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(54) Title: An eNB for notifying UE the TDD reconfiguration of the serving cell

	1st frame	2nd frame	3rd frame
Configuration of the interfering cell:	#2DSUDDDSUDD	#2DSUDDDSUDD	#2DSUDDDSUDD
Configuration of the serving cell:	#3DSUUUDSDDD	#1DSUDDDSUUD	#0DSUUUDSUUU
OLPC subframe pattern:			

"0" for OLPC with P0 1 without eNB-to-eNB interference from the neighboring cell
 "1" for OLPC with P0 2 with eNB-to-eNB interference from the neighboring cell

Fig. 1

(57) Abstract: The present invention aims to provide an eNB for notifying UE the TDD reconfiguration of the serving cell. An eNB for notifying UE the TDD reconfiguration of the serving cell is configured to signal a plurality of UEs TDD reconfiguration information of the serving cell via physical layer, wherein the TDD reconfiguration information contains at least one of the following items: - TDD UL-DL reconfiguration information; - OLPC subframe pattern information. Compared with the prior art, the present invention considers both TDD reconfiguration information and OLPC subframe pattern information. With the explicit L1 signalling of reconfiguration on CSS, such as a DCI containing TDD UL-DL reconfiguration information and/or OLPC subframe pattern information, the signalling overhead can be saved. With the explicit L1 signalling of reconfiguration on PDSCH, A/N for PDSCH increases the reliability of TDD reconfiguration and more signaling information can be conveyed on PDSCH.



An eNB for notifying UE the TDD reconfiguration of the serving cell

FIELD OF THE INVENTION

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The present invention relates to the field of mobile communications technology, and more specifically, to a technique of notifying UE (User Equipment) the TDD (Time Division Duplexing) reconfiguration of the serving cell.

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BACKGROUND OF THE INVENTION

In the WI of TDD eIMTA (enhanced Interference mitigation for traffic adaptation) in Rel-12, for the signaling mechanism of TDD reconfiguration, the following working assumption was agreed in the last RAN1 #73 meeting, and the detailed proposals will be discussed in the next

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- Explicit L1 signalling of reconfiguration by UE-group-common ePDCCH (Physical Downlink Control Channel) ;
- FFS which search space is used for this signalling;
- FFS the fallback solution to improve reliability and robustness of the explicit solution;
- FFS the necessary UL (Uplink) scheduling timing and HARQ (Hybrid Automatic Repeat Request) timing signalling;
- Strive to avoid additional blind decodes.

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In some tdocs submitted for #73 and the pervious meetings, for explicit L1 signaling, there are some proposals by using a new DCI (Downlink Control Information) with the same size as DCI 1C to notify the TDD reconfigurations on common search space (CSS). However, no detailed solution is presented by considering both CA (Carrier Aggregation) and HTN (Heterogeneous Netwroks) with the same cell ID among the marco and pico cells. In addition, there is on consideration of open-loop power control (OLPC) subframe pattern in L1 signaling

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in current proposals.

SUMMARY OF THE INVENTION

The present invention aims to provide an eNB for notifying UE the TDD reconfiguration of the
5 serving cell.

According to one aspect of the present invention, an eNB for notifying UE the TDD reconfiguration of the serving cell is provided. The eNB is configured to:

- signal a plurality of UEs TDD reconfiguration information of the serving cell via physical layer,
10 wherein the TDD reconfiguration information contains at least one of the following items:

- TDD UL-DL reconfiguration information;
- OLPC subframe pattern information.

According to another aspect of the present invention, an UE for receiving TDD reconfiguration
15 information of the serving cell is provided. The UE is configured to:

- receive a DCI on CSS for notifying the TDD reconfiguration of the serving cell via physical layer, wherein the DCI contains at least one of the following items:

- TDD UL-DL reconfiguration field containing TDD UL-DL reconfiguration information;

20 - OLPC subframe pattern field containing OLPC subframe pattern information;

- respond with a ACK message to the serving cell if the received DCI is correctly decoded and a NACK message to the serving cell if the received DCI is incorrectly decoded;

- work under the notified TDD reconfiguration of the serving cell in the next frame if the received DCI is correctly decoded.

25 Compared with the prior art, the present invention considers both TDD reconfiguration information and OLPC subframe pattern information. With the explicit L1 signalling of reconfiguration on CSS, such as a DCI containing TDD UL-DL reconfiguration information and/or OLPC subframe pattern information, the signalling overhead can be saved. Further, with
30 introduction of ACK/NACK (A/N) feedback of the DCI signaling, the reliability of explicit L1

signalling of reconfiguration on CSS is well improved. In addition, with the reconfiguration information on PDSCH, A/N for PDSCH increases the reliability of TDD reconfiguration and more signaling information can be conveyed on PDSCH. Besides, by notification of TDD UL-DL configuration of the neighboring cells, the OLPC subframe pattern can be implicitly signaled.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Through reading the following detailed depiction on the non-limiting embodiments with reference to the accompanying drawings, the other features, objectives, and advantages of the present invention will become clearer.

Fig. 1 shows an example on the variation of the OLPC subframe pattern triggered by TDD reconfiguration of the serving cell.

Same or like reference numerals in the accompanying drawings indicate the same or corresponding components.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, the present invention will be further described in detail with reference to the accompanying drawings.

In the last RAN1 #73 meeting, it was also agreed that at least two subframe sets can be configured to support separate open-loop power control parameters (P0 and alpha). Considering the agreed working assumption of explicit L1 signalling of reconfiguration by UE-group-common ePDCCH was taken, the OLPC subframe pattern may be changed dynamically, i.e. the subframe sets for which two sets of the OLPC parameters (P0 and alpha) are applied. The eNB-to-eNB mainly depends on the TDD UL-DL configurations of the serving cell and the vicinity neighboring cells.

In case the variation of the OLPC subframe pattern is triggered by TDD reconfiguration of the serving cell, the OLPC subframe pattern to be applied can also be carried on explicit L1 signaling for reconfiguration by UE-group common ePDCCH. Fig. 1 gives an example on the variation of the OLPC subframe pattern caused by dynamic TDD reconfiguration of the serving cell. For the variation of the OLPC subframe pattern triggered by TDD reconfiguration of any neighboring cell, another new explicit/implicit L1 signaling may be needed for the subframe pattern notification, which is beyond the scope of the concerned L1 signaling for TDD reconfigurations of the present invention.

In the present invention, several new signaling mechanisms under above assumptions considering TDD reconfiguration information and/or OLPC subframe pattern information are provided.

An eNB notifies UEs the TDD reconfiguration of the serving cell. Specifically, the eNB signals a plurality of UEs TDD reconfiguration information of the serving cell via physical layer, wherein the TDD reconfiguration information contains but not limited to the following items:

- 1) TDD UL-DL reconfiguration information;
- 2) OLPC subframe pattern information;
- 3) TDD UL-DL reconfiguration information and OLPC subframe pattern information.

Further, a new DCI is defined for the above reconfiguration information used to notify the TDD reconfigurations of the serving cell on CSS, wherein TDD UL-DL reconfiguration information is contained in a TDD UL-DL reconfiguration field and/or OLPC subframe pattern information is contained in an OLPC subframe pattern field.

The above reconfiguration information for notifying the TDD reconfigurations of the serving cell can also be used on PDSCH, and the occupied PDSCH resources are scheduled by TDD eIMTA-capable UEs separately with different DL grant scrambled by C-RNTI on UE search space (USS).

The signaling designs of TDD UL-DL reconfiguration information are as follows:

a) TDD UL-DL reconfiguration of one or more CCs (carrier components).

i) TDD UL-DL reconfiguration of each varied CC is notified separately.

5 Carrier indicator field (CIF) and the corresponding reconfiguration should be carried in the explicit L1 signaling.

ii) TDD UL-DL reconfigurations of multiple CC are delivered together.

- Without CIF

10 TDD (re)configurations of all CCs are delivered by ascending/descending order of the CC indexes in case one CC is reconfigured.

- With CIF

The reconfigurations of the varied CCs are delivered with CIF.

b) Signal by TDD configuration combinations of multiple CCs.

15 Candidates of TDD (re)configurations of one or more combinations of a plurality of CCs are signaled via higher layer.

The notification of the configured one candidate of TDD configurations of one combination is carried on PHY signaling.

20 c) Signal for a group (groups) of CCs with the same reconfigurations.

CCs with same TDD reconfiguration are grouped and this information is signaled via higher layer.

The group index and TDD reconfiguration of the reconfigured group are delivered.

25 TDD reconfigurations of multiple groups are signaled by ascending/descending order of the group indexes in case one CC is reconfigured.

The signaling designs of OLPC subframe pattern information are as follows:

a) Bitmap manner in the OLPC subframe pattern information and each bit indicates the OLPC parameter set.

30 Since there are maximum 5 flexible subframes among 7 TDD configurations, thus maximum 5

bits can be used to notify via a bitmap manner.

Among the 5 flexible subframes, if a DL (Downlink) subframe is configured in the serving cell, the corresponding bit will be ignored in the OLPC subframe pattern due no ULPC (uplink power control) is needed for a DL subframe.

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b) Higher layer signaling + L1 signaling to reduce the signaling overhead

Configure candidate subframe patterns (a subset of 2^5 subframe patterns) and the parameters for different subframe sets in subframe patterns, including the parameters of different Po_{cell}, Po_{ue} sets, i.e. {Po_{ue1}, Po_{ue2}, ..., Po_{uek}, } and alpha. These configurations are signaled through higher layer .

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PHY layer signaling is used to indicate the adopted subframe pattern.

1-3 bits are suggested for PHY indication, depending on the provided candidates of subframe patterns by higher layer.

15 In case of the TDD reconfiguration information is on CSS, the size thereof corresponding to different signaling designs are described in the below.

1) signal for each reconfigured CC separately

- 3bit (CC Indicator of the reconfigured CC) + 3bits (TDD UL-DL reconfigurations)+1-3/5

20 bits(Optional, OLPC subframe pattern)+“0” for other bits; or

- same size as DCI 1C with a new cell-specific RNTI for different cell ID cases;

- same size as DCI 1C with TP-specific RNTIs for HTN scenarios with the same cell ID, and the TP-specific RNTIs are signalled via higher layer signaling.

25 2) signal for all reconfigured CCs together

- maximum 7 CCs are configured, to avoid CIF in CSS, [3bits (TDD UL-DL reconfigurations)+1-3/5 bits(Optional, OLPC subframe pattern)]*7, by ascending order of the CC indexes;

- for CCs without reconfigurations, zero bits or repeat information can be carried instead;

30 - same size as DCI 1C/1A/2A (1A/2A, with 1-3/5-bit OLPC subframe pattern) with a new

cell-specific RNTI for different cell ID cases;

- same size as DCI 1C/1A (1A/2A, with 1-3/5-bit OLPC subframe pattern) with TP-specific RNTIs for HTN scenarios with the same cell ID, and the TP-specific RNTIs are signalled via higher layer signaling.

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3) signal by TDD configuration combinations of multiple CCs

- 1-N bits (Indicator of the combination of the TDD configurations of multiple CCs)+ “0” for other bits;

- the maximum number of the candidates of the combinations could be 2^N ;

10 • for maximum 5 CCs are configured, there are maximum 7^5 combinations, thus about N=15 bits is enough for differentiation;

- to reduce the signaling overhead, a smaller number of combinations could be selected;

- to reduce the signaling overhead, a subsets of TDD configuration combination of multiple CCs are supported through higher layer configuration;

15 - the notification of the configured one is carried on PHY signaling within the DCI defined by the present invention;.

- since the OLPC subframe patterns are CC-specific, i.e. different CCs have different interference levels on different subframe sets, the OLPC subframe pattern field is carefully considered only if the OLPC subframe patterns for one or more of the CCs within a combination are provided, and the OLPC subframe pattern information can be signaled on a combination basis;

20

- same size as DCI 1C with a new cell-specific RNTI for different cell ID cases;

- same size as DCI 1C with TP-specific RNTIs for HTN scenarios with the same cell ID, and the TP-specific RNTIs are signalled via higher layer signaling.

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4) signal for a group (groups) of CCs with the same reconfigurations. A special case is that each CC is a CC group

- 1-3bits (CC group indicator) + 3bits (TDD UL-DL reconfigurations)+ “0” for other bits; or

- [1-3bit (CC group indicator) + 3bits (TDD UL-DL reconfigurations)]*N, by ascending order of the CC group index. N is the number of the reconfigured CC groups;

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- CCs are grouped to different groups, the group configurations are signaled via higher layer;
- since the OLPC subframe patterns are CC-specific, i.e. different CCs have different interference levels on different subframe sets, the OLPC subframe pattern information is carefully considered only if the OLPC subframe patterns for all CCs within a group are provided;
- same size as DCI 1C/1A (1A, with $5 \leq N \leq 7$) with a new cell-specific RNTI for different cell ID cases;
- same size as DCI 1C/1A (1A, (1A, with $5 \leq N \leq 7$) with TP-specific RNTIs for HTN scenarios with the same cell ID, and the TP-specific RNTIs are signalled via higher layer signaling.

For the introduced new DCI on CSS above, the new DCI with the same size with the used DCI formats in current specification will not increase the complexity of blind decoding. However, the additional burden introduced by descrambling of CRC by a new RNTI is innegligible. In order to decrease the additional descrambling burden introduced by a new RNTI, the reconfiguration signaling is defined to be only delivered on specific subframe, e.g. subframe #0.

The advantage of the explicit L1 signalling of reconfiguration on CSS is it could save the signaling overhead. However, since there is no A/N feedback for common signaling, the reliability issues should be carefully considered to avoid the interference caused by missing or wrong detection of the TDD reconfiguration. To enhance the reliability of the TDD reconfigured by a UE-group common manner on CSS, the following solutions are provided:

- 1) e)PDCCH with high CCE aggregation level;
- 2) long CRC field;
- 3) duplicate transmissions on multiple subframes, e.g. subframe #0 and #1 in a frame, CC combining can be applied to decrease the PDCCH error rate.

In addition, A/N for this UE-group common PHY signaling is also provided, like A/N for PDCCH for SPS release.

The reconfiguration will be valid in the next frame for both eNB and the UEs correctly decoded the reconfiguration signaling. Then the Ues work under the notified TDD reconfiguration of the serving cell in the next frame.

- 5 Based on A/N for the UE-group common PHY signaling, the following fallback solutions to improve the reliability and robustness of the explicit L1 signaling solution are considered.

- ACK->NACK, or missing the signaling, retransmit the UE-group common PHY signaling;
- NACK->ACK, UE fallbacks to the procedures like a legacy UE which works under the

10 semi-static configuration of the serving cell or fallbacks to the previous configuration of the serving cell, ignoring the DL assign and UL grant on the collision subframes;

wherein ACK->NACK means UE correctly decoded the reconfiguration signaling but wrongfully respondes a NACK message, NACK->ACK means UE incorrectly decoded the reconfiguration signaling and wrongfully respondes a ACK message.

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Additionally, for HTN scenarios where macro and pico cells share a same cell ID, if the serving cell of the eNB and another cell are sharing a same cell ID, the TP-specific RNTIs are signalled via higher layer.

- 20 As described above, the TDD UL-DL reconfiguration information and OLPC subframe pattern information via USS can be contained in a signaling block, which are designed similar to those on CSS.

Further, in case of the TDD reconfiguration information is used on CSS, a signaling block

25 including the TDD UL-DL reconfiguration for different CCs, the OLPC subframe pattern indicator for each reconfigured CC, e.g. the above fields, and the TDD UL-DL configuration of the other neighboring cells, can be delivered on the same PDSCH resources for all TDD eIMTA-capable UEs.

- 30 In some cases, the above signaling block may include the TDD UL-DL reconfiguration for

different CCs of the serving cell and the TDD UL-DL configuration of the other neighboring cells. Accordingly, UE can compute the OLPC subframe pattern based on these TDD UL-DL reconfigurations.

- 5 The above PDSCH resources are scheduled by TDD eIMTA-capable UEs separately with different DL grant scrambled by C-RNTI on USS.

For HTN with the same cell ID, multiple signaling blocks may be allocated for UEs in different TPs with different TDD UL-DL reconfigurations.

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The advantages of the TDD reconfiguration information on USS lie in:

- 1) A/N for PDSCH increases the reliability of TDD UL-DL reconfiguration;
 - 2) more signaling information can be conveyed on PDSCH;
 - 3) by notification of TDD UL-DL configuration of the neighboring cells, the OLPC subframe
- 15 pattern can be implicitly signaled.

However, the disadvantage is also obvious that it costs more signaling over head on PDCCH via dedicated DCIs which indicates the PDSCH resources with TDD reconfiguration information.

- 20 Since A/N reply for PDSCH has already existed, thus to improve reliability and robustness of this solution, the same fallback solution as described above can be also adopted.

It should be noted that the present invention may be implemented in software or a combination of software and hardware; for example, it may be implemented by an ASIC (Application

25 Specific Integrated Circuit), a general-purpose computer, or any other similar hardware devices.

The software program of the present invention may be executed by a processor to implement the above steps or functions. Likewise, the software program of the present invention (including relevant data structure) may be stored in a computer readable recording medium, for example, a

30 RAM memory, a magnetic or optical driver, or a floppy disk, and other similar devices. Besides,

some steps or functions of the present invention may be implemented by hardware, for example, a circuit cooperating with a processor to execute various functions or steps.

Additionally, a portion of the present invention may be applied as a computer program product, for example, a computer program instruction, which, may invoke or provide a method and/or technical solution according to the present invention through operations of the computer when executed by the computer. Further, the program instruction invoking the method of the present invention may be stored in a fixed or mobile recording medium, and/or transmitted through broadcast or data flow in other signal bearer media, and/or stored in a working memory of a computer device which operates based on the program instruction. Here, one embodiment according to the present invention comprises an apparatus comprising a memory for storing a computer program instruction and a processor for executing the program instruction, wherein when the computer program instruction is executed by the processor, the apparatus is triggered to run the methods and/or technical solutions according to a plurality of embodiments of the present invention.

To those skilled in the art, it is apparent that the present invention is not limited to the details of the above exemplary embodiments, and the present invention may be implemented with other embodiments without departing from the spirit or basic features of the present invention. Thus, in any way, the embodiments should be regarded as exemplary, not limitative; the scope of the present invention is limited by the appended claims instead of the above description, and all variations intended to fall into the meaning and scope of equivalent elements of the claims should be covered within the present invention. No reference signs in the claims should be regarded as limiting of the involved claims. Besides, it is apparent that the term “comprise” does not exclude other units or steps, and singularity does not exclude plurality. A plurality of units or modules stated in a system claim may also be implemented by a single unit or module through software or hardware. Terms such as the first and the second are used to indicate names, but do not indicate any particular sequence.

CLAIMS

1. An eNB for notifying UE the TDD reconfiguration of the serving cell, wherein the eNB is configured to:

- signal a plurality of UEs TDD reconfiguration information of the serving cell via physical layer, wherein the TDD reconfiguration information contains at least one of the following items:

- TDD UL-DL reconfiguration information;
- OLPC subframe pattern information.

2. The eNB of claim 1, wherein the TDD reconfiguration information contains TDD UL-DL reconfiguration information;

wherein the TDD UL-DL reconfiguration information further includes TDD UL-DL reconfiguration of one or more CCs.

3. The eNB of claim 1 or 2, wherein the TDD reconfiguration information contains OLPC subframe pattern information;

wherein the OLPC subframe pattern information further includes maximum 5 bits indicating interference from the neighboring cell in a bitmap manner of each reconfigured CC.

4. The eNB of claim 1, wherein the TDD reconfiguration information contains TDD UL-DL reconfiguration information;

wherein the eNB is configured to:

- signal the plurality of UEs candidates of TDD configurations of one or more combinations of a plurality of CCs via higher layer;

wherein the TDD UL-DL reconfiguration information further includes an indication of the configured candidate of TDD configurations of one combination.

5. The eNB of claim 1 or 4, wherein the TDD reconfiguration information contains OLPC subframe pattern information;

wherein the eNB is configured to:

- signal the plurality of UEs candidates of subframe patterns of a combination of one or more of the CCs via higher layer;

wherein the OLPC subframe pattern information further includes an indication of the configured candidate of subframe patterns.

6. The eNB of claim 1, wherein the TDD reconfiguration information contains TDD UL-DL reconfiguration information;

wherein the eNB is configured to:

- group CCs with same TDD reconfiguration and signal the plurality of UEs with the group information via higher layer;

wherein the TDD UL-DL reconfiguration information further includes the group index and TDD reconfiguration of the reconfigured group.

7. The eNB of claim 1 or 6, wherein the TDD reconfiguration information contains OLPC subframe pattern information and all the CCs are within one group with same TDD reconfiguration;

wherein the OLPC subframe pattern information further includes the subframe pattern of each CC.

8. The eNB of any of claims 1-7, wherein the TDD reconfiguration information is using on common search space or PDSCH.

9. The eNB of claim 8, wherein the TDD reconfiguration information used on common search space is contained in a new DCI with a TDD UL-DL reconfiguration field containing TDD UL-DL reconfiguration information and/or an OLPC subframe pattern field containing OLPC subframe pattern information.

10. The eNB of claim 9, wherein the eNB is further configured to:

- signal the DCI in subframe #0 and dublicately transmit the DCI in subframe #1.

11. The eNB of any of claims 8-10c, wherein the TDD reconfiguration information is using on common search space;

wherein the eNB is further configured to:

- receive the response with ACK/NACK message from the plurality of UEs;
- retransmit the reconfiguration information to at least one of the UEs when the at least one of the UEs responds a NACK message or misses the signaling.

12. The eNB of any of claims 8-11, wherein the TDD reconfiguration information is using on common search space;

wherein the eNB is further configured to:

- signal the plurality of UEs the TP-specific RNTIs via higher layer in HTN scenarios where the serving cell of the eNB and another cell are sharing a same cell ID.

13. The eNB of claim 8, wherein the TDD reconfiguration information is using on PDSCH;

wherein the TDD reconfiguration information is delivered on the same PDSCH resources for the plurality of UEs, and the PDSCH resources are scheduled by each of the UEs separately with different DL grant scrambled by C-RNTI on UE search space.

14. An UE for receiving TDD reconfiguration information of the serving cell, wherein the UE is configured to:

- receive a DCI on CSS for notifying the TDD reconfiguration of the serving cell via physical layer, wherein the DCI contains at least one of the following items:
 - TDD UL-DL reconfiguration field containing TDD UL-DL reconfiguration information;
 - OLPC subframe pattern field containing OLPC subframe pattern information;

- respond with a ACK message to the serving cell if the received DCI is correctly decoded and a NACK message to the serving cell if the received DCI is incorrectly decoded;
- work under the notified TDD reconfiguration of the serving cell in the next frame if the received DCI is correctly decoded.

15. The UE of claim 14, wherein the UE is further configured to:

- fallback to previous configuration or semi-static configuration of the serving cell when signaling error happens in the DCI signaling.

	1st frame	2nd frame	3rd frame																
Configuraition of the interfering cell:	#2 D S U D D D S U D D	#2 D S U D D D S U D D	#2 D S U D D D S U D D																
Configuration of the serving cell:	#3 D S U U U D S D D D	#1 D S U U D D S U U D	#0 D S U U U D S U U U																
OLPC subframe pattern:	<table><tr><td>1</td><td>1</td></tr></table> <table><tr><td>×</td><td>×</td><td>×</td><td>×</td></tr></table>	1	1	×	×	×	×	<table><tr><td>1</td><td>×</td></tr></table> <table><tr><td>0</td><td>1</td><td>×</td></tr></table>	1	×	0	1	×	<table><tr><td>1</td><td>1</td></tr></table> <table><tr><td>0</td><td>1</td><td>1</td></tr></table>	1	1	0	1	1
1	1																		
×	×	×	×																
1	×																		
0	1	×																	
1	1																		
0	1	1																	
"0" for OLPC with P0_1 without eNB-to-eNB interference from the neighboring cell																			
"1" for OLPC with P0_2 with eNB-to-eNB interference from the neighboring cell																			

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/081219

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/04(2009.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04B; H04W; H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI;CNABS;CNTXT;VEN: TDD, time division duplex, reconfiguration, uplink, UL, downlink, DL, OLPC, open loop power control, CC, component carrier

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012039252A1 (QUALCOMM INC) 16 February 2012 (2012-02-16) paragraphs 0029-0032 of description	1, 2, 8-11, 14, 15
Y	US 2012039252A1 (QUALCOMM INC) 16 February 2012 (2012-02-16) paragraphs 0029-0032 of description	1, 2, 8-11, 14, 15
Y	CN 102334364A (QUALCOMM INC) 25 January 2012 (2012-01-25) paragraphs 0037-0045 of description	1, 2, 8-11, 14, 15
A	CN 102076031A (DATANG MOBILE COMMUNICATIONS EQUIP CO., LTD.) 25 May 2011 (2011-05-25) the whole document	1-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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