Non-patent document 2: R2-092866, "Synchronization channel and system information for carrier aggregation"
Non-patent document 3: 3GPP TS 36.331 V8.5.0
Non-patent document 4: 3GPP TS 36.321 V8.5.0
Non-patent document 5: 3GPP TS 36.101 V8.5.1

SUMMARY OF THE INVENTION

Problems to be solved by the invention

[0022]

As described above, whether to perform a cell search and quality measurement or not is determined by using a search threshold value and, when carrier aggregation is performed, all component carriers comprising the carrier aggregation are regarded as serving cells. A plurality of serving cells thus exist, and therefore it is required to determine how to make a comparison to a search threshold value.

[0023]

Embodiments of the invention seek to provide a communication terminal and a base station which are capable of determining a search threshold value for carrier aggregation to determine the timing of starting a cell search.

Means for solving the problems

[0024]

A communication terminal according to an aspect of the invention is capable of simultaneously communicating through a plurality of carriers by carrier aggregation, and comprises: a quality measurement unit for measuring the reception quality of a radio wave transmitted through a plurality of carriers from a base station of a connected cell to obtain a measured value; a primary carrier storage unit storing information specifying a primary carrier chosen from the plurality of carriers; a comparator for comparing a measured value of the primary carrier measured by the quality measurement unit to a threshold value; and a cell search unit for searching for another cell when the measured value of

the primary carrier is less than or equal to the threshold value.

According to another aspect of the present invention, a control method for a communication terminal capable of simultaneously communicating through a plurality of carriers by carrier aggregation comprises the steps of selecting a primary carrier from the plurality of carriers; measuring the reception quality of a radio wave transmitted through the plurality of carriers from a base station of a connected cell to obtain a measured value; comparing a measured value of the primary carrier to a threshold value; and searching for another cell when the measured value of the primary carrier is less than or equal to the threshold value.

Advantages of the invention

[0025]

Embodiments of the invention involve determining the timing of performing a cell search based on the reception quality of a primary carrier, and thereby may allow even a communication terminal supporting carrier aggregation to appropriately start a cell search.

[0026]

There are other aspects of the invention as described below. This disclosure of the invention therefore intends to provide part of the aspects of the invention and does not intend to limit the scope of the invention described and claimed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Figure 1 shows the timing for a communication terminal according to a first embodiment to perform a cell search;

Figure 2 shows a configuration of the communication terminal of the first embodiment;

Figure 3 shows an operation of the communication terminal of the first embodiment;

Figure 4 shows a scenario example of carrier aggregation;

Figure 5 shows another scenario example of carrier aggregation;

Figure 6 shows a process of specifying a primary component carrier;

Figure 7 shows another operation of a communication terminal to determine a primary component carrier;

Figure 8 shows a configuration of a base station;

Figure 9 illustrates frequency bands;

Figure 10 shows the timing for a communication terminal according to a second embodiment to perform a cell search;

Figure 11 shows a configuration of the communication terminal of the second embodiment;

CLAIMS

1. A communication terminal capable of simultaneously communicating through a plurality of carriers by carrier aggregation, the communication terminal comprising:

a quality measurement unit for measuring the reception quality of a radio wave transmitted through a plurality of carriers from a base station of a connected cell to obtain a measured value;

a primary carrier storage unit storing information specifying a primary carrier chosen from the plurality of carriers;

a comparator for comparing a measured value of the primary carrier measured by the quality measurement unit to a threshold value; and

a cell search unit for searching for another cell when the measured value of the primary carrier is less than or equal to the threshold value.

2. The communication terminal according to claim 1,

wherein the comparator compares a measured value of the primary carrier to the threshold value, as well as comparing a measured value of a carrier other than the primary carrier to a second threshold value different from the threshold value, and

wherein the cell search unit performs a cell search when the measured value of the primary carrier is less than or equal to the threshold value or when the measured value of the carrier other than the primary carrier is less than or equal to the second threshold value.

3. The communication terminal according to claim 1,

wherein the primary carrier storage unit, for each group into which the plurality of carriers are classified by frequency band, stores a frequency-band-specific primary carrier chosen from carriers included in the group concerned,

wherein the comparator compares a measured value of the frequency-band-specific primary carrier to the threshold value, and

wherein the cell search unit performs a cell search on carriers included in the same group when the measured value of the frequency-band-specific primary carrier is less than or equal to the threshold value.

4. The communication terminal according to any of claims 1 to 3, comprising

a reception mode detector for detecting the reception mode of a plurality of carrier-aggregated carriers and, if any carrier has not received data for a predetermined period, notifying the cell search unit of information specifying the carrier concerned,

wherein the cell search unit, when receiving the notification from the reception mode detector, sets a gap period for the carrier concerned in the notification and searches for a cell on another carrier not used for the band aggregation, in addition to quality measurement for a neighboring cell.

5. A communication terminal according to claim 4, comprising

a carrier priority storage unit storing information on priorities of a plurality of carriers provided by a base station,

wherein the cell search unit judges whether any of the carriers not used for the carrier aggregation is of higher priority than the carrier notified of by the reception mode detector or not based on the information stored in the carrier priority storage unit and, if any carrier is of higher priority, sets a gap period for the carrier concerned in the notification and searches for a cell on the carrier of higher priority.

6. A communication terminal according to claim 1,

wherein the comparator compares a measured value of the reception quality of the primary carrier to a threshold value for reception-strength-based reception quality and, if the measured value of the reception quality is more than or equal to the threshold value, compares measured values of the reception quality of the plurality of carriers used for the carrier aggregation to a threshold value for interference-considered reception quality, and

wherein when a measured value of the reception quality of at least one of the plurality of carriers is less than or equal to the threshold value for interference-

considered reception quality, the cell search unit performs a cell search on the carrier concerned.

7. A control method for a communication terminal capable of simultaneously communicating through a plurality of carriers by carrier aggregation, the communication terminal control method comprising the steps of:

selecting a primary carrier from the plurality of carriers;

measuring the reception quality of a radio wave transmitted through the plurality of carriers from a base station of a connected cell to obtain a measured value;

comparing a measured value of the primary carrier to a threshold value; and

searching for another cell when the measured value of the primary carrier is less than or equal to the threshold value.

8. The communication terminal control method according to claim 7,

wherein the step of comparing comprises comparing a measured value of the primary carrier to the threshold value, as well as comparing a measured value of a carrier other than the primary carrier to a second threshold value different from the threshold value, and

wherein the step of performing a cell search comprises performing a cell search when the measured value of the primary carrier is less than or equal to the threshold value or when the measured value of the carrier other than the primary carrier is less than or equal to the second threshold value.

9. The communication terminal control method according to claim 7,

wherein the step of selecting a primary carrier comprises, for each group into which the plurality of carriers are classified by frequency band, selecting a frequency-band-specific primary carrier from carriers included in the group concerned,

wherein the step of comparing comprises comparing a measured value of the frequency-band-specific primary carrier to the threshold value, and

wherein the step of performing a cell search comprises performing a cell search on carriers included in the same group when the measured value of the frequency-band-specific primary carrier is less than or equal to the threshold value.

10. The communication terminal control method according to any of claims 7 to 9, comprising the steps of:

detecting the reception mode of a plurality of carrier-aggregated carriers and judging whether any carrier has not received data for a predetermined period or not; and

if any carrier is judged to have not received data for a predetermined period, setting a gap period for the carrier concerned and searching for a cell on another carrier not used for the band aggregation.

11. The communication terminal control method according to claim 10, wherein the step of searching for another carrier comprises:

judging whether any of the carriers not used for the carrier aggregation is of higher priority than the carrier that has not received data for a predetermined period or not based on information stored in a carrier priority storage unit storing information on priorities of a plurality of carriers provided by a base station; and,

if any carrier is of higher priority, setting a gap period for the carrier that has not received data for a predetermined period and searching for a cell on the carrier of higher priority.