3GPP TSG-RAN WG1 #51
Jeju, Korea, November 5 – 9, 2007

⌘R1-07xxxx

CR-Form-v9.3

# DRAFT CHANGE REQUEST

⌘ 36.212 CR CRNum ⌘rev - ⌘ Current version: 8.0.0 ⌘

*For **HELP** on using this form look at the pop-up text over the ⌘ symbols. Comprehensive instructions on how to use this form can be found at http://www.3gpp.org/specs/CR.htm.*

***Proposed change affects:*** UICC apps⌘ ☐ ME [X] Radio Access Network [X] Core Network ☐

| | | |
|---|---|---|
| ***Title:*** | ⌘ | Update of 36.212 |
| ***Source to WG:*** | ⌘ | Editor (Qualcomm Europe) |
| ***Source to TSG:*** | ⌘ | |
| ***Work item code:*** | ⌘ | ***Date:*** ⌘ 02/11/2007 |
| ***Category:*** | ⌘ | F ***Release:*** ⌘ Rel-8 |

*Use one of the following categories:*
***F*** *(correction)*
***A*** *(corresponds to a correction in an earlier release)*
***B*** *(addition of feature),*
***C*** *(functional modification of feature)*
***D*** *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

*Use one of the following releases:*
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)
Rel-8 (Release 8)

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | Decisions taken at RAN1#50bis need to be reflected in 36.212 |
| ***Summary of change:*** | ⌘ | Inclusion of decisions from RAN1#50bis |
| ***Consequences if not approved:*** | ⌘ | Incomplete LTE physical layer specifications |

| | | | | |
|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | | | |
| | | Y | N | |
| ***Other specs affected:*** | ⌘ | | | Other core specifications ⌘ |
| | | | | Test specifications |
| | | | | O&M Specifications |
| ***Other comments:*** | ⌘ | | | |

**Commented [H1]:** Document numbers are allocated by the Working Group Secretary. Use the format of document number specified by the 3GPP Working Procedures.

**Commented [H2]:** Enter the specification number in this box. For example, 04.08 or 31.102. Do not prefix the number with anything . i.e. do not use "TS", "GSM" or "3GPP" etc.

**Commented [H3]:** Enter the CR number here. This number is allocated by the 3GPP support team. It consists of at least four digits, padded with leading zeros if necessary.

**Commented [H4]:** Enter the revision number of the CR here. If it is the first version, use a "-".

**Commented [H5]:** Enter the version of the specification here. This number is the version of the specification to which the CR was written and (normally) to which it will be applied if it is approved. Make sure that the latest version of the specification (of the relevant release) is used when creating the CR. If unsure what the latest version is, go to http://www.3gpp.org/specs/specs.htm.

**Commented [H6]:** For help on how to fill out a field, place the mouse pointer over the special symbol closest to the field in question.

**Commented [H7]:** Mark one or more of the boxes with an X.

**Commented [H8]:** SIM / USIM / ISIM applications.

**Commented [H9]:** Enter a concise description of the subject matter of the CR. It should be no longer than one line, but if this is not possible, do not enter hard new-line characters. Do not use redundant information such as "Change Request number xxx to 3GPP TS xx.xxx".

**Commented [H10]:** One or more organizations (3GPP Individual Members) which drafted the CR and are presenting it to the Working Group.

**Commented [H11]:** For CRs agreed at Working Group level, the identity of the WG. Use the format "xn" where
x = "C" for TSG CT, "R" for TSG RAN, "S" for TSG SA, "G" for for TSG GERAN;
n = digit identifying the Working Group; for CRs drafted during the TSG meeting itself, use "P".
Examples: "C4", "R5", "G3new", "SP".

**Commented [H12]:** Enter the acronym for the work item which is applicable to the change. This field is mandatory for category F, A, B & C CRs for Release 4 and later. A list of work item acronyms can be found in the 3GPP work plan. See http://www.3gpp.org/ftp/Specs/html-info/WI-List.htm .

**Commented [H13]:** Enter the date on which the CR was last revised. Format to be interpretable by English version of MS Windows ® applications, e.g. 19/02/2006.

**Commented [H14]:** Enter a single letter corresponding to the most appropriate category listed. For more detailed help on ... [1]

**Commented [H15]:** Enter a single release code from the list below.

**Commented [H16]:** Enter text which explains why the change is necessary.

**Commented [H17]:** Enter text which describes the most important components of the change. i.e. How the change is made.

**Commented [H18]:** Enter here the consequences if this CR were to be rejected. It is mandatory to complete this section c ... [2]

**Commented [H19]:** Enter the number of each clause which contains changes. Be as specific as possible (ie list each sub ... [3]

**Commented [H20]:** Tick "yes" box if any other specifications are affected by this change. Else tick "no". You MUST fill i ... [4]

**Commented [H21]:** List here the specifications which are affected or the CRs which are linked.

**Commented [H22]:** Enter any other information which may be needed by the group being requested to approve the CR. This ... [5]

# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document specifies the coding, multiplexing and mapping to physical channels for E-UTRA.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in [1].

(no further definitions)

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

~~(no symbols defined)~~

$N_{\text{symb}}^{\text{UL}}$ Number of SC-FDMA symbols in an uplink slot

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## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

| | |
|---|---|
| BCH | Broadcast channel |
| CFI | Control format indicator |
| DL-CCH | Downlink Control channel |
| DL-SCH | Downlink Shared channel |
| HI | HARQ indicator |
| MCH | Multicast channel |
| PBCH | Physical Broadcast channel |
| PCFICH | Physical Control Format Indicator channel |

| | |
|---|---|
| PCH | Paging channel |
| PDCCH | Physical Downlink Control channel |
| PDSCH | Physical Downlink Shared channel |
| PHICH | Physical HARQ indicator channel |
| PMCH | Physical Multicast channel |
| PRACH | Physical Random Access channel |
| PUCCH | Physical Uplink Control channel |
| PUSCH | Physical Uplink Shared channel |
| RACH | Random Access channel |
| UL-CCH | Uplink Control channel |
| UL-SCH | Uplink Shared channel |

# 4 Mapping to physical channels

## 4.1 Uplink

Table 4.1-1 specifies the mapping of the uplink transport channels to their corresponding physical channels. Table 4.1-2 specifies the mapping of the uplink control channel information to its corresponding physical channel.

**Table 4.1-1**

| TrCH | Physical Channel |
|---|---|
| UL-SCH | PUSCH |
| RACH | PRACH |

**Table 4.1-2**

| Control information | Physical Channel |
|---|---|
| UL-CCH | PUCCH |

## 4.2 Downlink

Table 4.2-1 specifies the mapping of the downlink transport channels to their corresponding physical channels. Table 4.2-2 specifies the mapping of the downlink control channel information to its corresponding physical channel.

**Table 4.2-1**

| TrCH | Physical Channel |
|---|---|
| DL-SCH | PDSCH |
| BCH | PBCH |
| PCH | PDSCH |
| MCH | PMCH |

**Table 4.2-2**

| Control information | Physical Channel |
|---|---|
| CFI | PCFICH |
| HI | PHICH |
| DL-CCH | PDCCH |

# 5 Channel coding, multiplexing and interleaving

Data and control streams from/to MAC layer are encoded/decoded to offer transport and control services over the radio transmission link. Channel coding scheme is a combination of error detection, error correcting, rate matching, interleaving and transport channel or control information mapping onto/splitting from physical channels.

## 5.1 Generic procedures

This section contains coding procedures which are used for more than one transport channel or control information type.

### 5.1.1 CRC calculation

Denote the input bits to the CRC computation by $a_0, a_1, a_2, a_3, ..., a_{A-1}$, and the parity bits by $p_0, p_1, p_2, p_3, ..., p_{L-1}$. $A$ is the size of the input sequence and $L$ is the number of parity bits. The parity bits are generated by one of the following cyclic generator polynomials:

- $g_{CRC24A}(D) = [D^{24} + D^{23} + D^{18} + D^{17} + D^{14} + D^{11} + D^{10} + D^7 + D^6 + D^5 + D^4 + D^3 + D + 1]$ and
- $g_{CRC24B}(D) = [D^{24} + D^{23} + D^6 + D^5 + D + 1]$ for a CRC length $L = 24$, and;
- $g_{CRC16}(D) = [D^{16} + D^{12} + D^5 + 1]$ for a CRC length $L = 16$.

The encoding is performed in a systematic form, which means that in GF(2), the polynomial:

$$a_0 D^{A+23} + a_1 D^{A+22} + ... + a_{A-1} D^{24} + p_0 D^{23} + p_1 D^{22} + ... + p_{22} D^1 + p_{23}$$

yields a remainder equal to 0 when divided by the corresponding length-24 CRC generator polynomial, $g_{CRC24A}(D)$ or $g_{CRC24B}(D)$, and the polynomial:

$$a_0 D^{A+15} + a_1 D^{A+14} + ... + a_{A-1} D^{16} + p_0 D^{15} + p_1 D^{14} + ... + p_{14} D^1 + p_{15}$$

yields a remainder equal to 0 when divided by $g_{CRC16}(D)$.

The bits after CRC attachment are denoted by $b_0, b_1, b_2, b_3, ..., b_{B-1}$, where $B = A + L$. The relation between $a_k$ and $b_k$ is:

$b_k = a_k$ for $k = 0, 1, 2, ..., A-1$

~~$b_k = p_{(L-1-(k-A))}$ for $k = A, A+1, A+2, ..., A+L-1$~~

$b_k = p_{k-A}$ for $k = A, A+1, A+2, ..., A+L-1$.

### 5.1.2 Code block segmentation and code block CRC attachment

The input bit sequence to the code block segmentation is denoted by $b_0, b_1, b_2, b_3, ..., b_{B-1}$, where $B > 0$. If $B$ is larger than the maximum code block size $Z$, segmentation of the input bit sequence is performed and an additional CRC sequence of $L = 24$ bits is attached to each code block. The maximum code block size is:

- $Z = 6144$.

If the number of filler bits $F$ calculated below is not 0, filler bits are added to the beginning of the first block.

Note that if $B < 40$, filler bits are added to the beginning of the code block.

The filler bits shall be set to <*NULL*> at the input to the encoder.

Total number of code blocks $C$ is determined by:

if $B \leq Z$

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