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[Continued on next page]

(54) Title: DISCONTINUOUS TRANSMISSION SIGNALING OVER AN UPLINK CONTROL CHANNEL

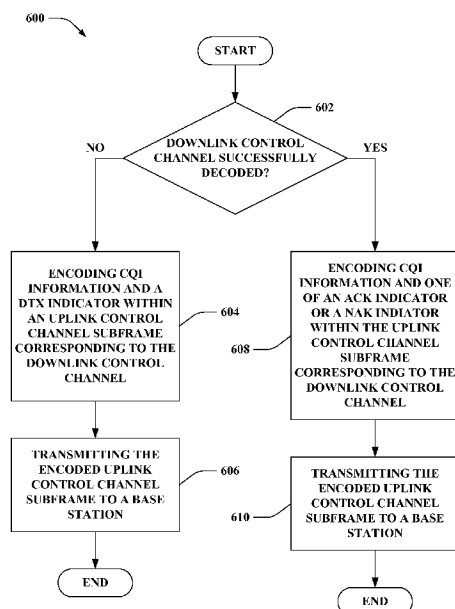


FIG. 6

(57) Abstract: Systems and methodologies are described that facilitate signaling and detecting discontinuous transmission (DTX) in a wireless communication environment. A DTX indicator and Channel Quality Indicator (CQI) feedback can be multiplexed within a common uplink control channel subframe and transmitted to a base station when the access terminal is operating in DTX mode for an Acknowledgement Channel. Further, when operating in non-DTX mode, the access terminal can multiplex an ACK indicator or a NAK indicator with the CQI feedback within a common uplink control channel subframe, which can thereafter be transferred to the base station. Accordingly, the base station can detect DTX operation or non-DTX operation of the access terminal. For example, reference signal symbols can carry one of the DTX indicator, the ACK indicator, or the NAK indicator. Pursuant to another example, the CQI feedback and the DTX indicator can be combined and carried jointly by non-reference signal symbols.



OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/033221

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L1/00

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)

H04L H04Q

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/202147 A1 (HAKKINEN HANNU [FI] ET AL HAKKINEN HANNU [FI] ET AL) 14 October 2004 (2004-10-14)	1-34
A	abstract; figures 1-5 paragraph [0007] - paragraph [0010] paragraph [0025] - paragraph [0028] paragraph [0030] paragraph [0045] - paragraph [0047]	35-50
A	RAN WG1: "Reply LS on CQI feedback" 3GPP DRAFT; R1-072639, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Kobe, Japan; 20070507, 23 May 2007 (2007-05-23), XP050106322 page 2, line 2 - line 35 ----- -/--	1-50



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 document 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

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

12 November 2009

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18/11/2009

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/033221

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PHILIPS ET AL: "Correction of DTX transmission in ACK/NACK field" 3GPP DRAFT; R1-02-1422 CR25214-295R2, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Shanghai, China; 20021105, 7 November 2002 (2002-11-07), XP050097112 page 4, line 19 - line 38	1-50
X	ALCATEL-LUCENT: "Multiplexing the Scheduling Request in the Uplink" 3GPP DRAFT; R1-074276_MUX_SRS, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Shanghai, China; 20071002, 2 October 2007 (2007-10-02), XP050107795 [retrieved on 2007-10-02] page 2, line 5 - line 12 page 3, line 1 - line 10 Table 1	35-50
A	page 2, line 5 - line 12 page 3, line 1 - line 10 Table 1	1-34
A	NOKIA SIEMENS NETWORKS ET AL: "Multiplexing of Scheduling Request with ACK/NACK and/or CQI" 3GPP DRAFT; R1-080312, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Sevilla, Spain; 20080108, 8 January 2008 (2008-01-08), XP050108833 [retrieved on 2008-01-08] the whole document	1-50
A	US 2003/185159 A1 (SEO MYEONG-SOOK [KR] ET AL) 2 October 2003 (2003-10-02) abstract; figures 3-5 paragraph [0042] paragraph [0123]	1-50

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/033221

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-34

encoding CQI and a DTX indicator within an uplink control
channel subframe

2. claims: 35-50

decoding an uplink control channel subframe, the subframe
containing a CQI and an indication of a successful or
unsuccessful decodation of a downlink channel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/033221

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004202147 A1	14-10-2004	NONE	
US 2003185159 A1	02-10-2003	KR 20030076908 A	29-09-2003