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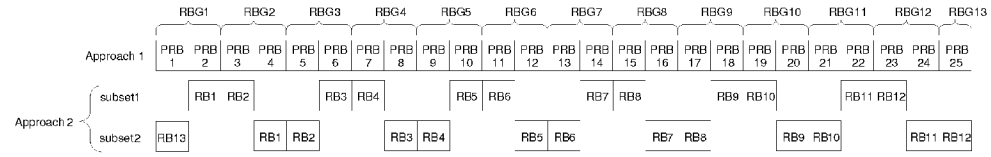
(54) Title: METHOD FOR INDICATING ALLOCATION OF RESOURCES

FIG 3



(57) Abstract: This invention is based on the recognition that it is desirable that all the patterns ofresource block allocation using the original groups or the subset are distinct. This can be achieved by applying a cyclic shift to the positions of the resource block groups before creating the subset. This leads to more flexibility in resource allocation for a given number of signalling bits. In UMTS LTE downlink signalling for indicating allocation of transmission resources to mobile terminals is under discussion. In this case the resource is number of resource blocks to be used for transmitting data from a base station to a mobile terminal, and which are identified mainly by their location in the frequency domain. Some current proposals suggest using a bit map to indicate which groups of resource blocks are allocated, where the groups consist ofconsecutive resource blocks. Additional bits indicate if a subset of groups is to be used instead.

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METHOD FOR INDICATING ALLOCATION OF RESOURCES

FIELD OF THE INVENTION

The present invention relates a method for indicating allocation of transmission resources in a mobile communication network, and to a primary station impelementing such a method.

This invention is, for example, relevant for UMTS systems.

BACKGROUND OF THE INVENTION

In UMTS LTE downlink signalling for indicating allocation of transmission resources to mobile terminals is under discussion. In this case the resource is number of resource blocks to be used for transmitting data from a base station to a mobile terminal, and which are identified mainly by their location in the frequency domain. Some current proposals suggest using a bit map to indicate which groups of resource blocks are allocated, where the groups consist of consecutive resource blocks. Additional bits indicate if a subset of groups is to be used instead.

This invention is based on the recognition that it is desirable that all the patterns of resource block allocation using the original groups or the subset are distinct. This can be achieved by applying a cyclic shift to the positions of the resource block groups before creating the subset. This leads to more flexibility in resource allocation for a given number of signalling bits.

In UMTS LTE downlink signalling for indicating allocation of transmission resources to mobile terminals is under discussion. In this case the resource is number of resource blocks to be used for transmitting data from a base station to a mobile terminal, and which are identified mainly by their location in the frequency domain.

One possibility is to use a bit map, where each bit corresponds to the allocation (or not) of a given resource block. In a conventional method, it is proposed to signal downlink resource allocations using a reduced resolution bit map. As an example, for a system with 25 Resource Blocks (RBs), the bit map would indicate the use or otherwise of each group of RBs. In this example the group size is 2. This is identified

as Approach 1 of Figure 2, where setting the bit "RBG1" indicates the use of Physical Resource Blocks PRB1 and PRB1.

In Approach 2 of Figure 2, some subsets of the resources are defined and the signalling indicates to which sub-set the bit map should be applied. In this example two subsets are considered. Therefore using subset 1, setting bit "RB1" would indicate the use of PRB1. Using Subset 1, setting bit "RB1" would indicate the use of PRB3. In order to make efficient use of signalling bits, it is desirable that distinct resource allocations are indicated using the different Approachs and subsets.

However, as mentioned for the example shown in Figure 2, with Approach 1, setting the bit "RBG1" indicates the use of the set "PRB1 and PRB2". In Approach 2, subset 1, setting bits "RB1" and "RB2" would also indicate the use of "PRB1 and PRB2".

SUMMARY OF THE INVENTION

An object of the invention is to propose an improved method of signaling resources to a mobile station.

It is another object of the invention to improve the flexibility of the allocation of resources to the secondary station.

According to a first aspect of the invention, a method is proposed for indicating an allocation of resources to a secondary station comprising selecting an allocation scheme from at least a first allocation scheme and a second allocation scheme, each allocation scheme being arranged to identify subsets of resources, wherein the resources of the subsets of the first allocation schemes are shifted from resources of the subsets of the second allocation schemes; signaling the allocation scheme to be used in an allocation signal.

According to a second aspect of the invention, a primary station is proposed, said primary station comprising signaling means for indicating an allocation of resources to a secondary station, said signaling means comprising means for selecting an allocation scheme from at least a first allocation scheme and a second allocation scheme, each allocation scheme being arranged to identify subsets of resources, wherein the resources of the subsets of the first allocation schemes are shifted from resources of the subsets of the second allocation schemes; and wherein the signaling

means are arranged for signaling the allocation scheme to be used in an allocation signal.

In accordance with this definition of the invention, it is proposed to shift the allocation sub-sets so as to diversify the possible allocate resources. For instance, in an embodiment of the invention, it is proposed to apply a cyclic shift to the subsets, such that the groups of resources in a subset do not overlap with groups defined in Approach 1.

These and other aspects of the invention will be apparent from and will be elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWING

The present invention will now be described in more detail, by way of example, with reference to the accompanying drawing, wherein:

- Fig. 1 is a block diagram of a system in which is implemented the invention.
- Fig. 2 is a representation of the resource blocks in accordance with a conventional method.
- Fig. 3 is a representation of the resource blocks in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a system of communication 300 as depicted on Figure 1, comprising a primary station 100, like a base station, and at least one secondary station 200 like a mobile station.

The radio system 300 may comprise a plurality of the primary stations 100 and/or a plurality of secondary stations 200. The primary station 100 comprises a transmitter means 110 and a receiving means 120. An output of the transmitter means 110 and an input of the receiving means 120 are coupled to an antenna 130 or an antenna array comprising a plurality of antennas, by a coupling means 140, which may be for example a circulator or a changeover switch. Coupled to the transmitter means 110 and receiving means 120 is a control means 150, which may be for example a processor. The secondary station 200 comprises a transmitter means 210 and a receiving means 220. An output of the transmitter means 210 and an input of the receiving means 220 are coupled to an antenna 230 or an antenna array comprising a

plurality of antennas, by a coupling means 240, which may be for example a circulator or a changeover switch. Coupled to the transmitter means 210 and receiving means 220 is a control means 250, which may be for example a processor. Transmission from the primary radio station 100 to the secondary station 200 takes place on a downlink channel 160 and transmission from the secondary radio station 200 to the first radio station 100 takes place on an uplink channel 260.

The primary station allocates resources of the uplink channel to the secondary stations. In accordance with an embodiment of the invention, the aim is that none of the groups in the subsets in Approach 2 should exactly match the resource block groups in Approach 1. If this condition is satisfied then, the physical resource patterns which can be allocated will be distinct.

This is illustrated for instance on figure 3 where none of the groups in the subsets of Approach 2 matches one group of Approach 1. For instance, if PRB1 corresponds to the set of resources consisting of RB1 and RB2, there is no subset of Approach 2 consisting of RB1 and RB2.

The preferred embodiment is a radio communication system using OFDMA in the downlink (such as UMTS LTE). Here the resource blocks refer to 12 sub-carriers in the frequency domain and a subframe in the time domain. The mobile terminals receive a control channel (PDCCH) which informs them of data being transmitted to them on a data channel (PDSCH). The information in the control channel includes an indication of which resource blocks contain data for that terminal. According to the invention this information comprises a bit map and some indication of whether the bit map refers to a reduced resolution resource map comprising groups of consecutive resource blocks, or one of a subset of groups of resource blocks, where the boundaries of the blocks in at least one subset are shifted with respect to the boundaries of the groups in the reduced resolution resource map.

In the present specification and claims the word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. Further, the word "comprising" does not exclude the presence of other elements or steps than those listed.

The inclusion of reference signs in parentheses in the claims is intended to aid understanding and is not intended to be limiting.

From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the art of radio communication

CLAIMS

1. A method for indicating an allocation of resources to a secondary station comprising
selecting an allocation scheme from at least a first allocation scheme and a second allocation scheme, each allocation scheme being arranged to identify subsets of resources, wherein the resources of the subsets of the first allocation schemes are shifted from resources of the subsets of the second allocation schemes;
signaling the allocation scheme to be used in an allocation signal.

2. The method of claim 1, wherein the subsets of the first allocation scheme are all different from the subsets of the second allocation scheme.

3. The method of claim 2 where the subsets are all of equal size.

4. The method of claim 3 where the subsets of the second allocation scheme are shifted by an amount not equal to size of a subset.

5. A primary station comprising signaling means for indicating an allocation of resources to a secondary station, said signaling means comprising means for selecting an allocation scheme from at least a first allocation scheme and a second allocation scheme, each allocation scheme being arranged to identify subsets of resources, wherein the resources of the subsets of the first allocation schemes are shifted from resources of the subsets of the second allocation schemes;
and wherein the signaling means are arranged for signaling the allocation scheme to be used in an allocation signal.

1/3

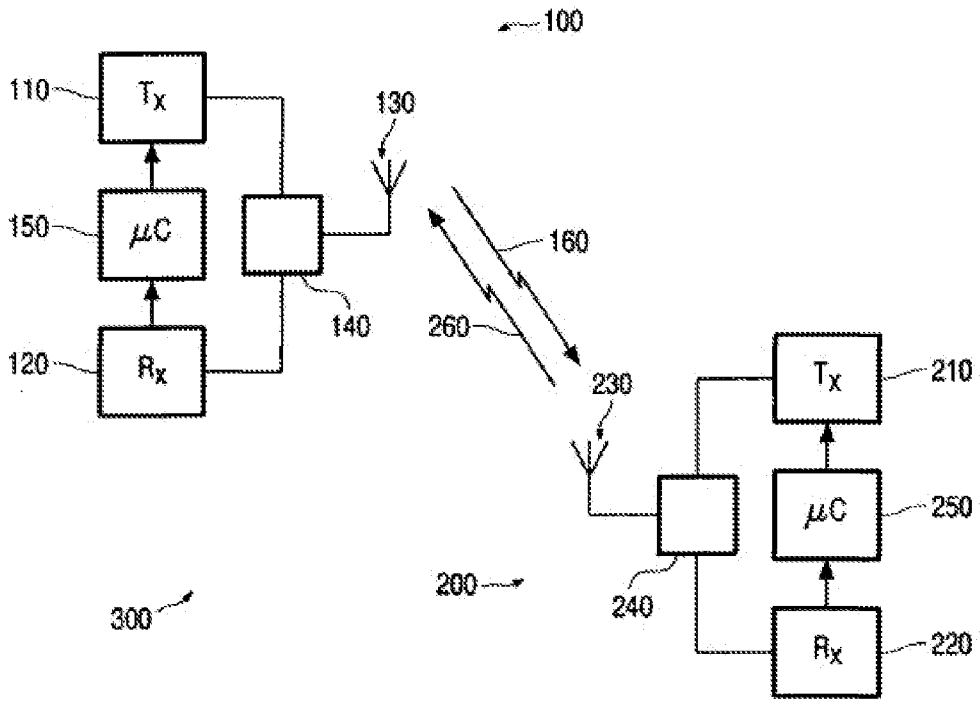
100
110
Tx
130
150
μC
160
140
260
120
Rx
230
Tx
210
μC
250
200
240
300
Rx
220

FIG 1

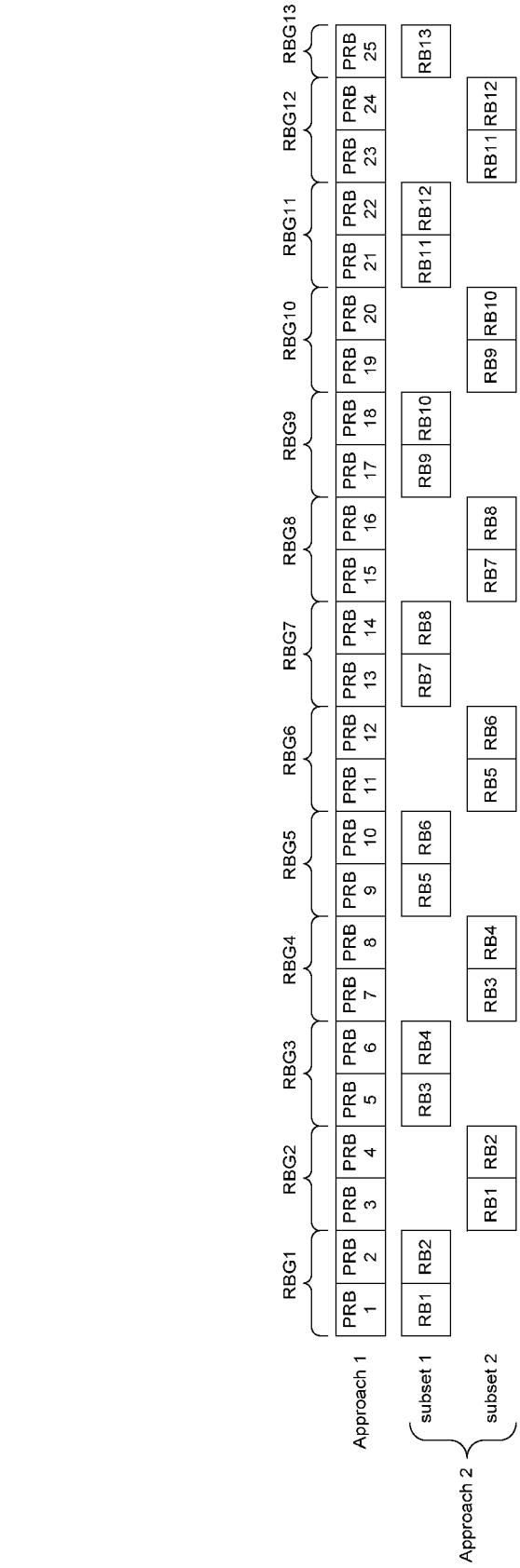
RBG1
RBG2
RBG3
RBG4
RBG5
RBG6
RBG7
RBG8
RBG9
RBG10
RBG11
RBG12
RBG13
PRB 1
PRB 2
PRB 3
PRB 4
PRB 5
PRB 6
PRB 7
PRB 8
PRB 9
PRB 10
PRB 11
PRB 12
PRB 13
PRB 14
PRB 15
PRB 16
PRB 17
PRB 18
PRB 19
PRB 20
PRB 21
PRB 22
PRB 23
PRB 24
PRB 25
Approach 1
RB1
RB2
RB3
RB4
RB5
RB6
RB7
RB8
RB9
RB10
RB11
RB12
RB13
subset 1
subset 2
Approach 2
RB1
RB2
RB3
RB4
RB5
RB6
RB7
RB8
RB9
RB10
RB11
RB12

FIG 2

3/3

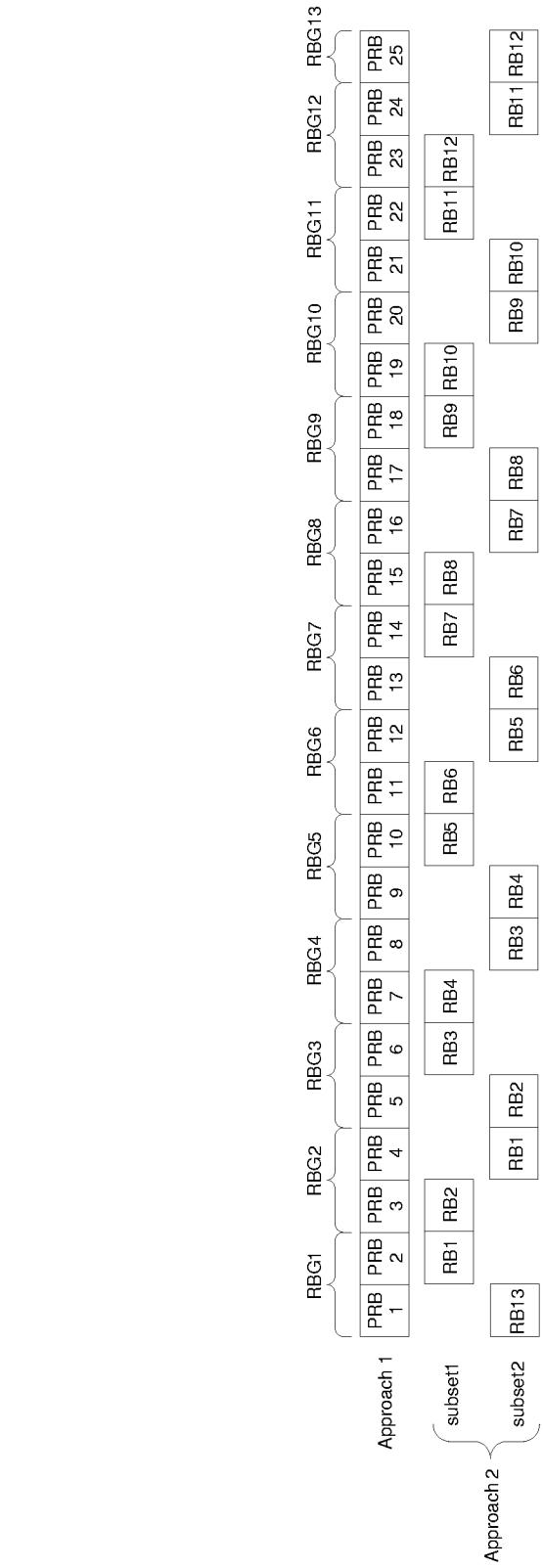
RBG1
RBG2
RBG3
RBG4
RBG5
RBG6
RBG7
RBG8
RBG9
RBG10
RBG11
RBG12
RBG13
PRB 1
PRB 2
PRB 3
PRB 4
PRB 5
PRB 6
PRB 7
PRB 8
PRB 9
PRB 10
PRB 11
PRB 12
PRB 13
PRB 14
PRB 15
PRB 16
PRB 17
PRB 18
PRB 19
PRB 20
PRB 21
PRB 22
PRB 23
PRB 24
PRB 25
Approach 1
RB1
RB2
RB3
RB4
RB5
RB6
RB7
RB8
RB9
RB10
RB11
RB12
subset1
Approach 2
RB13
RB1
RB2
RB3
RB4
RB5
RB6
RB7
RB8
RB9
RB10
RB11
RB12
subset2

FIG 3