



159159

TITLE OF THE INVENTION

BASE STATION AND COMMUNICATION METHOD

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a base station for generating and transmitting system information to a mobile station. The present invention also relates to a communication method of communicating system information in a communication system including the base station and the mobile station.

 2. Description of the Related Art

10 In W-CDMA (Wideband Code Division Multiple Access), a mobile station decodes broadcast channel information on a BCH (Broadcast Channel) and retrieves system information before establishing a radio link between a base station and the mobile station. The mobile station uses the system information to establish the radio link to the base station.

 Before entering soft handover or when in intermittent reception mode for standby, the mobile station needs to detect a cell with the smallest path-loss (a cell with the second smallest path-loss when entering soft handover mode). The process for establishing the radio link in this manner is referred to as a cell search (see "W-CDMA MOBILE COMMUNICATIONS SYSTEM" edited by Keiji Tachikawa, Japan, March 15, 2002, pages 35-36).

SUMMARY OF THE INVENTION

[Problem(s) to be solved by the Invention]

35 In W-CDMA, however, various kinds of system information are transmitted on a single broadcast channel and the broadcast channel information increases in size (in the number of bits



G00002

or in transmission time). Accordingly, the mobile station needs to receive the whole broadcast channel information, which presents a problem in that it takes considerable time for the cell search.

- 5 In addition, the mobile station cannot recognize whether it detects a cell until after receiving the whole broadcast channel information. Accordingly, it takes considerable time each time the mobile station repeats the cell search.
- 10 Particularly when the mobile station is situated outside the coverage area, it takes considerable time to repeat the cell search, which presents a problem of increasing power consumption in the mobile station.
- 15 A cell search during communication in the case of handover needs a fast cell search. However, considerable time for the cell search increases time required for handover, which presents a problem of degrading communication quality such as throughput.
- 20 On the other hand, system information includes sector-specific (cell-specific) system information, base station-specific system information, upper node-specific system information, location registration area-specific information, and
- 25 system-specific system information. When this system information is transmitted on a single broadcast channel, there is a problem in that the broadcast channel information increases in size (in the number of bits or in transmission time).
- 30 For example, when the mobile station changes sectors covered by the same base station and receives various kinds of system information on a single broadcast channel, the mobile station also receives base station-specific system information,
- 35 which is not always needed. For example, when the mobile station is situated at a sector boundary, the mobile station only receives broadcast channel

information from one sector while the same piece of mobile station-specific system information is transmitted from both sectors. Accordingly, there is a problem in that broadcast channel information
5 from the other sector causes interference.

In view of the aforementioned problems in the related art, it is a general object of the present invention to reduce the amount of information received by a mobile station on a
10 broadcast channel.

[Means for solving the Problem]

In one aspect of the present invention, there is provided a base station, including:

a system information generating unit
15 configured to generate system information;
a system information categorizing unit configured to categorize the system information into multiple pieces of system information; and
a multiplexing unit configured to
20 multiplex the categorized multiple pieces of system information into multiple channels or multiple blocks.

In another aspect of the present invention, there is provided a communication method of
25 communicating system information in a communication system including a base station and a mobile station, including the steps of:

at the base station,
generating system information;
30 categorizing the system information into multiple pieces of system information;
multiplexing the categorized multiple pieces of system information into multiple channels or multiple blocks;
35 transmitting the system information on the multiple channels or the multiple blocks; and
at the mobile station,

receiving system information included in a portion of the multiple channels or the multiple blocks.

[Effect of the Invention]

5 According to an embodiment of the present invention, it is possible to reduce the amount of information received by a mobile station on a broadcast channel.

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 shows a block diagram of a base station in accordance with a first or second embodiment of the present invention.

15 Fig. 2 shows a block diagram of a mobile station in accordance with the first or second embodiment of the present invention.

Fig. 3 shows three schemes used for transmitting multiple pieces of broadcast channel information on frequency blocks.

20 Fig. 4 shows a block diagram of a base station in accordance with a third embodiment of the present invention.

25 Fig. 5 shows a block diagram of a mobile station in accordance with the third embodiment of the present invention.

Fig. 6 shows a block diagram of another mobile station in accordance with the third embodiment of the present invention.

30 **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[Description of Notations]

10, 30 base station

101, 301 system information generating unit

35 103, 303 system information categorizing unit

105, 305 coding unit

107, 307 modulating unit
109, 309 multiplexing unit
111, 311 serial-parallel converting unit
113, 313 spreading code generating unit
5 115, 315 spreading code multiplying unit
117, 317 combining unit
20 mobile station
201a primary broadcast channel information
receiving unit
10 201b secondary broadcast channel
information receiving unit
203 cell search unit
205 secondary broadcast channel
information extracting unit
15 40, 50 mobile station
401a, 501a sector-specific broadcast
channel information receiving unit
401b, 501b base station-specific broadcast
channel information receiving unit
20 401c, 501c upper node-specific broadcast
channel information receiving unit
401d, 501d location registration area-
specific broadcast channel information receiving
unit
25 401e, 501e system-specific broadcast
channel information receiving unit
403 channel configuration information
storing unit
501 primary broadcast channel information
30 receiving unit
503 channel configuration information
extracting unit
[Best Mode of Carrying Out the Invention]
With reference to the accompanying
35 drawings, a description is given below with regard
to preferred embodiments of the present invention.
[First Embodiment]

In a first embodiment of the present invention, a base station transmits system information using multiple broadcast channels or multiple blocks (referred to as broadcast channel
5 blocks) which are derived by dividing a broadcast channel. Fig. 1 shows a block diagram of a base station 10 in accordance with the first embodiment of the present invention.

The base station 10 transmits system
10 information to a mobile station on a primary broadcast channel and a secondary broadcast channel. The mobile station receives primary broadcast channel information to perform a cell search. As used herein, the "cell search" refers to procedures
15 for detecting a cell and retrieving minimum system information. Since the mobile station needs to receive primary broadcast channel information upon establishing a connection with the base station 10, a frequency block and timing for the primary
20 broadcast channel have to be determined in advance. Then, the mobile station receives secondary system information to retrieve various kinds of system information.

The base station 10 includes a system
25 information generating unit 101, a system information categorizing unit 103, coding units 105, modulating units 107, a multiplexing unit 109, a serial-parallel converting unit 111, a spreading code (scrambling code) generating unit 113,
30 spreading code (scrambling code) multiplying units 115, and a combining unit 117.

The system information generating unit 101 generates system information to be transmitted to the mobile station. The system information includes
35 system information required for the cell search and system information not required for the cell search (system information other than the system

information required for the cell search).

The system information required for the cell search includes the following information:

- SFN (System Frame Number): a radio frame
5 number;
- system bandwidth: a transmission
bandwidth for the base station;
- network ID: information about an
operator;
- 10 - cell ID: information used for
identifying a cell in the base station; and
- the number of transmitting antennas: the
number of transmitting antennas in the base station
in the case of MIMO transmission.
- 15 The system information not required for
the cell search includes the following information:
- timer value or parameter value for the
mobile station: the time interval of the cell search
operations in the mobile station, the time interval
20 of received signal levels reported from the mobile
station to the base station, initial transmission
power for the mobile station, or the like;
- location registration area information:
location registration area number, or the like;
- 25 - cell search information: a threshold for
the received signal level which is used for the
mobile station to perform the cell search;
- neighboring cell information: cell IDs
of the neighboring cells, a system bandwidth, a
30 broadcast channel bandwidth, the number of
transmitting antennas, timing information (time lag
among base stations), transmission power, the number
of sectors, or the like;
- restriction information: information
35 about call restriction;
- the amount of uplink interference:
information about the amount of interference

detected by the base station;

- positioning information: latitude and longitude information, or the like;

- channel configuration information in the
5 cell: information about a paging channel, an L1/L2 control channel, or the like other than the broadcast channel;

- core network information: information
10 about a core network connected to the base station;
and

- measurement information for the mobile station: measurement information such as received power, SIR (Signal to Interference Ratio), or the like.

15 The system information categorizing unit
103 categorizes the system information into the system information required for the cell search (information to be transmitted on the primary broadcast channel) and the system information not
20 required for the cell search (information to be transmitted on the secondary broadcast channel). The system information categorizing unit 103 may incorporate channel information (a frequency block and timing) about the secondary broadcast channel
25 into information to be transmitted on the primary broadcast channel.

 The system information required for the cell search is encoded by the coding unit 105a and then modulated by the modulating unit 107a. In the
30 same manner, the system information not required for the cell search is encoded by the coding unit 105b and then modulated by the modulating unit 107b.

 The modulated system information is multiplexed by the multiplexing unit 109 into the
35 primary broadcast channel and the secondary broadcast channel, and then converted by the serial-parallel converting unit 111 into N information

symbol sequences on the frequency axis. The converted N information symbol sequences are arranged on the frequency axis.

The symbol sequences with a sequence
5 length N are multiplied by N spreading code
multiplying units 115 with spreading codes
(scrambling codes) supplied by a spreading code
generating unit 113 in the frequency direction, and
then the multiplied symbol sequences are supplied to
10 a combining unit 117.

The combining unit 117 multiplexes the
multiplied symbol sequences with the sequence length
N into a certain subcarrier among N subcarriers
corresponding to the synchronization signal. An
15 IFFT (Inverse Fast Fourier Transform) unit
transforms N symbols into orthogonal multicarrier
signals. A cyclic prefix (CP) adding unit inserts
CPs into the multicarrier signals for each Fourier
target time period. Then, the base station 10
20 generates radio signals from the multicarrier
signals supplied by the CP adding unit and transmits
them to the air.

The base station 10 may transmit primary
broadcast channel information in a shorter time
25 interval and transmit secondary broadcast channel
information in a longer time interval. Since the
mobile station first needs to receive primary
broadcast channel information, it is preferable for
the base station 10 to transmit the primary
30 broadcast channel information in a shorter time
interval, in order to reduce time for receiving
system information. It should be noted that
transmitting primary broadcast channel information
in a shorter time interval may not have significant
35 effects on overhead, because the amount of primary
broadcast channel information is smaller than the
amount of secondary broadcast channel information.

Also, transmitting secondary broadcast channel information in a longer time interval can reduce overhead, because the mobile station need not quickly receive secondary broadcast channel
5 information.

When a common spreading code (scrambling code) is used within the base station 10, signals from adjacent sectors are not subjected to interference but are combined when signals
10 transmitted from each sector are received (soft-combining). Soft-combining may be used for both the primary broadcast channel and the secondary broadcast channel. Using soft-combining for both the channels can increase the effect of combining
15 received signals. Alternatively, soft-combining may be used only for the primary broadcast channel. Using soft-combining for the primary broadcast channel can efficiently increase the effect of combining received signals, because primary
20 broadcast channel information is important and includes various kinds of common information for the base station. Alternatively, soft-combining may be used only for the secondary broadcast channel. Using soft-combining for the secondary broadcast
25 channel can efficiently increase the effect of combining received signals, when various kinds of common information for the base station is included in the secondary broadcast channel information.

The primary broadcast channel information
30 may be categorized into a portion to be soft-combined and the other portion not to be soft-combined. For example, common information for the base station may be soft-combined using the common spreading code.

35 Fig. 2 shows a block diagram of a mobile station 20 in accordance with the first embodiment of the present invention.

The mobile station 20 includes a primary broadcast channel information receiving unit 201a, a secondary broadcast channel information receiving unit 201b, a cell search unit 203, and a secondary
5 broadcast channel information extracting unit 205.

The primary broadcast channel receiving unit 201a receives primary broadcast channel information transmitted at a predetermined frequency block and timing.

10 The cell search unit 203 extracts system information required for the cell search which is included in the primary broadcast channel information and then performs the cell search. When the primary broadcast channel information includes
15 channel information about the secondary broadcast channel, the secondary broadcast channel information extracting unit 205 extracts channel information (a frequency block and timing) about the secondary broadcast channel.

20 The secondary broadcast channel receiving unit 201b uses the extracted channel information about the secondary broadcast channel to receive secondary broadcast channel information and to extract system information not required for the cell
25 search.

According to the first embodiment of the present invention, the mobile station may only receive primary broadcast channel information upon the cell search, because the base station transmits
30 system information required for the cell search on the primary broadcast channel. Therefore, it is possible to reduce the amount of information received by the mobile station on the primary broadcast channel and to reduce time for the cell
35 search.

Although broadcast channel information is categorized into primary broadcast channel

information and secondary broadcast channel
information in the first embodiment, system
information to be transmitted on the secondary
broadcast channel may be further categorized into
5 secondary broadcast channel information and shared
data channel information.

In addition, the broadcast channel
information may be categorized into multiple blocks
(primary broadcast channel block and secondary
10 broadcast channel block). Even though the single
broadcast channel is used, the mobile station can
receive system information included in a primary
broadcast channel block. This approach can achieve
the effect similar to the first embodiment.

15 [Second Embodiment]

In a second embodiment of the present
invention, a base station uses multiple frequency
blocks to transmit broadcast channel information
including primary broadcast channel information and
20 secondary broadcast channel information. The base
station in accordance with the second embodiment
also has the same structure as shown in Fig. 1. The
combining unit 117 multiplexes symbol sequences into
multiple frequency blocks as shown in Fig. 3. Fig.
25 3 shows three schemes used for transmitting multiple
pieces of broadcast channel information on multiple
frequency blocks.

In 3GPP Evolved UTRA and UTRAN, the system
bandwidth can be between 1.25 MHz and 20 MHz. In
30 the second embodiment, the whole system bandwidth is
divided into multiple frequency blocks and broadcast
channel information is transmitted on frequency
blocks with some space therebetween, in order to
improve reception quality due to the frequency
35 diversity effect.

In order to achieve the frequency
diversity effect, a localized transmission scheme, a

distributed transmission scheme, or a generalized distributed transmission scheme may be used. The localized transmission scheme uses a portion of the system bandwidth. The distributed transmission
5 scheme uses comb-shaped frequency blocks. The generalized distributed transmission scheme uses frequency blocks with some space therebetween.

According to the second embodiment of the present invention, it is possible to reduce the
10 amount of information received by the mobile station on the primary broadcast channel and to reduce time for the cell search. In addition, it is possible to improve reception quality by means of the frequency diversity effect.

15 [Third embodiment]

In a third embodiment of the present invention, a base station transmits system information using multiple broadcast channels or multiple blocks (referred to as broadcast channel
20 blocks) which are derived by dividing a broadcast channel. Fig. 4 shows a block diagram of a base station 30 in accordance with the third embodiment of the present invention.

The base station 30 categorizes system
25 information into sector-specific (cell-specific) information, base station-specific information, upper node-specific information, location registration area-specific information, and system-specific information. Then, the base station 30
30 transmits the system information to a mobile station on multiple broadcast channels or multiple broadcast channel blocks. The mobile station only receives necessary information on the multiple broadcast channels or multiple broadcast channel blocks. For
35 example, when the mobile station changes sectors covered by the same base station, the mobile station only receives sector-specific information without

receiving base-station specific information.

The base station 30 includes a system information generating unit 301, a system information categorizing unit 303, coding units 305, modulating units 307, a multiplexing unit 309, a serial-parallel converting unit 311, a spreading code generating unit 313, spreading code multiplying units 315, and a combining unit 317.

The system information generating unit 301 generates system information to be transmitted to the mobile station. The system information can be categorized into multiple pieces of system information, each of which is specific to each component in the radio network configuration. For example, the system information can be categorized into sector-specific information, base station-specific information, upper node-specific information, location registration area-specific information, and system-specific information, as shown in Table 1. As used herein, "an upper node" refers to an apparatus installed at an upper level of the base station, such as an access router or a radio network controller.

Table 1. Example categories of system information

system information	category
SFN (System Frame Number)	sector-specific or base station-specific information
system bandwidth (overall transmission bandwidth)	base station-specific information
network ID (PLMN identities of neighboring cells)	system-specific information
timer value or parameter value for a mobile station (UE timers and constraints in an idle mode)	system-specific information
location registration	location registration

area information	area-specific information
sector (cell) ID (cell identity)	sector-specific information
cell selection information (parameters for cell selection and re-selection)	sector-specific or base station-specific information
restriction information (cell access restriction)	sector-specific information
channel configuration information in the cell (configuration of common physical channels in the cell)	sector-specific or base station-specific information
amount of uplink interference	sector-specific information
measurement information for the mobile station (measurement control system information)	sector-specific or base station-specific information
core network information	base station-specific, system-specific, or upper node-specific information
positioning information (UE positioning information)	sector-specific or mobile station-specific information

The system information categorizing unit 303 categorizes the system information into multiple pieces of system information, each of which is
5 specific to each component in the radio network configuration. The coding units 305 through the CP adding units operate in the same manner as the first embodiment shown in Fig. 1.

The base station 30 may categorize the
10 system information based on predetermined configuration information about the broadcast channel which is stored in both the base station and the mobile station. For example, channel
information (a frequency block and timing) about the
15 broadcast channel for sector-specific information may be determined in advance. A mobile station 40 corresponding to this base station 30 is shown in

Fig. 5. The mobile station 40 includes a sector-specific broadcast channel information receiving unit 401a, a base station-specific broadcast channel information receiving unit 401b, an upper node-specific broadcast channel information receiving unit 401c, a location registration area-specific broadcast channel information receiving unit 401d, a system-specific broadcast channel information receiving unit 401e, and a channel configuration information storing unit 403. Each of the broadcast channel information receiving units 401a-401e refers to the channel configuration information storing unit 403 as needed and receives necessary broadcast channel information. For example, when the mobile station 40 changes sectors covered by the same base station, the mobile station 40 only receives sector-specific broadcast channel information.

Alternatively, the base station 30 may add configuration information about the broadcast channel to the primary broadcast channel information (system information to be transmitted on the primary broadcast channel) as described in the first embodiment. A mobile station 50 corresponding to this base station 30 is shown in Fig. 6. The mobile station 50 includes a primary broadcast channel information receiving unit 501, a sector-specific broadcast channel information receiving unit 501a, a base station-specific broadcast channel information receiving unit 501b, an upper node-specific broadcast channel information receiving unit 501c, a location registration area-specific broadcast channel information receiving unit 501d, a system-specific broadcast channel information receiving unit 501e, and a channel configuration information extracting unit 503. The primary broadcast channel information receiving unit 501 receives primary broadcast channel information. Then, the channel

configuration information extracting unit 503
extracts configuration information about the
broadcast channel from the primary broadcast channel
information. Each of the broadcast channel
5 information receiving units 501a-501e refers to the
configuration information about the broadcast
channel as needed and receives broadcast channel
information.

Alternatively, the configuration
10 information about the broadcast channel may specify
sector-specific system information, base station-
specific system information, or the like. In this
case, the specified system information may be
determined in advance or transmitted on the primary
15 broadcast channel.

The spreading code generating unit 313
generates a common spreading code for the same piece
of system information. For example, the spreading
code generating unit 313 generates a common
20 spreading code for base station-specific information,
because the base station-specific information is
common to multiple sectors covered by the base
station 30. In this manner, different spreading
codes among sectors are used for sector-specific
25 information and a common spreading code within the
base station 30 is used for base station-specific
information which does not include sector-specific
information. When a common spreading code is used
within the base station 30, signals from adjacent
30 sectors are not subjected to interference but are
combined when signals transmitted from each sector
are received (soft-combining).

When soft-combining is used, a pilot
channel corresponding to radio resources to be soft-
35 combined may be common to multiple sectors. For
example, a pilot channel controlling unit may be
provided to the base station 30, in order to

generate the pilot channel which is common to multiple sectors. Providing the pilot channel controlling unit can increase a gain in soft-combining. In the case where the pilot channel is
5 generated which is common to multiple sectors, some portions of frequency blocks for the pilot channel may be common to multiple sectors, while the other portions may be independent. Providing both the pilot channel which is common to multiple sectors
10 and the pilot channel which is independent among multiple sectors allows the mobile station to distinguish processes which are common to multiple sectors and processes which are independent among multiple sectors. For example, the processes which
15 are independent among multiple sectors include reception measurement at the mobile station, reception of L1/L2 control channels, and so on.

Alternatively, the pilot channels may be orthogonalized among multiple sectors. The mobile
20 station can receive the orthogonalized pilot channels and combine them.

When soft-combining is used, it is preferable that radio resources (frequency blocks) used in each sector should be common.

25 In addition, a CDD (Cyclic Delay Diversity) scheme can be applied to radio resources to be soft-combined. For example, a CDD unit may be provided to the base station 30, in order to apply CDD to the radio resources to be soft-combined.
30 Providing the CDD unit can achieve a higher diversity effect.

In the same manner, a common spreading code may be used for upper-node specific information among multiple base stations belonging to the same
35 upper node. This enables soft-combining among multiple base stations.

When soft-combining is used, the same

spreading code may not be always used among multiple sectors or multiple base stations, but different spreading codes may be used. When different spreading codes are used, the mobile station can
5 independently receive multiple pieces of broadcast channel information with the same content and combine them. This approach can achieve the effect similar to the use of soft-combining (precisely, the combining effect of this approach is smaller
10 compared to soft-combining).

According to the third embodiment of the present invention, the mobile station may only receive necessary broadcast channel information. Therefore, it is possible to reduce the amount of
15 information received by the mobile station on the broadcast channel, to reduce power consumption, and to achieve fast cell selection. For example, the mobile station can determine whether it changes sectors based on a cell ID and neighboring cell
20 information detected during the cell search.

In addition, soft-combining can improve reception quality, because signals transmitted from multiple sectors can be combined (without interference). In other words, the base station can
25 reduce transmission power or radio resource blocks (time intervals or frequency blocks) in order to achieve the same quality level.

Although broadcast channel information is classified into multiple pieces of broadcast channel information in the third embodiment, the broadcast
30 channel information may be categorized into multiple blocks (sector-specific broadcast channel block, base-station specific broadcast channel block, and so on). Even though the single broadcast channel is
35 used, the mobile station can receive system information included in a predetermined broadcast channel block. This approach can achieve the effect

similar to the third embodiment.

According to an embodiment of the present invention, it is possible to reduce the amount of information received by a mobile station on a
5 broadcast channel or a primary broadcast channel.

This international patent application is based on Japanese Priority Application No. 2006-127992 filed on May 1, 2006 and Japanese Priority Application No. 2006-169445 filed on June 19, 2006,
10 the entire contents of which are incorporated herein by reference.

WHAT IS CLAIMED IS

5
1. A base station, comprising:
a system information generating unit
configured to generate system information;
a system information categorizing unit
10 configured to categorize the system information into
multiple pieces of system information; and
a multiplexing unit configured to
multiplex the categorized multiple pieces of system
information into multiple channels or multiple
15 blocks.

20 2. The base station as claimed in Claim 1,
wherein:
the system information categorizing unit
categorizes the system information into first system
information required for a cell search and second
25 system information other than the first system
information, and
the multiplexing unit multiplexes the
first system information into a first broadcast
channel or a first broadcast channel block and
30 multiplexes the second system information into a
second broadcast channel or a second broadcast
channel block.

35

3. The base station as claimed in Claim 2,

wherein:

the first system information includes information about the second broadcast channel or the second broadcast channel block.

5

4. The base station as claimed in Claim 2,
10 wherein:

the first system information includes at least one of

a system frame number,
a system bandwidth,
15 a network ID,
a cell ID, and
the number of transmitting antennas.

20

5. The base station as claimed in Claim 1,
wherein:

the system information categorizing unit
25 categorizes the system information into first system information which is specific to a first component in a radio network configuration and second system information which is specific to a second component in the radio network configuration, and

30 the multiplexing unit multiplexes the first system information into a first broadcast channel or a first broadcast channel block and multiplexes the second system information into a second broadcast channel or a second broadcast
35 channel block.

6. The base station as claimed in Claim 5,
wherein:

5 the system information categorizing unit
categorizes the system information based on
predetermined configuration information about a
broadcast channel or a broadcast channel block.

10

7. The base station as claimed in Claim 5,
wherein:

15 the multiplexing unit adds configuration
information about a broadcast channel or a broadcast
channel block to the first system information.

20

8. The base station as claimed in Claim 1,
wherein:

25 the system information categorizing unit
categorizes the system information into first system
information including sector-specific system
information and second system information excluding
sector-specific system information, and

30 the multiplexing unit multiplexes the
first system information into a first broadcast
channel or a first broadcast channel block and
multiplexes the second system information into a
second broadcast channel or a second broadcast
channel block.

35

9. The base station as claimed in Claim 8,
further comprising:

5 a spreading code generating unit
configured to generate a common spreading code for
the second system information.

10

10. A communication method of
communicating system information in a communication
system including a base station and a mobile station,
comprising the steps of:

15 at the base station,
generating system information;
categorizing the system information into
multiple pieces of system information;
multiplexing the categorized multiple
20 pieces of system information into multiple channels
or multiple blocks;
transmitting the system information on the
multiple channels or the multiple blocks; and
at the mobile station,
25 receiving system information included in a
portion of the multiple channels or the multiple
blocks.