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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 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 ... [1]

Commented [H13]: Enter the date on which the CR was last revised. Format to be interpretable by English version ... [2]

Commented [H14]: Enter a single letter corresponding to the most appropriate category listed. For more detailed list ... [3]

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 ... [4]

Commented [H18]: Enter here the consequences if this CR were to be rejected. It is mandatory to complete this section ... [5]

Commented [H19]: Enter the number of each clause which contains changes. Be as specific as possible (ie list each ... [6]

Commented [H20]: Tick "yes" box if any other specifications are affected by this change. Else tick "no" ... [7]

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 ... [8]

CR-Form-v9.6

DRAFT CHANGE REQUEST

☞ 36.211 CR CRNum ☞ rev 1 ☞ Current version: 9.1.0 ☞

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 Radio Access Network Core Network

Title: ☞ Introduction of Rel-10 LTE-Advanced features in 36.211

Source to WG: ☞ Ericsson

Source to TSG: ☞

Work item code: ☞ **Date:** ☞ dd/mm/yyyy

Category: ☞ **B** **Release:** ☞ Rel-10

Use **one** of the following categories: Use **one** of the following releases:

F (correction)	R99 (Release 1999)
A (corresponds to a correction in an earlier release)	Rel-4 (Release 4)
B (addition of feature),	Rel-5 (Release 5)
C (functional modification of feature)	Rel-6 (Release 6)
D (editorial modification)	Rel-7 (Release 7)
Detailed explanations of the above categories can be found in 3GPP TR 21.900.	Rel-8 (Release 8)
	Rel-9 (Release 9)
	Rel-10 (Release 10)

Reason for change: ☞ Inclusion of Rel-10 decisions on carrier aggregation, enhanced downlink MIMO and uplink MIMO

Summary of change: ☞

Consequences if not approved: ☞ Rel-10 will be incomplete.

Clauses affected: ☞

	Y	N
Other specs affected: ☞	<input type="checkbox"/>	<input type="checkbox"/>
Other core specifications	<input type="checkbox"/>	<input type="checkbox"/>
Test specifications	<input type="checkbox"/>	<input type="checkbox"/>
O&M Specifications	<input type="checkbox"/>	<input type="checkbox"/>

Other comments: ☞

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.

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1 Scope

The present document describes the physical channels for evolved 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 36.201: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer – General Description".
- [3] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".
- [4] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".
- [5] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer – Measurements".
- [6] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".
- [7] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
- [8] 3GPP TS36.321, "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification"
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3 Definitions, symbols and abbreviations

3.1 Symbols

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

(k, l)	Resource element with frequency-domain index k and time-domain index l
$a_{k,l}^{(p)}$	Value of resource element (k, l) [for antenna port p]
D	Matrix for supporting cyclic delay diversity
D_{RA}	Density of random access opportunities per radio frame
f_0	Carrier frequency

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f_{RA}	PRACH resource frequency index within the considered time-domain location
M_{sc}^{PUSCH}	Scheduled bandwidth for uplink transmission, expressed as a number of subcarriers
M_{RB}^{PUSCH}	Scheduled bandwidth for uplink transmission, expressed as a number of resource blocks
$M_{bit}^{(q)}$	Number of coded bits to transmit on a physical channel [for codeword q]
$M_{symb}^{(q)}$	Number of modulation symbols to transmit on a physical channel [for codeword q]
M_{symb}^{layer}	Number of modulation symbols to transmit per layer for a physical channel
M_{symb}^{ap}	Number of modulation symbols to transmit per antenna port for a physical channel
N	A constant equal to 2048 for $\Delta f = 15$ kHz and 4096 for $\Delta f = 7.5$ kHz
$N_{CP,l}$	Downlink cyclic prefix length for OFDM symbol l in a slot
N_{CS}	Cyclic shift value used for random access preamble generation
$N_{cs}^{(1)}$	Number of cyclic shifts used for PUCCH formats 1/1a/1b in a resource block with a mix of formats 1/1a/1b and 2/2a/2b
$N_{RB}^{(2)}$	Bandwidth available for use by PUCCH formats 2/2a/2b, expressed in multiples of N_{sc}^{RB}
N_{RB}^{HO}	The offset used for PUSCH frequency hopping, expressed in number of resource blocks (set by higher layers)
N_{ID}^{cell}	Physical layer cell identity
N_{ID}^{MBSFN}	MBSFN area identity
N_{RB}^{DL}	Downlink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
$N_{RB}^{min, DL}$	Smallest downlink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
$N_{RB}^{max, DL}$	Largest downlink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
N_{RB}^{UL}	Uplink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
$N_{RB}^{min, UL}$	Smallest uplink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
$N_{RB}^{max, UL}$	Largest uplink bandwidth configuration, expressed in multiples of N_{sc}^{RB}
N_{symb}^{DL}	Number of OFDM symbols in a downlink slot
N_{symb}^{UL}	Number of SC-FDMA symbols in an uplink slot
N_{sc}^{RB}	Resource block size in the frequency domain, expressed as a number of subcarriers
N_{SP}	Number of downlink to uplink switch points within the radio frame
N_{RS}^{PUCCH}	Number of reference symbols per slot for PUCCH
N_{TA}	Timing offset between uplink and downlink radio frames at the UE, expressed in units of T_s
$N_{TA, offset}$	Fixed timing advance offset, expressed in units of T_s
$n_{PUCCH}^{(1)}$	Resource index for PUCCH formats 1/1a/1b
$n_{PUCCH}^{(2)}$	Resource index for PUCCH formats 2/2a/2b
n_{PDCCH}	Number of PDCCHs present in a subframe
n_{PRB}	Physical resource block number
n_{PRB}^{RA}	First physical resource block occupied by PRACH resource considered
$n_{PRB, offset}^{RA}$	First physical resource block available for PRACH
n_{VRB}	Virtual resource block number
n_{RNTI}	Radio network temporary identifier
n_f	System frame number
n_s	Slot number within a radio frame
P	<u>antenna ports</u>
p	Antenna port number <u>transmission port</u>
q	Codeword number
r_{RA}	Index for PRACH versions with same preamble format and PRACH density

Q_m	Modulation order: 2 for QPSK, 4 for 16QAM and 6 for 64QAM transmissions
$s_l^{(p)}(t)$	Time-continuous baseband signal for antenna port p and OFDM symbol l in a slot
$t_{RA}^{(0)}$	Radio frame indicator index of PRACH opportunity
$t_{RA}^{(1)}$	Half frame index of PRACH opportunity within the radio frame
$t_{RA}^{(2)}$	Uplink subframe number for start of PRACH opportunity within the half frame
T_f	Radio frame duration
T_s	Basic time unit
T_{slot}	Slot duration
W	Precoding matrix for downlink spatial multiplexing
β_{PRACH}	Amplitude scaling for PRACH
β_{PUCCH}	Amplitude scaling for PUCCH
β_{PUSCH}	Amplitude scaling for PUSCH
β_{SRS}	Amplitude scaling for sounding reference symbols
Δf	Subcarrier spacing
Δf_{RA}	Subcarrier spacing for the random access preamble
ν	Number of transmission layers

3.2 Abbreviations

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

CCE	Control channel element
CDD	Cyclic delay diversity
PBCH	Physical broadcast channel
PCFICH	Physical control format indicator channel
PDCCH	Physical downlink control channel
PDSCH	Physical downlink shared channel
PHICH	Physical hybrid-ARQ indicator channel
PMCH	Physical multicast channel
PRACH	Physical random access channel
PUCCH	Physical uplink control channel
PUSCH	Physical uplink shared channel

4 Frame structure

Throughout this specification, unless otherwise noted, the size of various fields in the time domain is expressed as a number of time units $T_s = 1/(15000 \times 2048)$ seconds.

Downlink and uplink transmissions are organized into radio frames with $T_f = 307200 \times T_s = 10$ ms duration. Two radio frame structures are supported:

- Type 1, applicable to FDD,
- Type 2, applicable to TDD.

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