

Agenda Item: 14.4

Source: Ericsson

Title: Value Range for Physical Channel Information Elements

Document for: Discussion and Decision

1 Introduction

In this paper the notation for several physical channel information elements and the min and max values for their parameters are discussed. The value ranges are proposed to be included in 25.331. Tabular format according to the result of the email discussion has been used [1].

2 Discussion

Note that not all of the physical channel information elements are treated here; some of the information elements need further discussion.

2.1 Primary CCPCH info

According to 25.211 [3], the primary CCPCH has a fixed rate of 30 kbps (SF=256 and the same channelisation code in the entire system). The scrambling code (one out of 512) that is used by the Primary CCPCH is also indicated on the SCH.

2.2 Secondary CCPCH info

The Secondary CCPCH can have a SF between 4 and 256 and is allocated among the same set of channelisation codes as a dedicated downlink channel.

The channelisation codes are numbered according to what has been proposed to 25.213 [4], where the notation $C_{SF,code\ number}$ is used. The *code number* numbers the codes for one SF between 0 and SF-1.

The scrambling code for the Secondary CCPCH can be given if it is different from the Primary CCPCH.

2.3 PRACH info

The notation here is collected from the WG1 specifications. When a UE uses the PRACH it first selects an access slot. There is a maximum of 15 access slots available per 20 ms.

The UE then also chooses a preamble signature among a maximum of 16 signatures. This signature is transmitted in the preamble part starting at the chosen access slot, and is spread with a preamble scrambling code. There are 256 different scrambling codes and the code used also corresponds to what scrambling code that should be used in the PRACH message part.

However, the message part must be spread with a spreading code given by UTRAN. This spreading code has a spreading factor between 32 and 256.

2.4 AICH info

The Acquisition indication channel is spread with a channelisation code with SF 256 in a similar way as a dedicated downlink channel. The scrambling code, one out of 512 is only included in this information element if different from the scrambling code used for the Primary CCPCH.

2.5 PICH info

The Page indication channel, which carries the Page indicators, is spread with a channelisation code with SF 256 in the same way as for a downlink dedicated channel. The scrambling code, one out of 512 is only included in this information element if different from the scrambling code used for the Primary CCPCH.

Further, how many page indicators there is in each frame must be stated; this number can be 18, 36, 72 or 144.

2.6 Uplink DPCH info

For a UE using a dedicated physical channel one of 2^{24} scrambling codes are used. The scrambling codes could be either long or short. This will require 25 bits of signalling. If this number is considered to be too high, one could develop an algorithm for calculating (based on other parameters) the scrambling code to be used.

Further, a SF for the channelisation code for each DPDCH has to be signalled to the UE. The DPCCH channelisation code has a fixed SF of 256 and is not necessary to signal to the UE. The SF of the uplink DPDCH is between 4 and 256. What restriction that is set on the configuration of SF when the UE uses several DPDCHs is FFS.

2.7 Downlink DPCH info

If the scrambling code is different from the scrambling code of the Primary CCPCH this is given in this IE. Further, a channelisation code for each DPDCH is signalled to the UE. The DPCCH is time multiplexed on the channelisation code used by the first DPDCH and is not signalled to the UE. The SF of the downlink DPCH is between 4 and 512.

3 Proposed text to 25.331

10.2.6.2 Primary CCPCH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
DL scrambling code	M		Integer(0..511)	DL scrambling code used for Primary CCPCH

10.2.6.3 Secondary CCPCH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
DL scrambling code	C – Dlscode		Integer(0..511)	
Channelization code	M			
Spreading factor	M		Enumerated(4, 16, 32, 64, 128, 256)	
Code number	M		Integer(0..maxCodeNum)	

Condition	Explanation
<i>Dlscode</i>	The DL scrambling code information element is only sent if it is different from the DL scrambling code of the Primary CCPCH

Range Bound	Explanation
MaxCodeNum	Maximum number of codes for one spreading factor (SF) is equal to SF-1.

10.2.6.4 PRACH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Access slot		1 to <maxAccessSlots>	Integer(0..14)	
Preamble spreading code		1 to <maxPcodes>	Integer(0..255)	
Preamble signature		1 to <maxPsigns>	Integer(0..15)	
Spreading factor		1 to <maxRates>	Enumerated(32, 64, 128, 256)	

Range Bound	Explanation
<i>MaxAccessSlots</i>	Maximum number of allowed access slots for the preambles
<i>MaxPcodes</i>	Maximum number of codes to use for spreading of the preamble. There is also a one to one mapping from preamble code to what scrambling code to use for the message part.
<i>MaxPsigns</i>	Maximum number of allowed preamble signatures.
<i>MaxRates</i>	Maximum number of rates or SF that are allowed to use on the data part (I-branch) in the message part of the random access

10.2.6.X AICH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Channelisation code	M		Integer(0.255)	SF is fixed and equal to 256
DL scrambling code	C – Dlscode		Integer(0..511)	

Condition	Explanation
Dlscode	The DL scrambling code information element is only sent if it is different from the DL scrambling code of the Primary CCPCH.

10.2.6.X PICH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Channelisation code	M		Integer(0.255)	SF is fixed and equal to 256
Number of page indicators per frame			Enumerated(18, 36, 72, 144)	
DL scrambling code	C – Dlscode		Integer(0..511)	

Condition	Explanation
Dlscode	The DL scrambling code information element is only sent if it is different from the DL scrambling code of the Primary CCPCH

10.2.6.6 Uplink DPCH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
UL scrambling code	<u>M</u>			What short or long uplink scrambling code a certain UE should use
<u>Scrambling code type</u>	<u>M</u>		<u>Enumerated(short, long)</u>	
<u>Scrambling code number</u>	<u>M</u>		<u>Integer(0..2²⁴)</u>	
<u>DPCH channelization code</u>	<u>M</u>			<u>SF of the channelization code for control part. [The necessity of this parameter is FFS.]</u>
DPDCH channelization code		1 to <maxDPDCHcount>	<u>Enumerated(4, 8, 16, 32, 64, 128, 256)</u>	SF of the channelization code for data part

Range Bound	Explanation
<u>MaxDPDCHcount</u>	Maximum number of DPDCH's

10.2.6.8 Downlink DPCH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
DL scrambling code	C - DLscore		<u>Integer(0..511)</u>	
DL channelization code		1 to <maxDPCHcount>		Channelization codes to be used in the downlink for DPCH
<u>Spreading factor</u>	<u>M</u>		<u>Enumerated(4, 16, 32, 64, 128, 256, 512)</u>	
<u>Code number</u>	<u>M</u>		<u>Integer(0..maxCodeNum)</u>	

Condition	Explanation
<u>Dlscore</u>	The DL scrambling code information element is only sent if it is different from the DL scrambling code of Primary CCPCH

Range Bound	Explanation
<u>MaxDPCHcount</u>	Maximum number of DPCH's
<u>MaxCodeNum</u>	<u>Maximum number of codes for one spreading factor (SF) is equal to SF-1.</u>

4 Proposal

It is proposed that 25.331 [2] is updated according to chapter 3.

5 References

- [1] Report of the email discussion group - Enhanced RRC message and IE tabular descriptions
- [2] 3GPP TS 25.331 v1.1.0: "RRC Protocol Specification"
- [3] 3GPP TS 25.211 v2.1.1: "Physical channels and mapping of transport channels onto physical channels (FDD)"
- [4] 3GPP TS 25.213 v2.1.2: "Spreading and modulation (FDD)"