CELL SEARCH METHOD IN CDMA CAPABLE OF CARRYING OUT A CELL SEARCH PROCESSING AT A HIGH SPEED

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This application is a division of application Ser. No. 09/661,464, filed Sep. 13, 2000, now pending, and based on Japanese Patent Application No. 11-260461, filed Sep. 14, 1999, by Koichi Tamura. This application claims only subject matter disclosed in the parent application and therefore presents no new matter.

BACKGROUND OF THE INVENTION

This invention relates to a cell search method in a code division multiple access (CDMA) system.

In the manner which is well known in the art, a code division multiple access (CDMA) system is one of multiple access system techniques in a cellular system (mobile communication system) such as a mobile telephone system and a portable telephone system used when a plurality of stations simultaneously carry out communications by using the same frequency band. On the other hand, a frequency division multiple access (FDMA) system, a time division multiple access (TDMA) system, and so on, are used as other multiple access system techniques other than the CDMA system. In comparison with the other multiple access techniques, the CDMA system is advantageous in that it is possible to achieve a high frequency utilization efficiency and is possible to accommodate more users.

The CDMA system carries out multiple access by a spread spectrum communication which transmits a spectrum of an information signal by spreading the spectrum of the information signal into a wide band sufficiently wider than an original information band width.

The cellular system (mobile communications system) generally comprises a mobile communications terminal (which is also called a "mobile station") MS and a plurality of base stations BS each of which attends to a cell. The CDMA system is adopted as an access system for third-generation mobile communication systems. In the CDMA system, the mobile station MS carries out, as a handover in a case where the mobile station MS moves between a moving source cell and a moving destination cell, a soft handover which combines an electric wave signal from a base station BS in the moving source cell with another electric wave signal from another base station BS in the moving destination cell. In order to perform the soft handover, the mobile station MS must carry out a cell search which searches the base station BS in the moving destination cell. That is, the "cell search" or a "cell search processing" means that the mobile station MS detects a connected cell.

In addition, in the CDMA system, in order to increase a capacity by suppressing and preventing transmission and reception of interference signals, sectorization (a directivity control technique) for dividing each cell into a plurality of sectors is carried out.

Although each base station always transmits a radio signal via a radio channel called a perch channel, the radio signal on the perch channel is transmitted using a peculiar spreading code in each cell (base station). Accordingly, each base station informs, using the perch channel, the mobile station of a spreading code used in peripheral cells of its own station. The mobile station periodically measures line quality (signal-to-interference ratio (SIR)) of a radio channel (the perch channel of the peripheral cells) which uses the informed spreading code and informs a network of a measured result. Such an operation is called a peripheral cell search. As a result, the network can determine that to which cell the mobile station is moving.

In prior art, the above-mentioned cell search processing is a processing which is necessary to the mobile station MS on starting communication. That is, if the spreading code and a spreading timing are not established by the cell search, the mobile station MS cannot carry out a demodulation processing. As a result, rapidness of the cell search processing is one of techniques desired in communications in the CDMA system.

In addition, various preceding arts related to the present invention are already known. By way of example, Japanese Unexamined Patent Publication of Tokkai No. Hei 9-271,071 or JP-A 9-271071 describes "MOBILE COMMUNICATION EQUIPMENT" to shorten the initial synchronization of a mobile station, time requiring the judgement of existence in a range and long code synchronous acquisition time in a cellular system using a CDMA (code division multiple access)/TDD (time division duplex) system. The mobile communication equipment described in JP-A 9-271071 comprises a receiving base-band processing part, a synchronizing circuit, a receiving level detection circuit. The receiving base-band processing part reproduces the data of a perch channel from a received signal by using symbol timing obtained from the synchronizing circuit. The synchronizing circuit detects a unique word from the data of the perch channel and executes slot synchronous acquisition. The receiving level detection circuit judges, as the nearest base station, a base station using a short code having the highest receiving level out of obtained receiving levels. The base station inserts information related to frame timing and information related to a long code sort used for an outgoing communication channel into the perch channel and transmits these information. The synchronizing circuit receives the transmitted information, acquires frame synchronization and acquires long code synchronization by using the long code sort.

In addition, Japanese Unexamined Patent Publication of Tokkai No. Hei 10-126,830 or JP-A 10-126830 describes "MOBILE COMMUNICATION TERMINAL" to detect the change of receiving quality of peripheral cells and to instruct the soft handover to a mobile communication terminal by adding a receiving level measurement means to the mobile communication terminal to measure the receiving level of the signal received in a receiving band before the adverse diffusion in addition to a peripheral cell search constitution. In JP-A 10-126830, a mobile communication station acquires the spread code information which is used by peripheral cells and stores it in a spread code storage means. A peripheral cell search control means sets a cell search execution cycle and a receiving level measurement execution cycle to first and second timers, respectively. When the second timer counts up its counting, the peripheral cell search control means instructs a receiving level measurement means to measure the receiving level and decides the value of RSSI change of a signal included in a receiving band based on the measurement result of the receiving level measurement means. If the RSSI change is large, the spread codes which are used by the peripheral cells stored in the spread code storage means are successively set to a sequential inverse spread means. Then a receiving quality measurement means measures the SIR received from every peripheral cell.