcome of step 830 is "NO," step 850 follows and proceeds with the traffic channel (e.g., decode the data packets carried by the traffic channel). Process 800 subsequently returns to step 820.

[0047] FIG. 9 shows a block diagram of an apparatus 900, which may be used to implement some disclosed embodiments (such as described above). By way of example, apparatus 900 may include a reference-generating unit (or module) 910 configured to generate a pilot signal and a reference signal, wherein the reference signal comprising a sequence of known symbols (e.g., to one or more receiving ATs); and a transmitting unit 930 configured to transmit the pilot signal and the reference signal in a time slot. In a multi-carrier system, transmitting unit 930 may be further configured to transmit the time slot on a subset of carriers.

[0048] Apparatus 900 may also include a multiplexing unit 920 configured to multiplex the pilot signal and the reference signal into the time slot (e.g., in a time-division-multiplexed or code-division-multiplexed format, such as described above). Apparatus 900 may further include a processing unit (or controller) 940 configured to control and/or coordinate the operations of various units.

[0049] Apparatus 900 may be implemented in an AP (e.g., AP 106 in FIG. 1), or other network infrastructure elements.

[0050] FIG. 10 illustrates a block diagram of an apparatus 1000, which may also be used to implements some disclosed embodiments (such as described above). By way of example, apparatus 1000 may include a receiving unit 1010 configured to receive a pilot signal and a reference signal in a time slot (e.g., in a time-division-multiplexed or code-division-multiplexed format, such as described above); and a measurement unit 1030 configured to perform a position-location (e.g., TOA) measurement based on the pilot signal and the reference signal. Apparatus 1000 may further include a searching unit 1020, configured to search for the pilot signal. Apparatus 1000 may also include a processing unit (or controller) 1040, configured to control and/or coordinate the operations of various units

[0051] Apparatus 1000 may be implemented in an AT, or other communication devices.

[0052] Embodiments disclosed herein (such as described above) provide some embodiments for enhancing position location in wireless communications. There are other embodiments and implementations.

[0053] Embodiments disclosed herein may be applied to a multi-carrier wireless communication system. For example, a reference transmission may be sent on some, all, or any combination of carriers.

[0054] Various units/modules in FIGs. 9-10 and other embodiments may be implemented in hardware, software, firmware, or a combination thereof. In a hardware implementation, various units may be implemented within one or more application specific integrated circuits (ASIC), digital signal processors (DSP), digital signal processing devices (DSPDs), field programmable gate arrays (FPGA), processors, microprocessors, controllers, microcontrollers, programmable logic devices (PLD), other electronic units, or any combination thereof. In a software implementation, various units may be implemented with modules (e.g., procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in a memory unit and executed by a processor (or a processing unit). The memory unit may be implemented within the processor or external to the processor, in which case it can be communicatively coupled to the processor via various means known in the art.

[0055] Those of skill in the art would understand that information and signals 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 above description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0056] Those of skill would further appreciate that the various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the embodiments disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present invention.

[0057] The various illustrative logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (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 conventional 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, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0058] The steps of a method or algorithm described in connection with the embodiments disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module

may reside in random access memory (RAM), flash memory, read only memory (ROM), electrically programmable ROM (EPROM), electrically erasable programmable ROM (EEPROM), registers, hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. An exemplary storage medium is coupled to the processor such the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. The processor and the storage medium may reside in an ASIC. The ASIC may reside in an AT. In the alternative, the processor and the storage medium may reside as discrete components in an AT.

[0059] The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

[0060] **WHAT IS CLAIMED IS:**

CLAIMS

1. A method for wireless communications, comprising:

generating a pilot signal and a reference signal, the reference signal comprising a sequence of symbols known to an access terminal; and

transmitting the pilot signal and the reference signal in a time slot.

2. The method of claim 1, further comprising time-division-multiplexing the pilot signal and the reference signal in the time slot.

3. The method of claim 2, wherein the time slot includes a pilot channel time-division-multiplexed with a traffic channel, the pilot channel carrying the pilot signal and the traffic channel carrying the reference signal.

4. The method of claim 3, wherein the reference signal substantially occupies the traffic channel.

5. The method of claim 2, further comprising transmitting the reference signal at a maximum power.

6. The method of claim 1, further comprising code-division-multiplexing the pilot signal and the reference signal in the time slot

7. The method of claim 1, wherein the reference signal is substantially identical to the pilot signal.

8. The method of claim 1, wherein the reference signal includes a sector ID.

9. The method of claim 1, wherein the reference signal is transmitted in accordance with a predetermined schedule.

10. The method of claim 1, wherein the reference signal is transmitted in response to a request from the access terminal.

11. The method of claim 1, further comprising transmitting the time slot on a subset of multiple carriers.

12. A communication structure transmitted on a carrier wave, comprising:

a pilot channel carrying a pilot signal; and

a traffic channel carrying a reference signal, the reference signal comprising a sequence of symbols known to an access terminal.

13. The communication structure of claim 12, wherein the pilot channel is time-division-multiplexed with the traffic channel.

14. The communication structure of claim 12, wherein the reference signal is substantially identical to the pilot signal.

15. The communication structure of claim 12, wherein the reference signal includes a sector identifier.

16. An apparatus adapted for wireless communications, comprising:

means for generating a pilot signal and a reference signal, the reference signal comprising a sequence of symbols known to an access terminal; and

means for transmitting the pilot signal and the reference signal in a time slot.

17. The apparatus of claim 16, further comprising means for multiplexing the pilot signal and the reference signal in the time slot in one of a time-division-multiplexed format and a code-division-multiplexed format.

18. The apparatus of claim 16, wherein the time slot includes a pilot channel and a traffic channel, wherein the pilot channel carries the pilot signal and the traffic channel carries the reference signal.

19. The apparatus of claim 16, wherein the reference signal is transmitted in accordance with a predetermined schedule.

20. The apparatus of claim 16, wherein the reference signal is transmitted in response to a request from the access terminal.

21. The apparatus of claim 16, wherein the means for transmitting is further configured to transmit the time slot on a subset of multiple carriers.

22. A method for wireless communications, comprising:

receiving a pilot signal and a reference signal in a time slot, the reference signal comprising a sequence of symbols known to a receiver; and

performing a position-location measurement based on the pilot signal and the reference signal.

23. The method of claim 22, wherein the time slot includes a pilot channel time-division-multiplexed with a traffic channel, the pilot channel carrying the pilot signal and the traffic channel carrying the reference signal.

24. The method of claim 23, further comprising identifying the reference signal carried by the traffic channel.

25. The method of claim 22, wherein the pilot signal and the reference signal are code-division-multiplexed in the time slot.

26. The method of claim 22, further comprises searching for the pilot signal.

27. The method of claim 26, wherein the searching for the pilot signal is based on the received reference signal.

28. The method of claim 22, wherein the reference signal is substantially identical to the pilot signal.

29. An apparatus for wireless communications, comprising:

means for receiving a time slot having a pilot channel and a traffic channel; and

means for performing a position-location measurement based on the pilot signal and the reference signal.

30. The apparatus of claim 29, further comprising means for searching for the pilot signal.

31. A method for wireless communications, comprising:

receiving a pilot signal and a portion of a control channel; and

performing a position-location measurement based on the pilot signal and the portion of the control channel.

32. The method of claim 31, wherein the portion of the control channel includes a preamble.