

sequence 606 with appropriate training sequence 605 selected at step 654 to determine the correlation quality 508 of uplink beam 130. In particular, correlation module 400 may execute at least a portion of correlation algorithm 602 to determine the correlation quality 508 of uplink beam 130. The method may then return to step 652 to receive another signal sequence 606 via uplink beam 130. In one embodiment, a new correlation quality 508 is determined for the signal sequence 606 received via uplink beam 130 in each time slot during an ongoing call. It should be understood that the method illustrated in FIG. 21 may be used to determine a correlation quality 508 for each uplink beam 130.

[0240] The method of FIG. 21 may be used to decrease processing time since the signal sequence 606 in each uplink beam 130 is correlated with one known training sequence 608 rather than each known training sequence 608. In particular, the use of relevant signaling information 180 to determine one or more appropriate training sequences 605 decreases the processing time required to determine the correlation quality 508 of each uplink beam 130.

[0241] FIGS. 22 and 23 illustrate a system and method for determining whether to select the beam selection determinations made by fast decision beam selection module 408 or smart decision beam selection module 410 in accordance with an embodiment of the present inventions.

[0242] FIG. 22 illustrates a system for determining whether to use fast decision beam selection module 408, smart decision beam selection module 410, or neither for selecting an appropriate one or more narrow beams 34 for receiving signals from and/or transmitting signals to one or more mobile station 15. Processing module 62 comprises fast decision beam selection module 408, smart decision beam selection module 410, and fast/smart selection module 416. As discussed above with reference to FIG. 12, fast decision beam selection module 408 is operable to determine fast decision beam selections 440 substantially in real time based on the current frame of signals received via one or more beams. And as discussed above with reference to FIGS. 16 and 17, smart decision beam selection module 410 is operable to determine smart decision beam selections 620, such as uplink and downlink smart decision beam selections 506 and 507, based on both current and previous frames of such signals. In some embodiments, smart antenna apparatus 16 switches to the smart decision beam selections 620 determined by smart decision beam selection module 410 in the frame following the current frame. Thus, in some embodiments, there may be a delay of one or more frames between the frame at which uplink signals are received by smart antenna apparatus 16 and the frame at which smart antenna apparatus 16 switches to the appropriate smart decision beam selections 620. In addition, in some embodiments, since smart decision beam selection module 410 determines smart decision beam selections based on both current and previous frames of signal data, smart decision beam selections 620 are only determined when smart decision beam selection module 410 has information regarding previous frames of the signals being analyzed.

[0243] Fast/smart selection module 416 is generally operable to determine whether to select beam selection determinations made by fast decision beam selection module 408, smart decision beam selection module 410, or neither for one or more time slots or frames. Generally, fast decision

beam selections 440 are used during the initiation of a call or other communication to or from a mobile station 15 since smart antenna apparatus 16 has little or no prior data regarding the mobile link connection with mobile station 15, and smart decision beam selections 620 are used after the call has been established and smart antenna apparatus 16 has data regarding the location of mobile station 15 from signals received in prior frames. In some embodiments, fast decision beam selections 440 are used for signals received from mobile stations 15 in a random access channel (RACH), such as access request signals. In addition, fast decision beam selections 440 may be used for one or more of initial frames after mobile station 15 has switched to the traffic channel which is used during at least a first portion of the call. In one embodiment, fast decision beam selections 440 are used for RACH signals and for the first time slot after mobile station 15 switches to a traffic channel to support a call, and smart decision beam selections 620 are used for subsequent time slots during the call.

[0244] Fast/smart selection module 416 may be a discrete module operable to perform the determine whether to use fast decision beam selections 440 or smart decision beam selections 620 as discussed above, or it may be a distributed system distributed among any number of components of smart antenna apparatus 16, such as fast decision beam selection module 408, smart decision beam selection module 410. For example, in one embodiment, smart decision beam selection module 410 is operable to determine whether to use the smart decision beam selection 620 or the fast decision beam selection 440 for a particular time slot.

[0245] The beam selected by fast/smart selection module 416, which is generally a fast decision beam selection 440 or a smart decision beam selection 620, may be referred to as a fast/smart beam selection 622. In some embodiments, fast/smart beam selection 622 is the beam selected for one of the frequencies used by base station transceiver 24. Thus, smart antenna apparatus 16 may determine a fast/smart beam selection 622 for each frequency used by base station transceiver 24. In some embodiments, fast/smart beam selections 622 are further processed by central processing unit 118 before being selected as transmitting beam selection 124 or receiving beam selection 126.

[0246] FIG. 23 illustrates a method using fast decision beam selections 440 and smart decision beam selections 620 in smart antenna system 14. At step 630, a random access (RACH) burst is communicated by a mobile station 15 and received by receiving system 100 in a particular time slot of a current frame. The burst is communicated to processing module 62 at step 632. At step 634, fast decision beam selection module 408 determines a fast decision beam selection 440 substantially in real time based on the burst received in the particular time slot of the current frame. At step 636, the burst is communicated to base station transceiver 24 via the beam selected as fast decision beam selection 440.

[0247] At step 638, mobile station 15 switches to a traffic channel for communicating voice or other data signals during the call. In particular, mobile station 15 may switch to a particular traffic channel assigned by base station system 12. At step 640, mobile station 15 transmits traffic signals in a first frame of the assigned traffic channel, which are received by receiving system 100 and communicated to