TSG RAN Meeting #25   **RP-040319**
Palm Springs, CA USA, 7 - 9 September 2004

Title		**Linked CRs (Rel-4 and Rel-5/Rel-6 Category A) to TS25.224 & TS25.331 for corrections of radio access procedure for 1.28Mcps TDD**
Source		**TSG RAN WG1**
Agenda Item		**7.2.6**

RAN1/2 Tdoc	Spec	CR	Rev	Phase	Cat	Current Version	Subject	Workitem	Remarks
R1-041018	25.224	135	1	Rel-4	F	4.10.0	Corrections of radio access procedure for 1.28Mcps TDD	LCRTDD-Phys	
R1-041018	25.224	136	1	Rel-5	A	5.7.0	Corrections of radio access procedure for 1.28Mcps TDD	LCRTDD-Phys	There are related CRs on 25.433, in Tdoc RP-040324 (not claimed to be directly linked though).
R1-041018	25.224	137	1	Rel-6	A	6.1.0	Corrections of radio access procedure for 1.28Mcps TDD	LCRTDD-Phys	
R2-041764	25.331	2382	-	Rel-4	F	4.14.0	Correction on PRACH selection in 1.28Mcps TDD	LCRTDD-L23	
R2-041765	25.331	2383	-	Rel-5	A	5.9.0	Correction on PRACH selection in 1.28Mcps TDD	LCRTDD-L23	
R2-041766	25.331	2384	-	Rel-6	A	6.2.0	Correction on PRACH selection in 1.28Mcps TDD	LCRTDD-L23	

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CHANGE REQUEST

⌘ **25.224** CR **135** ⌘rev **1** ⌘ Current version: **4.10.0** ⌘

For **HELP** *on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

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

Title: ⌘	Corrections of radio access procedure for 1.28Mcps TDD
Source: ⌘	RAN WG1
Work item code:⌘	LCRTDD-Phys
Date: ⌘	04/08/2004

Category: ⌘ **F**

Use <u>one</u> 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.

Release: ⌘ Rel-4

Use <u>one</u> of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
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)

Reason for change: ⌘	In the current specification, the radio access procedure is not stated very clearly when the number of FPACH is more than one. The correct understanding should like this: there should be fixed mapping relation between RACH and FPACH, each RACH may be shared by users with different ASC. For all the configured RACH resources, UE should select one based on its transport format then randomly selects one SYNC-UL sequence based on its ASC and uniquely select the FPACH to listen the acknowledgement from Node B. In addition, the FPACH number that Node B sends the acknowledgement is chosen according to its received SYNC-UL number. This CR makes the corresponding change to clarify the procedure and make it easier for understanding.
Summary of change:⌘	In the current specification, the radio access procedure is not stated very clearly, this CR makes the corresponding change to clarify the procedure. This CR has isolated impacts on Node B and UE radio access functionality only when more than one FPACH is configured for a cell; if only one FPACH is configured in the cell, no any impact forseen.
Consequences if not approved: ⌘	The radio access procedure is not very clear, Node B and UE have no idea by which FPACH it should use for acknowledgement and listen to, respectively.

Clauses affected: ⌘	5.6

	Y	N		
Other specs ⌘	X		Other core specifications ⌘	25.331, 25.433
affected:		X	Test specifications	

	X	O&M Specifications	

Other comments:	⌘	There also has the corresponding changes in RAN2 and RAN3 specification.

How to create CRs using this form:

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Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.6   Random Access Procedure

The physical random access procedure described below is invoked whenever a higher layer requests transmission of a message on the RACH. The physical random access procedure is controlled by primitives from RRC and MAC.

5.6.1   Definitions

FPACH$_i$: : The ith FPACH ~~number i~~, parameter i indicates the position of the FPACH, the first position is corresponding to the first instance defined in IE "PRACH system information list" (see [15]).

L$_i$: Length of RACH transport blocks associated to FPACH$_i$ in sub-frames

N$_{RACHi}$: The number of PRACHs associated to the ith FPACH

n$_{RACHi}$: The number of a PRACH associated to the ith FPACH ranging from 0 to N$_{RACHi}$-1

M   : Maximum number transmissions in the UpPCH

WT   : Maximum number of sub-frames to wait for the network acknowledgement to a sent signature

SFN'   : The sub-frame number counting the sub-frames. At the beginning of the frame with the system frame number SFN=0 the sub-frame number is set to zero.

5.6.2   Preparation of random access

When the UE is in i~~l~~dle mode, it will keep the downlink synchronisation and read the system information. From the used SYNC-DL code in DwPCH, the UE will get the code set of 8 SYNC-UL codes (signatures) assigned to UpPCH for random access.

The description (codes, spreading factor, midambles, time slots) of the P-RACH, FPACH, ~~and~~ S-CCPCH (carrying the FACH transport channel) channel; mapping relation of RACH and FPACH; ASC (available SYNC-UL sequences and available sub-channels) sets for each RACH are~~is~~ broadcast on the BCH.

Thus, when sending a SYNC-UL sequence, the UE knows which FPACH resource~~s~~, P-RACH resources and S-CCPCH resources will be used for the access.

The physical random access procedure described in this sub-clause is initiated upon request from the MAC sub-layer (see [18] and [19]).

Before the physical random-access procedure can be initiated, Layer 1 shall receive the following information by a CPHY-TrCH-Config-REQ from the RRC layer:

- The association between which signatures and which FPACHs; which FPACHs and which PRACHs; which PRACHs and which S-CCPCHs; including the parameter values for each listed physical channel.

- The length L$_i$ of a RACH message associated to FPACH$_i$ can be configured to be either 1 or 2 or 4 sub-frames corresponding to a length in time of either 5 ms or 10 ms or 20 ms.

NOTE 1: N$_{RACHi}$ PRACHs can be associated with to FPACH$_i$. The maximum allowed

          N$_{RACHi}$ is L$_i$.

- The available UpPCH sub-channels for each Access Service Class (ASC);

NOTE 2: An UpPCH sub-channel is defined by a (sub-set of) signature(s) and sub-frame numbers.

- The set of Transport Format parameters for the PRACH message;

- The "M" maximum number transmissions in the UpPCH;

- The "WT" maximum number of sub-frames to wait for the network acknowledgement to a sent signature; (1..4) the maximum value supported by Layer 1 is 4 sub-frames.

- The initial signature power "Signature_Initial_Power";

- The power-ramping factor Power Ramp Step [Integer];

The above parameters may be updated from higher layers before each physical random access procedure is initiated.

At each initiation of the physical random access procedure, Layer 1 shall receive the following information from the higher layers (MAC):

- The Transport Format to be used for the specific PRACH message;

- The ASC for the specific Random Access procedure with the timing and power level indication;

- The data to be transmitted (Transport Block Set).

5.6.3   Random access procedure

The physical random-access procedure shall be performed as follows:

UE side:

1   Set the Signature Re-Transmission Counter to M.

2   Set the Signature transmission power to Signature_Initial_Power.

3   Based on the transport format indicated by MAC layer, a unique RACH used for the radio access is chosen, and then rRandomly select the UpPCH sub-channel from the available ones for the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

4   Transmit a signature using the selected UpPCH sub-channel at the signature transmission power. In the case that the Commanded Signature transmission Power exceeds the maximum allowed value, set the Signature transmission Power to the maximum allowed power.

5   After sending a signature, listen to the relevant FPACH for the next WT sub-frames to get the network acknowledgement. The UE will read the $FPACH_i$ associated to the transmitted UpPCH only in the sub-frames fulfilling the following relation:

$(SFN' \bmod L_i) = n_{RACHi}$; $n_{RACHi} = 0, \ldots, N_{RACHi} - 1$,

Here, FPACH to which UE should listen is decided according to the following fomula:

$FPACH_i = N \bmod M$,

Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACHs that defined in the cell.

6   In case no valid answer is detected in the due time: Increase the Signature transmission power by $\Delta P_0 =$ Power Ramp Step [dB], decrease the Signature Re-transmission counter by one and if it is still greater than 0, then repeat from step 3; else report a random access failure to the MAC sub-layer.

7   In case a valid answer is detected in the due time

   a) set the timing and power level values according to the indication received by the network in the $FPACH_i$

   b) send at the sub-frame coming 2 sub-frames after the one carrying the signature acknowledgement, the RACH message on the relevant PRACH. In case L_i is bigger than one and the sub-frame number of the acknowledgement is odd the UE will wait one more sub-frame. The relevant PRACH is the n_{RACHi}th PRACH associated to the $FPACH_i$ if the following equation ifs fulfilled:

$(SFN' \bmod L_i) = n_{RACHi}$;

Here SFN' isf the sub-frame number of the arrival of the acknowledgement.

Both on the UpPCH and on the PRACH, the transmit power level shall never exceed the indicated value signalled by the network.

Network side:

- The node B will transmit the FPACH$_i$ associated with the received~~transmitted~~ UpPCH only in the sub-frames fulfilling the following relation:

    (SFN' mod L)=n$_{RACHi}$; n$_{RACHi}$=0,…, N$_{RACHi}$-1,

    Here, FPACH number i is selected according to the following fomula based on acknowledged signature:

    FPACH$_i$= N mod M,

    Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACH that defined in the cell.

- The Node B will not acknowledge UpPCHs transmitted more than WT sub-frames ago

At the reception of a valid signature:

- Measure the timing deviation with respect to the reference time T$_{ref}$ of the received first path in time from the UpPCH and acknowledge the detected signature sending the FPACH burst on the relevant FPACH.

For examples on the random access procedure refer to Annex CB.

5.6.3.1 The use and generation of the information fields transmitted in the FPACH

The Fast Physical Access CHannel (FPACH) is used by the Node B to carry, in a single burst, the acknowledgement of a detected signature with timing and power level adjustment indication to a user equipment.

The length and coding of the information fields is explained in TS25.221 sub-clause 6.3.3.1.

5.6.3.1.1 Signature Reference Number

The Signature Reference Number field contains the number of the acknowledged signature. The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.2 Relative Sub-Frame Number

The Relative Sub-Frame Number field indicates the current sub-frame number with respect to the sub-frame at which the acknowledged signature has been detected.

The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.3 Received starting position of the UpPCH (UpPCH$_{POS}$)

The *received starting position of the UpPCH (UpPCH$_{POS}$)* field indirectly indicates to the user equipment the timing adjustment it has to implement for the following transmission to the network. The node B computes the proper value for this parameter according to the following rules: UpPCH$_{POS}$ = UpPTS$_{Rxpath}$ - UpPTS$_{TS}$

where

UpPTS$_{Rxpath}$: time of the reception in the Node B of the SYNC-UL to be used in the uplink synchronization process

UpPTS$_{TS}$: time instance two symbols prior to the end of the DwPCH according to the Node B internal timing

This information shall be used by the UE to adjust its timing when accessing the network, as described in section [5.2 'Uplink Synchronisation'] .

5.6.3.1.4 Transmit Power Level Command for the RACH message

This field indicates to the user equipment the power level to use for the RACH message transmission on the FPACH associated P-RACH.

The network may set this value based on the measured interference level (I) (in dBm) on the specific PRACH and on the desired signal to interference ratio (SIR) (in dB) on this channel as follows:

*Transmit Power Level Command for the PRACH(*PRX$_{PRACH,des}$*)*

$PRX_{PRACH,des}$ is the desired receive power level on the PRACH.

The UE shall add to this value the estimated path-loss to compute the power level to transmit for the PRACH

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CHANGE REQUEST

⌘   **25.224 CR 136**   ⌘**rev** **1** ⌘   Current version: **5.7.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

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

Title:	⌘	Corrections of radio access procedure for 1.28Mcps TDD
Source:	⌘	RAN WG1

Work item code:⌘	LCRTDD-Phys		**Date:** ⌘	04/08/2004

Category:	⌘	**A**	**Release:** ⌘	Rel-5

Use <u>one</u> of the following categories:
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   R99   (Release 1999)
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   Rel-5   (Release 5)
   Rel-6   (Release 6)
   Rel-7   (Release 7)

Reason for change:	⌘	In the current specification, the radio access procedure is not stated very clearly when the number of FPACH is more than one. The correct understanding should like this: there should be fixed mapping relation between RACH and FPACH, each RACH may be shared by users with different ASC. For all the configured RACH resources, UE should select one based on its transport format then randomly selects one SYNC-UL sequence based on its ASC and uniquely select the FPACH to listen the acknowledgement from Node B. In addition, the FPACH number that Node B sends the acknowledgement is chosen according to its received SYNC-UL number. This CR makes the corresponding change to clarify the procedure and make it easier for understanding.
Summary of change:⌘		In the current specification, the radio access procedure is not stated very clearly, this CR makes the corresponding change to clarify the procedure. This CR has isolated impacts on Node B and UE radio access functionality only when more than one FPACH is configured for a cell; if only one FPACH is configured in the cell, no any impact forseen.
Consequences if not approved:	⌘	The radio access procedure is not very clear, Node B and UE have no idea by which FPACH it should use for acknowledgement and listen to, respectively.

Clauses affected:	⌘	5.6

		Y	**N**	
Other specs	⌘	**X**		Other core specifications ⌘ 25.331, 25.433
affected:			**X**	Test specifications

	X	O&M Specifications	

Other comments:	⌘	There also has the corresponding changes in RAN2 and RAN3 specification.

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5.6 Random Access Procedure

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5.6.1 Definitions

$FPACH_i$: : The ith FPACH number i, parameter i indicates the position of the FPACH, the first position is corresponding to the first instance defined in IE "PRACH system information list" (see [15]).

L_i : Length of RACH transport blocks associated to $FPACH_i$ in sub-frames

N_{RACHi} : The number of PRACHs associated to the ith FPACH

n_{RACHi} : The number of a PRACH associated to the ith FPACH ranging from 0 to N_{RACHi}-1

M   : Maximum number transmissions in the UpPCH

WT   : Maximum number of sub-frames to wait for the network acknowledgement to a sent signature

SFN'   : The sub-frame number counting the sub-frames. At the beginning of the frame with the system frame number SFN=0 the sub-frame number is set to zero.

5.6.2 Preparation of random access

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The description (codes, spreading factor, midambles, time slots) of the P-RACH, FPACH, and S-CCPCH (carrying the FACH transport channel) channel; mapping relation of RACH and FPACH; ASC (available SYNC-UL sequences and available sub-channels) sets for each RACH areis broadcast on the BCH.

Thus, when sending a SYNC-UL sequence, the UE knows which FPACH resources, P-RACH resources and S-CCPCH resources will be used for the access.

The physical random access procedure described in this sub-clause is initiated upon request from the MAC sub-layer (see [18] and [19]).

Before the physical random-access procedure can be initiated, Layer 1 shall receive the following information by a CPHY-TrCH-Config-REQ from the RRC layer:

- The association between which signatures and which FPACHs; which FPACHs and which PRACHs; which PRACHs and which S-CCPCHs; including the parameter values for each listed physical channel.

- The length L_i of a RACH message associated to $FPACH_i$ can be configured to be either 1 or 2 or 4 sub-frames corresponding to a length in time of either 5 ms or 10 ms or 20 ms.

NOTE 1: N_{RACHi} PRACHs can be associated with to $FPACH_i$. The maximum allowed

N_{RACHi} is L_i.

- The available UpPCH sub-channels for each Access Service Class (ASC);

NOTE 2: An UpPCH sub-channel is defined by a (sub-set of) signature(s) and sub-frame numbers.

- The set of Transport Format parameters for the PRACH message;

- The "M" maximum number transmissions in the UpPCH;

- The "WT" maximum number of sub-frames to wait for the network acknowledgement to a sent signature; (1..4) the maximum value supported by Layer 1 is 4 sub-frames.

- The initial signature power "Signature_Initial_Power";

- The power-ramping factor Power Ramp Step [Integer];

The above parameters may be updated from higher layers before each physical random access procedure is initiated.

At each initiation of the physical random access procedure, Layer 1 shall receive the following information from the higher layers (MAC):

- The Transport Format to be used for the specific PRACH message;

- The ASC for the specific Random Access procedure ~~with the timing and power level indication~~;

- The data to be transmitted (Transport Block Set).

5.6.3   Random access procedure

The physical random-access procedure shall be performed as follows:

UE side:

1   Set the Signature Re-Transmission Counter to M.

2   Set the Signature transmission power to Signature_Initial_Power.

3   Based on the transport format indicated by MAC layer, a unique RACH used for the radio access is chosen, and then r~~R~~andomly select the UpPCH sub-channel from the available ones for the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

4   Transmit a signature using the selected UpPCH sub-channel at the signature transmission power. In the case that the Commanded Signature transmission Power exceeds the maximum allowed value, set the Signature transmission Power to the maximum allowed power.

5   After sending a signature, listen to the relevant FPACH for the next WT sub-frames to get the network acknowledgement. The UE will read the $FPACH_i$ associated to the transmitted UpPCH only in the sub-frames fulfilling the following relation:

   $(SFN' \bmod L_i)=n_{RACHi}$; $n_{RACHi}=0,\ldots, N_{RACHi}-1$,

   Here, FPACH to which UE should listen is decided according to the following fomula:

   $FPACH_i= N \bmod M$,

   Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACHs that defined in the cell.

6   In case no valid answer is detected in the due time: Increase the Signature transmission power by $\Delta P_0 =$ Power Ramp Step [dB], decrease the Signature Re-transmission counter by one and if it is still greater than 0, then repeat from step 3; else report a random access failure to the MAC sub-layer.

7   In case a valid answer is detected in the due time

   a) set the timing and power level values according to the indication received by the network in the $FPACH_i$

   b) send at the sub-frame coming 2 sub-frames after the one carrying the signature acknowledgement, the RACH message on the relevant PRACH. In case L_i is bigger than one and the sub-frame number of the acknowledgement is odd the UE will wait one more sub-frame. The relevant PRACH is the $n_{RACHi}{}^{th}$ PRACH associated to the $FPACH_i$ if the following equation ifs fulfilled:

   $(SFN' \bmod L_i)=n_{RACHi}$;

   Here SFN' is~~f~~ the sub-frame number of the arrival of the acknowledgement.

Both on the UpPCH and on the PRACH, the transmit power level shall never exceed the indicated value signalled by the network.

Network side:

- The node B will transmit the FPACH$_i$ associated ~~with~~ the received~~transmitted~~ UpPCH only in the sub-frames fulfilling the following relation:

  (SFN' mod L)=n$_{RACHi}$; n$_{RACHi}$=0,…, N$_{RACHi}$-1,

  Here, FPACH number i is selected according to the following fomula based on acknowledged signature:

  FPACH$_i$= N mod M,

  Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACH that defined in the cell.

- The Node B will not acknowledge UpPCHs transmitted more than WT sub-frames ago

At the reception of a valid signature:

- Measure the timing deviation with respect to the reference time T$_{ref}$ of the received first path in time from the UpPCH and acknowledge the detected signature sending the FPACH burst on the relevant FPACH.

For examples on the random access procedure refer to Annex CB.

5.6.3.1 The use and generation of the information fields transmitted in the FPACH

The Fast Physical Access CHannel (FPACH) is used by the Node B to carry, in a single burst, the acknowledgement of a detected signature with timing and power level adjustment indication to a user equipment.

The length and coding of the information fields is explained in TS25.221 sub-clause 6.3.3.1.

5.6.3.1.1 Signature Reference Number

The Signature Reference Number field contains the number of the acknowledged signature. The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.2 Relative Sub-Frame Number

The Relative Sub-Frame Number field indicates the current sub-frame number with respect to the sub-frame at which the acknowledged signature has been detected.

The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.3 Received starting position of the UpPCH (UpPCH$_{POS}$)

The *received starting position of the UpPCH (UpPCH$_{POS}$)* field indirectly indicates to the user equipment the timing adjustment it has to implement for the following transmission to the network. The node B computes the proper value for this parameter according to the following rules: UpPCH$_{POS}$ = UpPTS$_{Rxpath}$ - UpPTS$_{TS}$

where

UpPTS$_{Rxpath}$: time of the reception in the Node B of the SYNC-UL to be used in the uplink synchronization process

UpPTS$_{TS}$: time instance two symbols prior to the end of the DwPCH according to the Node B internal timing

This information shall be used by the UE to adjust its timing when accessing the network, as described in section [5.2 'Uplink Synchronisation'] .

5.6.3.1.4 Transmit Power Level Command for the RACH message

This field indicates to the user equipment the power level to use for the RACH message transmission on the FPACH associated P-RACH.

The network may set this value based on the measured interference level (I) (in dBm) on the specific PRACH and on the desired signal to interference ratio (SIR) (in dB) on this channel as follows:

*Transmit Power Level Command for the PRACH(*PRX$_{PRACH,des}$*)*

$PRX_{PRACH,des}$ is the desired receive power level on the PRACH.

The UE shall add to this value the estimated path-loss to compute the power level to transmit for the PRACH.

CR-Form-v7.1

CHANGE REQUEST

⌘   **25.224 CR 137** ⌘**rev 1** ⌘   Current version: **6.1.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

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

Title: ⌘	Corrections of radio access procedure for 1.28Mcps TDD	
Source: ⌘	RAN WG1	
Work item code:⌘	LCRTDD-Phys	**Date:** ⌘ 04/08/2004

Category: ⌘ **A**	**Release:** ⌘ Rel-6

Use <u>one</u> of the following categories:
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  Rel-4   *(Release 4)*
  Rel-5   *(Release 5)*
  Rel-6   *(Release 6)*
  Rel-7   *(Release 7)*

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| **Consequences if not approved:** ⌘ | The radio access procedure is not very clear, Node B and UE have no idea by which FPACH it should use for acknowledgement and listen to, respectively. |

Clauses affected: ⌘ 5.6	

	Y	**N**	
Other specs ⌘	**X**		Other core specifications ⌘ 25.331, 25.433
affected:		**X**	Test specifications

	X	O&M Specifications	

Other comments:	⌘	There also has the corresponding changes in RAN2 and RAN3 specification.

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Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.6   Random Access Procedure

The physical random access procedure described below is invoked whenever a higher layer requests transmission of a message on the RACH. The physical random access procedure is controlled by primitives from RRC and MAC.

5.6.1   Definitions

$FPACH_{i\,:}$: The ith FPACH ~~number i~~, parameter i indicates the position of the FPACH, the first position is corresponding to the first instance defined in IE "PRACH system information list" (see [15]).

L_i : Length of RACH transport blocks associated to $FPACH_i$ in sub-frames

N_{RACHi} : The number of PRACHs associated to the ith FPACH

n_{RACHi} : The number of a PRACH associated to the ith FPACH ranging from 0 to N_{RACHi}-1

M   : Maximum number transmissions in the UpPCH

WT   : Maximum number of sub-frames to wait for the network acknowledgement to a sent signature

SFN'   : The sub-frame number counting the sub-frames. At the beginning of the frame with the system frame number SFN=0 the sub-frame number is set to zero.

5.6.2   Preparation of random access

When the UE is in i~~I~~dle mode, it will keep the downlink synchronisation and read the system information. From the used SYNC-DL code in DwPCH, the UE will get the code set of 8 SYNC-UL codes (signatures) assigned to UpPCH for random access.

The description (codes, spreading factor, midambles, time slots) of the P-RACH, FPACH, ~~and~~ S-CCPCH (carrying the FACH transport channel) channel; mapping relation of RACH and FPACH; ASC (available SYNC-UL sequences and available sub-channels) sets for each RACH are~~is~~ broadcast on the BCH.

Thus, when sending a SYNC-UL sequence, the UE knows which FPACH resource~~s~~, P-RACH resources and S-CCPCH resources will be used for the access.

The physical random access procedure described in this sub-clause is initiated upon request from the MAC sub-layer (see [18] and [19]).

Before the physical random-access procedure can be initiated, Layer 1 shall receive the following information by a CPHY-TrCH-Config-REQ from the RRC layer:

- The association between which signatures and which FPACHs; which FPACHs and which PRACHs; which PRACHs and which S-CCPCHs; including the parameter values for each listed physical channel.

- The length L_i of a RACH message associated to $FPACH_i$ can be configured to be either 1 or 2 or 4 sub-frames corresponding to a length in time of either 5 ms or 10 ms or 20 ms.

NOTE 1: N_{RACHi} PRACHs can be associated with to $FPACH_i$. The maximum allowed

            N_{RACHi} is L_i.

- The available UpPCH sub-channels for each Access Service Class (ASC);

NOTE 2:   An UpPCH sub-channel is defined by a (sub-set of) signature(s) and sub-frame numbers.

- The set of Transport Format parameters for the PRACH message;

- The "M" maximum number transmissions in the UpPCH;

- The "WT" maximum number of sub-frames to wait for the network acknowledgement to a sent signature; (1..4) the maximum value supported by Layer 1 is 4 sub-frames.

- The initial signature power "Signature_Initial_Power";

- The power-ramping factor Power Ramp Step [Integer];

The above parameters may be updated from higher layers before each physical random access procedure is initiated.

At each initiation of the physical random access procedure, Layer 1 shall receive the following information from the higher layers (MAC):

- The Transport Format to be used for the specific PRACH message;

- The ASC for the specific Random Access procedure with the timing and power level indication;

- The data to be transmitted (Transport Block Set).

5.6.3   Random access procedure

The physical random-access procedure shall be performed as follows:

UE side:

1   Set the Signature Re-Transmission Counter to M.

2   Set the Signature transmission power to Signature_Initial_Power.

3   Based on the transport format indicated by MAC layer, a unique RACH used for the radio access is chosen, and then rRandomly select the UpPCH sub-channel from the available ones for the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

4   Transmit a signature using the selected UpPCH sub-channel at the signature transmission power. In the case that the Commanded Signature transmission Power exceeds the maximum allowed value, set the Signature transmission Power to the maximum allowed power.

5   After sending a signature, listen to the relevant FPACH for the next WT sub-frames to get the network acknowledgement. The UE will read the $FPACH_i$ associated to the transmitted UpPCH only in the sub-frames fulfilling the following relation:

$(SFN' \bmod L_i) = n_{RACHi}$; $n_{RACHi} = 0, \ldots, N_{RACHi} - 1$,

Here, FPACH to which UE should listen is decided according to the following fomula:

$FPACH_i = N \bmod M$,

Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACHs that defined in the cell.

6   In case no valid answer is detected in the due time: Increase the Signature transmission power by $\Delta P_0 =$ Power Ramp Step [dB], decrease the Signature Re-transmission counter by one and if it is still greater than 0, then repeat from step 3; else report a random access failure to the MAC sub-layer.

7   In case a valid answer is detected in the due time

a)   set the timing and power level values according to the indication received by the network in the $FPACH_i$

b)   send at the sub-frame coming 2 sub-frames after the one carrying the signature acknowledgement, the RACH message on the relevant PRACH. In case L_i is bigger than one and the sub-frame number of the acknowledgement is odd the UE will wait one more sub-frame. The relevant PRACH is the n_{RACHi} [th] PRACH associated to the $FPACH_i$ if the following equation ifs fulfilled:

$(SFN' \bmod L_i) = n_{RACHi}$;

Here SFN' isf the sub-frame number of the arrival of the acknowledgement.

Both on the UpPCH and on the PRACH, the transmit power level shall never exceed the indicated value signalled by the network.

Network side:

- The node B will transmit the FPACH$_i$ associated with the received~~transmitted~~ UpPCH only in the sub-frames fulfilling the following relation:

  (SFN' mod L)=n$_{RACHi}$; n$_{RACHi}$=0,…, N$_{RACHi}$-1,

  Here, FPACH number i is selected according to the following fomula based on acknowledged signature:

  FPACH$_i$= N mod M,

  Where, N denotes the signature number (0..7) and M denotes the maximum number of FPACH that defined in the cell.

- The Node B will not acknowledge UpPCHs transmitted more than WT sub-frames ago

At the reception of a valid signature:

- Measure the timing deviation with respect to the reference time T$_{ref}$ of the received first path in time from the UpPCH and acknowledge the detected signature sending the FPACH burst on the relevant FPACH.

For examples on the random access procedure refer to Annex CB.

5.6.3.1 The use and generation of the information fields transmitted in the FPACH

The Fast Physical Access CHannel (FPACH) is used by the Node B to carry, in a single burst, the acknowledgement of a detected signature with timing and power level adjustment indication to a user equipment.

The length and coding of the information fields is explained in TS25.221 sub-clause 6.3.3.1.

5.6.3.1.1 Signature Reference Number

The Signature Reference Number field contains the number of the acknowledged signature. The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.2 Relative Sub-Frame Number

The Relative Sub-Frame Number field indicates the current sub-frame number with respect to the sub-frame at which the acknowledged signature has been detected.

The user equipment shall use this information to verify whether it is the recipient of the FPACH message.

5.6.3.1.3 Received starting position of the UpPCH (UpPCH$_{POS}$)

The *received starting position of the UpPCH (UpPCH$_{POS}$)* field indirectly indicates to the user equipment the timing adjustment it has to implement for the following transmission to the network. The node B computes the proper value for this parameter according to the following rules: $UpPCH_{POS} = UpPTS_{Rxpath} - UpPTS_{TS}$

where

UpPTS$_{Rxpath}$: time of the reception in the Node B of the SYNC-UL to be used in the uplink synchronization process

UpPTS$_{TS}$: time instance two symbols prior to the end of the DwPCH according to the Node B internal timing

This information shall be used by the UE to adjust its timing when accessing the network, as described in section [5.2 'Uplink Synchronisation'] .

5.6.3.1.4 Transmit Power Level Command for the RACH message

This field indicates to the user equipment the power level to use for the RACH message transmission on the FPACH associated P-RACH.

The network may set this value based on the measured interference level (I) (in dBm) on the specific PRACH and on the desired signal to interference ratio (SIR) (in dB) on this channel as follows:

*Transmit Power Level Command for the PRACH(*PRX$_{PRACH,des}$*)*

$PRX_{PRACH,des}$ is the desired receive power level on the PRACH.

The UE shall add to this value the estimated path-loss to compute the power level to transmit for the PRACH.

CR-Form-v7.1

CHANGE REQUEST

| ⌘ | **25.331** CR **2382** | ⌘**rev** | **-** | ⌘ | Current version: | **4.14.0** | ⌘ |

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

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

Title:	⌘	Correction on PRACH selection in 1.28Mcps TDD

Source:	⌘	RAN WG2

Work item code:⌘	LCRTDD-L23	*Date:* ⌘	19/08/2004

Category:	⌘	**F**		*Release:* ⌘	*Rel-4*

Use *one* of the following categories:	Use *one* of the following releases:
F *(correction)*	Ph2 (GSM Phase 2)
A *(corresponds to a correction in an earlier release)*	R96 (Release 1996)
B *(addition of feature),*	R97 (Release 1997)
C *(functional modification of feature)*	R98 (Release 1998)
D *(editorial modification)*	R99 (Release 1999)
Detailed explanations of the above categories can	Rel-4 (Release 4)
be found in 3GPP TR 21.900.	Rel-5 (Release 5)
	Rel-6 (Release 6)
	Rel-7 (Release 7)

Reason for change:	⌘	RRC was incapable of performing FPACH selection at UE, since the mapping between FPACH and SYNC_UL had already been clearly indicated. The truth is when UE selects one SYNC_UL, then the target monitored FPACH will be determined by L1 rule. Without that rule, NodeB has no knowledge to determine on which FPACH to send access ACK on received SYNC_UL burst;

Summary of change:⌘	In section 8.6.6.31, FPACH selection functionality was removed from RRC. <u>Isolated impacts analysis:</u> If UE has already been implemented according to this change, no impact is foreseen, otherwise will be affected; If NodeB has been implemented accroding to this change, no impact is foreseen, otherwise will be affected.

Consequences if not approved:	⌘	The incorrect functionality and misalignment with L1 will remain and possibly leads into access failure.

Clauses affected:	⌘	8.6.6.31

		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	25.224 CR 135 Rev1.
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.6.6.31 ~~FPACH/PRACH Selection (1.28 Mcps TDD only)~~ void

~~Where more than one FPACH is defined, the FPACH that a UE should receive following a UpPCH transmission is defined by the UpPCH signature (SYNC_UL) code that the UE used. The FPACH/PRACH number = N mod M where N denotes the signature number (0..7) and M denotes the number of FPACH/PRACH combinations that have been defined. The FPACH/PRACH number indicates the position of the FPACH/PRACH description in the IE "PRACH info".~~

~~The PRACH that should be used is selected out of the ones associated with the FPACH in the IE "PRACH info" according to [33].~~

CR-Form-v7.1

CHANGE REQUEST

⌘	**25.331** CR **2383**	⌘**rev**	**-**	⌘	Current version:	**5.9.0**	⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

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

Title: ⌘	Correction on PRACH selection in 1.28Mcps TDD	
Source: ⌘	RAN WG2	
Work item code: ⌘	LCRTDD-L23	***Date:*** ⌘ 19/08/2004

Category: ⌘ **A**	***Release:*** ⌘ *Rel-5*

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:
Ph2　(GSM Phase 2)
R96　(Release 1996)
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)

Reason for change: ⌘	RRC was incapable of performing FPACH selection at UE, since the mapping between FPACH and SYNC_UL had already been clearly indicated. The truth is when UE selects one SYNC_UL, then the target monitored FPACH will be determined by L1 rule. Without that rule, NodeB has no knowledge to determine on which FPACH to send access ACK on received SYNC_UL burst;
Summary of change: ⌘	In section 8.6.6.31, FPACH selection functionality was removed from RRC. Isolated impacts analysis: If UE has already been implemented according to this change, no impact is foreseen, otherwise will be affected; If NodeB has been implemented accroding to this change, no impact is foreseen, otherwise will be affected.
Consequences if not approved: ⌘	The incorrect functionality and misalignment with L1 will remain and possibly leads into access failure.

Clauses affected: ⌘	8.6.6.31

	Y	**N**	
Other specs affected: ⌘	**X**		Other core specifications ⌘ 25.224 CR 136 Rev1.
		X	Test specifications
		X	O&M Specifications

Other comments: ⌘	

How to create CRs using this form:

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.6.6.31 ~~FPACH/PRACH Selection (1.28 Mcps TDD only)~~ void

~~Where more than one FPACH is defined, the FPACH that a UE should receive following a UpPCH transmission is defined by the UpPCH signature (SYNC_UL) code that the UE used. The FPACH/PRACH number = N mod M where N denotes the signature number (0..7) and M denotes the number of FPACH/PRACH combinations that have been defined. The FPACH/PRACH number indicates the position of the FPACH/PRACH description in the IE "PRACH info".~~

~~The PRACH that should be used is selected out of the ones associated with the FPACH in the IE "PRACH info" according to [33].~~

CR-Form-v7.1

CHANGE REQUEST

| ⌘ | **25.331** CR **2384** | ⌘ **rev** | **-** | ⌘ | Current version: | **6.2.0** | ⌘ |

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

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

Title: ⌘	Correction on PRACH selection in 1.28Mcps TDD	
Source: ⌘	RAN WG2	
Work item code:⌘	LCRTDD-L23	***Date:*** ⌘ 19/08/2004
Category: ⌘ **A**		***Release:*** ⌘ *Rel-6*

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:
Ph2 (GSM Phase 2)
R96 (Release 1996)
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)

Reason for change: ⌘	RRC was incapable of performing FPACH selection at UE, since the mapping between FPACH and SYNC_UL had already been clearly indicated. The truth is when UE selects one SYNC_UL, then the target monitored FPACH will be determined by L1 rule. Without that rule, NodeB has no knowledge to determine on which FPACH to send access ACK on received SYNC_UL burst;
Summary of change:⌘	In section 8.6.6.31, FPACH selection functionality was removed from RRC. Isolated impacts analysis: If UE has already been implemented according to this change, no impact is foreseen, otherwise will be affected; If NodeB has been implemented accroding to this change, no impact is foreseen, otherwise will be affected.
Consequences if not approved: ⌘	The incorrect functionality and misalignment with L1 will remain and possibly leads into access failure.

Clauses affected: ⌘	8.6.6.31	
	Y N	
Other specs ⌘	**X** ☐ Other core specifications ⌘	25.224 CR 137 Rev1.
affected:	☐ **X** Test specifications	
	☐ **X** O&M Specifications	
Other comments: ⌘		

How to create CRs using this form:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.6.6.31 ~~FPACH/PRACH Selection (1.28 Mcps TDD only)~~ void

~~Where more than one FPACH is defined, the FPACH that a UE should receive following a UpPCH transmission is defined by the UpPCH signature (SYNC_UL) code that the UE used. The FPACH/PRACH number = N mod M where N denotes the signature number (0..7) and M denotes the number of FPACH/PRACH combinations that have been defined. The FPACH/PRACH number indicates the position of the FPACH/PRACH description in the IE "PRACH info".~~

~~The PRACH that should be used is selected out of the ones associated with the FPACH in the IE "PRACH info" according to [33].~~