TSG-RAN Working Group 1 meeting No. 17 **_TSGR1-00-1331_**
November 21-24, Stockholm, Sweden

TSG-RAN Working Group 2 (Radio L2 and Radio L3) R2-002135
Beijing, China, 9th - 13th October 2000

Source: **TSG-RAN WG2**

To: **TSG-RAN WG3**

Cc: **TSG-RAN WG1**

Title: **Response to LS (R3-002343) on FDD RACH/PRACH modelling**

Contact: Wolfgang.Granzow@eed.ericsson.se

RAN2 thanks RAN3 for the LS on FDD RACH/PRACH modelling (R3-002343, R2-001906).

RAN2 would like to confirm that the common resource model illustrated in TS 25.430 is correct. Also the present RACH/PRACH model should provide the desired feature that on the Iub/Iur interfaces, one RACH transport channel can be transported on one transport bearer and the TFI can be used to uniquely denote the number and size of the contained TBs in an Iub frame.

The questions raised in R2-001906 can be answered as follows.

> *What is a PRACH: e.g. can different PRACH's use the same scrambling code and subchannel, but different pre-amble signatures, or are all used subchannels/signatures on one scrambling code always belonging to the same PRACH ?*

In FDD mode, the RACH/PRACH model used in RAN2 allows to configure different PRACHs in the following two ways:

1.) For each PRACH indicated in system information a different preamble scrambling code is employed. For each PRACH, sets of "available signatures" and "available subchannel numbers" are defined in the "PRACH info (for RACH)" Information Element in TS 25.331. Any PRACH with an individual scrambling code may employ the complete or a subset of signatures and subchannels.

2.) Two (or more) PRACHs indicated in system information use a common preamble scrambling code. In this case each PRACH shall employ a distinct (non-overlapping) set of "available signatures" and "available subchannel numbers" in order to enable Node B to identify from the received random access signal which PRACH and respective RACH is used.

For each PRACH a set of up to eight "PRACH partitions" can be defined for establishment of Access Service Classes (ASCs). A PRACH partition is defined as the complete or a subset of the "available signatures" and "available subchannel numbers" defined for one PRACH.

> *Does WG2 consider the PRACH to transport one RACH transport channel or is e.g. each PRACH partition carrying a RACH transport channel ?*

The RACH/PRACH model in RAN2 assumes a one-to-one mapping between one RACH and one specific PRACH. The mapping is defined in system information in "PRACH system information list" IE, see TS 25.331. Partitions of one PRACH always carry the same RACH.

Up to what extend should the Node B be aware of the detailed settings of the PRACH/RACH; e.g. should the Node-B be aware of the Access Service Class associated to different parts of the PRACH. Note that the Node B will normally not be aware of the information it broadcasts.

Node B must be aware of which signature (from “available signatures” IE) and access slot number (from “available access slot number” IE) is assigned to a specific PRACH in order to perform PRACH message processing and mapping to the correct RACH.

Note that an ASC is defined by a PRACH partition and an individual persistence value. Node B could be aware of what ASC is used by the UE if the PRACH partitions of each ASC are non-overlapping and thus uniquely identifiable. Generally PRACH partitions may be overlapping such that a mapping of a certain received RACH preamble to an ASC would be ambiguous. From RAN2 point of view there is no need for Node B to be aware of ASCs on a PRACH.

From RAN3 point of view it is important that the current approach on Iub, in which on one transport bearer the TFI can uniquely indicate the number and size of TBs received from a UE, can be maintained. Although not supported today, WG3 could e.g. extend the current approach by allowing the establishment of several transport bearers for one PRACH e.g. per PRACH partition.

It is necessary to configure a transport bearer for each RACH/PRACH defined in system information. For each such transport bearer the RACH TFI uniquely indicates the number and size of TBs received from a UE. The specification allows to set the parameters of a RACH/PRACH pair such that two different PRACH employ the same scrambling code but different signatures and subchannels. In this case it however shall be ensured by the choice of available signatures and subchannels that from a received preamble (time slot and signature) it can be uniquely identified to which RACH/PRACH the subsequent message on PRACH belongs. Establishment of different transport bearers for each PRACH partition used for ASCs is not required.

In order to clarify the present model of RACH/PRACH, RAN2 has agreed on some changes in TS 25.302, TS 25.331 and TR 25.922. The respective CRs are attached to this liaison.

4. References

[1] R2-001906 (R3-002343), LS on FDD RACH/PRACH (RAN3)

TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) *R2-001954*
Beijing, PR China, 9 -13 October, 2000

Agenda Item: 6.3

Source: Ericsson

Title: Clarification of RACH/PRACH model in TS 25.302

Document for: Decision

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1. Introduction

At the RAN3#15 meeting some discussions on the model of the RACH and PRACH in FDD mode came up which resulted in a liaison statement [1] sent from RAN3 to RAN2. This contribution aims to provide some clarifications on the RACH/PRACH model in TS 25.302 in order to clarify the issues raised in the questions from RAN3.

2. RACH/PRACH model

From the questions raised by RAN3 there seems to be some clarification needed on the definition of a PRACH, the relationship between a PRACH and its preamble scrambling code and the usage of PRACH partitions.

The parameters that define individual pairs of RACH and PRACH are specified in TS 25.331, in the information element "PRACH system information list".

The "PRACH system information list" IE defines sets of "PRACH system information", one for each pair of RACH and PRACH that shall be configured in a cell. The "PRACH system information list" IE is mandatory present in SIB 5 and SIB 6[1]. The total number of configured RACH/PRACH pairs corresponds to the sum of PRACH system information multiplicity factors used in both SIB5 and SIB 6.

A PRACH could therefore be defined in a pragmatic way simply as a common uplink physical channel which is indicated in system information. It is straightforward for the UE to count the indicated RACH/PRACH pairs, perform a selection and configure itself for accessing the selected channel. There are however some restrictions on the choice of parameters to be included in PRACH system information. Restrictions are especially due to the requirement that the PRACH receiver in the Node B must be capable to identify unambiguously on which PRACH a random access is received. This is necessary to perform the mapping of the decoded PRACH message part to the correct RACH transport channel associated with the PRACH. For complexity reasons it is furthermore a desired feature that PRACH identification in FDD mode is completed in the preamble transmission phase in order to decode the PRACH message part which follows the preamble, as generally there might be different transport format parameters defined on each RACH.

Taking into account the above requirements, in FDD mode, the RACH/PRACH model allows to configure different PRACHs in the following two ways:

1.) For each PRACH indicated in system information a different preamble scrambling code is employed. For each PRACH, sets of "available signatures" and "available subchannel numbers" are defined in the "PRACH info (for

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[1] In SIB 6, the presence of "PRACH system information list" IE should actually be indicated as optional ("OP"). If e.g. only a single RACH/PRACH is configured it would be indicated in SIB 5 only and could be employed in both UE idle and connected mode. A respective change is proposed in [2].

RACH)" Information Element in TS 25.331. Any PRACH with an individual scrambling code may employ the complete or a subset of signatures and subchannels.

2.) Two (or more) PRACHs indicated in system information use a common preamble scrambling code. In this case each PRACH shall employ a distinct (non-overlapping) set of "available signatures" and "available subchannel numbers" in order to enable Node B to identify from the received random access signal which PRACH and respective RACH is used.

Figure 1 shows examples of suitable FDD RACH/PRACH configurations for one cell. The upper part of the figure illustrates the one-to-one mapping between a RACH and a PRACH. Each RACH is specified via an individual Transport Format Set (TFS). The associated PRACH employs a Transport Format Combination Set (TFCS), with each TFC in the set corresponding to one specific TF of the RACH. The maximum number of PRACH per cell is currently limited to 16. The maximum number of RACHs must be the same due to the one-to-one correspondence between a RACH and a PRACH.

With each PRACH, a scrambling code is associated. TS 25.331 allows to address 16 different scrambling codes. Also, to each PRACH a set of "available subchannels" and "available signatures" is assigned.

For each PRACH a set of up to eight "PRACH partitions" can be defined for establishment of Access Service Classes (ASCs). A PRACH partition is defined as the complete or a subset of the "available signatures" and "available subchannel numbers" defined for one PRACH. An ASC consists of a PRACH partition and a persistence value. PRACH partitions employed for ASC establishment may be overlapping (note that Figure 1 only illustrates cases of non-overlapping.PRACH partitions).

PRACH 0 and PRACH 1 in Figure 1 employ the full set of PRACH subchannels and preamble signatures and are identified by using different preamble scrambling codes.

PRACH 2 and PRACH 3 illustrate a configuration where a common scrambling code but distinct (non-overlapping) partitions of "available subchannels" and "available signatures" are assigned. This configuration may e.g. be appropriate for establishment of two RACH/PRACH pairs, one with 10 and the other with 20 ms TTI.

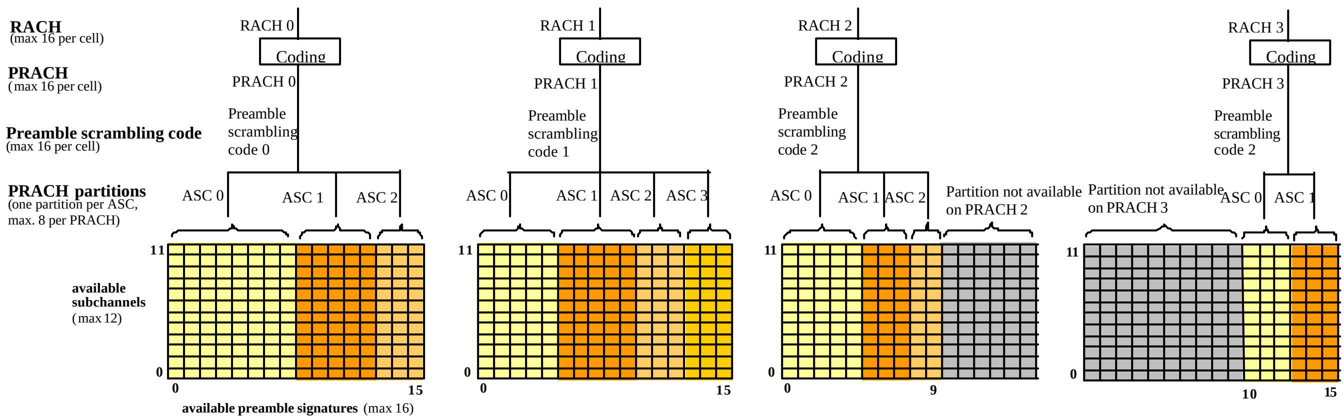

Figure 11: Examples of FDD RACH/PRACH configurations in a cell

3. Conclusion

We propose to modify the description of RACH/PRACH in TS 25.302 as attached below. It is furthermore proposed to include the example of PRACH configurations as described in Section 2 of this document into TR 25.922 [3], see Tdoc R2-001968 [3].

Also, we propose a small change of the note related to the "PRACH system information" IE in TS 25.331 [2]. The note is proposed to be generalized from the case of 10/20 ms TTI to cover the general case of establishment of various RACHs with differing Transport Format Sets either with the same or with different TTI.

4. References

[1] R2-001906 (R3-002343), LS on FDD RACH/PRACH (RAN3)

[2] R2-001964, CR 551 to 25.331 on RACH/PRACH system information

[3] R2-001968, CR 008 to 25.922 on RACH/PRACH configurations

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***Document* R2-001954**
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25.302	**CR**	**072**	Current Version: 3.4.0

GSM (AA.BB) or 3G (AA.BBB) specification number ? *? CR number as allocated by MCC support team*

For submission to:	TSG-RAN#10	for approval	X	strategic	(for SMG use only)
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Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio	X	Core Network

Source: Ericsson **Date:** 2000-10-06

Subject: RACH model

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: This CR proposes editorial modifications of the description of the current RACH/PRACH model.

Clauses affected: 6.1

Other specs affected:

Other 3G core specifications	X	? List of CRs:	25.331 CR 551, 25.922 CR 008
Other GSM core specifications		? List of CRs:	
MS test specifications		? List of CRs:	
BSS test specifications		? List of CRs:	
O&M specifications		? List of CRs:	

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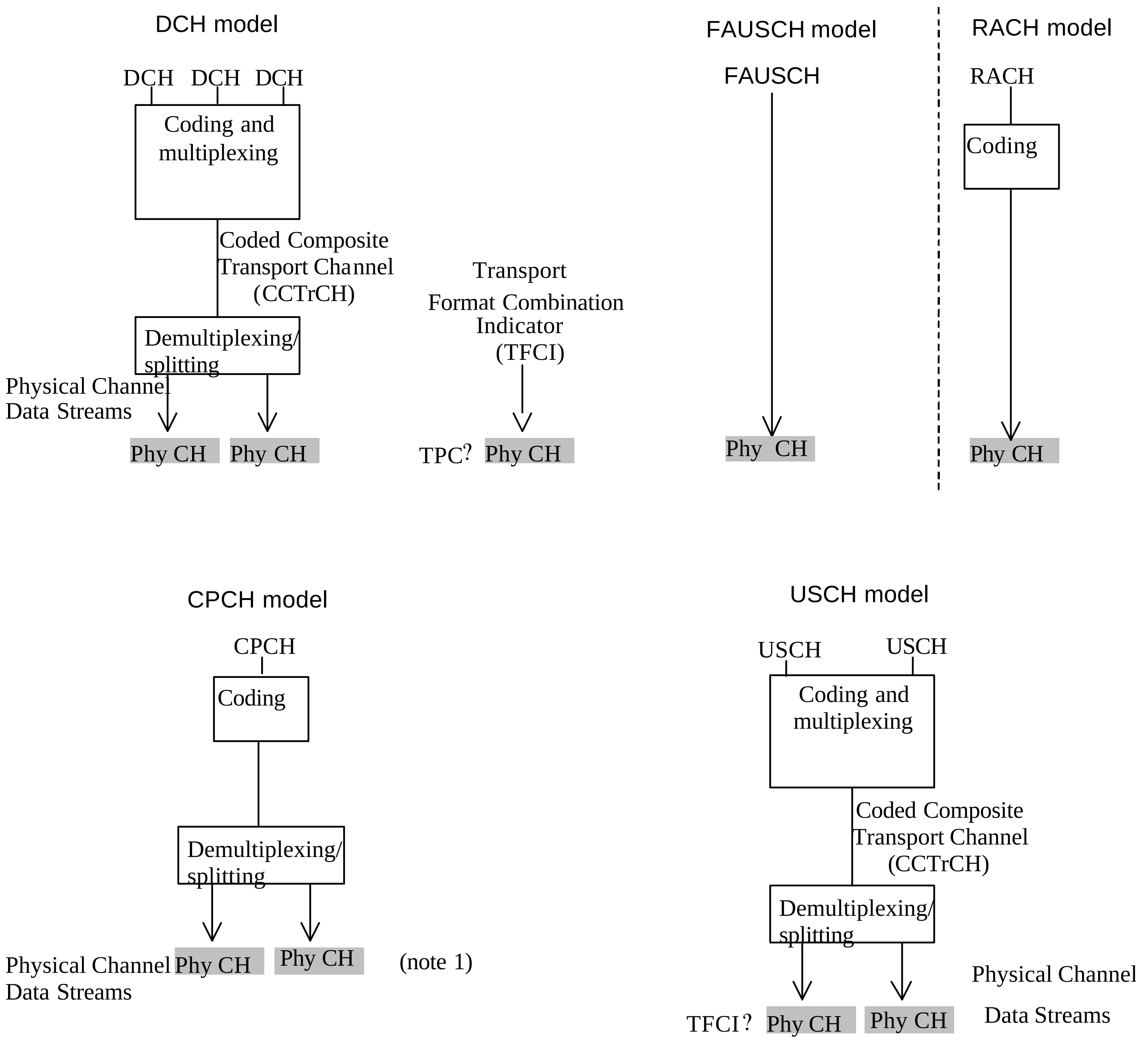
6 Model of physical layer of the UE

6.1 Uplink models

Figure 2 shows models of the UE's physical layer in the uplink for both FDD and TDD mode. It shows the models for DCH, RACH, FAUSCH, CPCH (the latter two used in FDD mode only) and USCH (TDD only). Some restriction exist for the use of different types of transport channel at the same time, these restrictions are described in the chapter "UE Simultaneous Physical Channel combinations". More details can be found in [3] and [4].



NOTE 1: Only the data part of the CPCH can be mapped on multiple physical channels (in case of multi-code PCPCH).
NOTE 2: FAUSCH and CPCH are for FDD only.
NOTE 3: USCH is for TDD only.

Figure 2: Model of the UE's physical layer - uplink

The DCH model shows that one or several DCHs can be processed and multiplexed together by the same coding and multiplexing unit. The detailed functions of the coding and multiplexing unit are not defined in the present document but in [3] and [4]. The single output data stream from the coding and multiplexing unit is denoted *Coded Composite Transport Channel (CCTrCH)*.

The bits on a CCTrCH Data Stream can be mapped on the same Physical Channel and should have the same C/I requirement.

On the downlink, multiple CCTrCH can be used simultaneously with one UE. In the case of FDD, only one fast power control loop is necessary for these different CCtrCH, but the different CCtrCH can have different C/I requirements to provide different QoS on the mapped Transport Channels. In the case of TDD, different power control loops can be applied for different CCTrCH. One physical channel can only have bits coming from the same CCTrCH.

On the uplink and in the case of FDD, only one CCTrCH can be used simultaneously. On the uplink and in the case of TDD, multiple CCTrCH can be used simultaneously.

When multiple CCTrCH are used by one UE, one or several TFCI can be used, but each CCTrCH has only zero or one corresponding TFCI. In the case of FDD, these different words are mapped on the same DPCCH. In the case of TDD, these different TFCI can be mapped on different DPCH.

The data stream of the CCTrCH is fed to a data demultiplexing/splitting unit that demultiplexes/splits the CCTrCH's data stream onto one or several *Physical Channel Data Streams*.

The current configuration of the coding and multiplexing unit is either signalled to, or optionally blindly detected by, the network for each 10 ms frame. If the configuration is signalled, it is represented by the *Transport Format Combination Indicator (TFCI)* bits. Note that the TFCI signalling only consists of pointing out the current transport format combination within the already configured transport format combination set. In the uplink there is only one TFCI representing the current transport formats on all DCHs of one CCTrCH simultaneously. In FDD mode, the physical channel data stream carrying the TFCI is mapped onto the physical channel carrying the power control bits and the pilot. In TDD mode the TFCI is time multiplexed onto the same physical channel(s) as the DCHs. The exact locations and coding of the TFCI are signalled by higher layers.

The DCH and USCH have the possibility to perform Timing Advance in TDD mode.

For the FAUSCH, there is no coding, since the FAUSCH is only used for the transmission of a reservation request by sending an up-link signalling code (USC) at the time-offset allocated for the specific UE during the 10 ms frame. Due to the fixed time-offset allotted to a specific UE, the FAUSCH is a dedicated control channel.

The model for the RACH case shows that RACH is a common type transport channel in the uplink. RACHs are always mapped one-to-one onto physical channels (PRACHs), i.e. there is no physical layer multiplexing of RACHs. Service multiplexing is handled by the MAC layer. In one cell several RACHs/PRACHs may be configured. If more than one PRACH is configured in a cell, the UE performs PRACH selection as specified in TS 25.331 [4]. The RACHs mapped to the PRACHs may all employ the same Transport Format and Transport Format Combination Sets, respectively. It is however also possible that individual RACH Transport Format Sets are applied on each available RACH/PRACH. The available pairs of RACH and PRACHs and their parameters are indicated in system information. In FDD mode, the various PRACHs are distinguished either by employing different preamble scrambling codes, or by using a common scrambling code but distinct (non-overlapping) partitions of available signatures and available subchannels. Examples of RACH/PRACH configurations are given in TR 25.922 [6].

The CPCH, which is another common type transport channel, has a physical layer model as shown in figure2. There is always a single CPCH transport channel mapped to a PCPCH physical channel which implies a one-to-one correspondence between a CPCH TFI and the TFCI conveyed on PCPCH. Demultiplexing/splitting applies to multicode PCPCH physical channels. A CPCH transport channel belongs to a CPCH set which is identified by the application of a common, CPCH set-specific scrambling code for access preamble and collision detection, and multiple PCPCH physical channels. Each PCPCH shall employ a subset of the Transport Format Combinations implied by the Transport Format Set of the CPCH set. A UE can request access to CPCH transport channels of a CPCH set, which is assigned when the service is configured for CPCH transmission.

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25.331 **CR** **551** Current Version: 3.4.1

GSM (AA.BB) or 3G (AA.BBB) specification number ? *? CR number as allocated by MCC support team*

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Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Ericsson **Date:** 2000-10-06

Subject: RACH/PRACH System information

Work item:

Category:
(only one category shall be marked with an X)

F Correction	X	**Release:**	Phase 2	
A Corresponds to a correction in an earlier release			Release 96	
B Addition of feature			Release 97	
C Functional modification of feature			Release 98	
D Editorial modification			Release 99	X
			Release 00	

Reason for change: A refinement of the RACH model (proposed for TS 25.302) implies small correction (generalization) of in a note related to the “PRACH system information list” IE. Furthermore the presence of the “PRACH system information list” and “Secondary CCPCH system information” IEs in SIB 6 is corrected (OP instead of MP).

Clauses affected: 10.2.49.8.7, 10.3.6.54

Other specs affected:

Other 3G core specifications	X	? List of CRs:	25.302 CR 072, 25.922 CR 008
Other GSM core specifications		? List of CRs:	
MS test specifications		? List of CRs:	
BSS test specifications		? List of CRs:	
O&M specifications		? List of CRs:	

Other comments:

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10.2.49.8.7 System Information Block type 6

The system information block type 6 contains parameters for the configuration of the common and shared physical channels to be used in connected mode. The block may also contain scheduling information for other system information blocks.

Information Element/Group name	Need	Multi	Type and reference	Semantics description
References to other system information blocks	OP		References to other system information blocks 10.3.8.11	Only system information blocks with area scope "Cell" and update mechanism "value tag" may be referenced.
PhyCH information elements				
CHOICE *mode*	MP			
>FDD				
>>PICH Power offset	MP		PICH Power offset 10.3.6.49	
>>AICH Power offset	MP		AICH Power offset 10.3.6.3	
>>CSICH Power offset	OP		CSICH Power offset 10.3.6.14	
>TDD				
>>PUSCH system information	OP		PUSCH system information 10.3.6.65	
>>PDSCH system information	OP		PDSCH system information 10.3.6.45	
>>Midamble configuration	MD		Midamble configuration 10.3.6.39	Default value is defined in 10.3.6.39

>>Primary CCPCH Tx Power	OP		Primary CCPCH Tx Power 10.3.6.58	For path loss calculation
>>PRACH Constant Value	OP		Constant Value 10.3.6.10	Operator controlled PRACH Margin for SF 16 case. In the SF 8 case 3dB is added.
>>DPCH Constant Value	OP		Constant Value 10.3.6.10	Operator controlled UL DPCH Margin
>>PUSCH Constant Value	OP		Constant Value 10.3.6.10	Operator controlled PUSCH Margin
Primary CCPCH info	OP		Primary CCPCH info 10.3.6.56	Note 1
PRACH system information list	~~MP~~OP		PRACH system information list 10.3.6.54	
Secondary CCPCH system information	~~MP~~OP		Secondary CCPCH system information 10.3.6.71	
CBS DRX Level 1 information	CV CTCH		CBS DRX Level 1 information 10.3.8.3	

NOTE 1: DL scrambling code of the Primary CCPCH is the same as the one for Primary CPICH (FDD only).

Condition	Explanation
CTCH	The IE is mandatory if the IE "CTCH indicator" is equal to TRUE for at least one FACH, otherwise the IE is not needed

10.3.6.54 PRACH system information list

Information element	Need	Multi	Type and reference	Semantics description
PRACH system information	MP	1 .. <maxPRACH>		
>PRACH info	MP		PRACH info (for RACH) 10.3.6.51	
>Transport channel identity	MP		Transport channel identity 10.3.5.18	
>RACH TFS	MD		Transport format set 10.3.5.23	Default value is the value of "RACH TFS" for the previous PRACH in the list (note : the first occurrence is then MP)
>RACH TFCS	MD		Transport Format Combination Set 10.3.5.20	Default value is the value of "RACH TFCS" for the previous PRACH in the list (note : the first occurrence is then MP)
>PRACH partitioning	MD		PRACH partitioning 10.3.6.45	Default value is the value of "PRACH partitioning" for the previous PRACH in the list (note : the first occurrence is then MP)
>Persistence scaling factors	OP		Persistence scaling factors 10.3.6.47	If this IE is absent, value is the value of "Persistence scaling factors" for the previous PRACH in the list if value exists
>AC-to-ASC mapping	OP		AC-to-ASC mapping 10.3.6.1	Only present in SIB 5 If this IE is absent, value is the value of "AC-to-ASC mapping ~~Persistence scaling factor~~s" for the previous PRACH in the list if value exists
>CHOICE *mode*	MP			
>>FDD				
>>>Primary CPICH TX power	MD		Primary CPICH TX power 10.3.6.60	Default value is the value of "Primary CPICH TX power" for the previous PRACH in the list (note : the first occurrence is then MP)
>>>Constant value	MD		Constant value 10.3.6.10	Default value is the value of "Constant value" for the previous PRACH in the list (note : the first occurrence is then MP)
>>>PRACH power offset	MD		PRACH power offset 10.3.6.53	Default value is the value of "PRACH power offset" for the previous PRACH in the list (note : the first occurrence is then MP)
>>>RACH transmission parameters	MD		RACH transmission parameters 10.3.6.66	Default value is the value of "RACH transmission parameters" for the previous PRACH in the list (note : the first occurrence is then MP)
>>>AICH info	MD		AICH info 10.3.6.2	Default value is the value of "AICH info" for the previous PRACH in the list (note : the first occurrence is then MP)
>>TDD				(no data)

NOTE: If the setting of the PRACH information results in that a combination of a signature, preamble scrambling code and subchannel corresponds to a RACH with ~~a TTI of both 10 ms and 20 ms~~ different TFS and/or TFCS, then for that combination only the ~~TTI~~ TFS/TFCS of ~~value 10 ms~~ the PRACH listed first is valid, where PRACHs listed in SIB 5 shall be counted first.

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***Document* R2-001968**
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25.922	**CR**	**008**	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ? *? CR number as allocated by MCC support team*

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for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

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Proposed change affects:
(at least one should be marked with an X)

(U)SIM	ME	UTRAN / Radio	Core Network
	X	X	

Source: Ericsson **Date:** 2000-10-06

Subject: RACH/PRACH configuration

Work item:

Category:
(only one category shall be marked with an X)

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: The means how to configure several Random Access channels in a cell in FDD mode were identified as unclear. This has lead to misunderstanding and some discussions between RAN2 and RAN3. This CR proposes a new section on examples of RACH/PRACH configurations in order to clarify the issues that have caused misunderstandings.

Clauses affected: Annex

Other specs affected:

Other 3G core specifications	X	? List of CRs:	25.302 CR072, 25.331 CR 551
Other GSM core specifications		? List of CRs:	
MS test specifications		? List of CRs:	
BSS test specifications		? List of CRs:	
O&M specifications		? List of CRs:	

Other comments:

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***** New section in the Annex *****

Annex H: Examples of FDD RACH/PRACH Configuration

This appendix illustrates examples of RACH/PRACH configurations in a cell in FDD mode.

H.1 Principles of RACH/PRACH Configuration

In one cell, several RACHs and PRACHs may be configured by an operator, in order to meet the performance requirements in regard to the expected traffic volume. The model of RACH and PRACH described in TS 25.302 defines a one-to-one mapping between a certain RACH and a PRACH.

The RACHs mapped to the PRACHs may all employ the same Transport Format and Transport Format Combination Sets, respectively. It is however also possible that individual RACH Transport Format Sets are applied on each available RACH/PRACH. The parameters that define pairs of RACH and PRACH are specified in TS 25.331, in the information element "PRACH system information list".

The "PRACH system information list" IE defines sets of "PRACH system information", one for each pair of RACH and PRACH that shall be configured in a cell. The "PRACH system information list" IE is included in SIB 5 and SIB 6. The total number of configured RACH/PRACH pairs corresponds to the sum of PRACH system information multiplicity factors used in both SIB5 and SIB 6.

A PRACH could therefore be defined in a pragmatic way simply as a common uplink physical channel which is indicated in system information. It is straightforward for the UE to count the indicated RACH/PRACH pairs, perform a selection and configure itself for accessing the selected channel. There are however some restrictions on the choice of parameters to be included in PRACH system information. Restrictions are especially due to the requirement that the PRACH receiver in the Node B must be capable to identify unambiguously on which PRACH a random access is received. This is necessary to perform the mapping of the decoded PRACH message part to the correct RACH transport channel associated with the PRACH. For complexity reasons it is furthermore a desired feature that PRACH identification in FDD mode is completed in the preamble transmission phase in order to decode the PRACH message part which follows the preamble, as generally there might be different transport format parameters defined on each RACH.

Taking into account the above requirements, in FDD mode, the RACH/PRACH model allows to configure different PRACHs in the following two ways:

1.) For each PRACH indicated in system information a different preamble scrambling code is employed. For each PRACH, sets of "available signatures" and "available subchannel numbers" are defined in the "PRACH info (for RACH)" Information Element in TS 25.331. Any PRACH with an individual scrambling code may employ the complete or a subset of signatures and subchannels.

2.) Two (or more) PRACHs indicated in system information use a common preamble scrambling code. In this case each PRACH shall employ a distinct (non-overlapping) set of "available signatures" and "available subchannel numbers" in order to enable Node B to identify from the received random access signal which PRACH and respective RACH is used.

Figure H.1 shows examples of suitable FDD RACH/PRACH configurations for one cell. The upper part of the figure illustrates the one-to-one mapping between a RACH and a PRACH. Each RACH is specified via an individual Transport Format Set (TFS). The associated PRACH employs a Transport Format Combination Set (TFCS), with each TFC in the set corresponding to one specific TF of the RACH. The maximum number of PRACH per cell is currently limited to 16. The maximum number of RACHs must be the same due to the one-to-one correspondence between a RACH and a PRACH.

With each PRACH, a scrambling code is associated. TS 25.331 allows to address 16 different scrambling codes. Also, to each PRACH a set of "available subchannels" and "available signatures" is assigned.

For each PRACH a set of up to eight "PRACH partitions" can be defined for establishment of Access Service Classes (ASCs). A PRACH partition is defined as the complete or a subset of the "available signatures" and "available subchannel numbers" defined for one PRACH. An ASC consists of a PRACH partition and a persistence value. PRACH partitions employed for ASC establishment may be overlapping (note that Figure H.1 only illustrates cases of non-overlapping.PRACH partitions).

PRACH 0 and PRACH 1 in Figure H.1 employ the full set of PRACH subchannels and preamble signatures and are identified by using different preamble scrambling codes.

PRACH 2 and PRACH 3 illustrate a configuration where a common scrambling code but distinct (non-overlapping) partitions of "available subchannels" and "available signatures" are assigned. This configuration may e.g. be appropriate for establishment of two RACH/PRACH pairs, one with 10 and the other with 20 ms TTI.

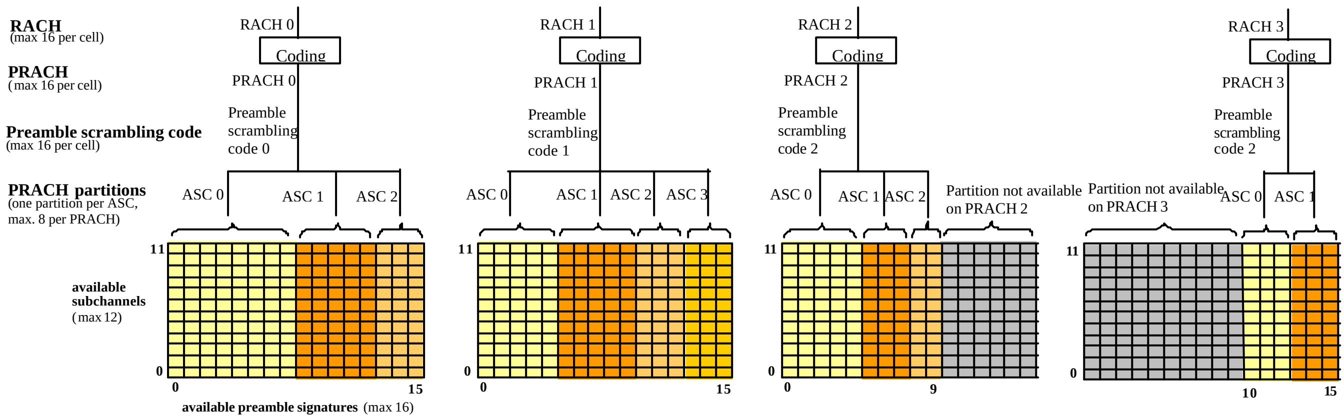

Figure H.1: Examples of FDD RACH/PRACH configurations in a cell