

Agenda Item: AH21
Source: Siemens AG
To: TSG RAN WG1
Title: Modulation of the SYNC-DL
Document for: Decision

1. Summary

This paper gives the description of the modulation of the SYNC-DL at Layer 1 for 1.28 Mcps TDD option.

2. Introduction

In the TR25.928 the P-CCPCH is used for a multiple number of Transport channels: The BCH, PCH and FACH. Since the WCR the usage of the P-CCPCH has been aligned with 3.84 Mcps TDD. Now the P-CCPCH is used for the BCH only and it shares the resource units of code $C_{Q^{?16}}^{(k?1)}$ and $C_{Q^{?16}}^{(k?2)}$ in time slot #0 with non-P-CCPCH physical channels like e.g. the PICH.

The fact that in the P-CCPCH the BCH was formerly time multiplexed with other transport channels, made it necessary that the BCH was pointed to be means of the sequence of phase quadruples on the DwPCH like shown in TR25.928.

Since now the usage of the P-CCPCH has changes it seems appropriate to reconsider the usefulness of the present sequence of phase quadruples on the DwPCH and adapt it to the new situation on the resource units of code $C_{Q^{?16}}^{(k?1)}$ and $C_{Q^{?16}}^{(k?2)}$ in time slot #0.

As in the present 1.28 Mcps TDD option there mainly the P-CCPCH and some non-PCCPCH physical channels on the regarded resource units, there are two quadruples only S1 is indicating to have a P-CCPCH in the next 4 sub-frames whereas S2 indicates to have no P-CCPCH in the next following sub-frames.

This proceeding has the following advantages:

1. The DwPCH then fulfils the same functionality as the SCH in the 3.84 Mcps option such as:
 - ✍ Provide the possibility to distinguish between odd and even radio frame and to distinguish between the 1st and 2nd sub-frame after reading two consecutive DwPCH.
 - ✍ Identification of the code group through the used SYNC-DL code
 - ✍ First DL synchronisation
2. Since only two sequences have to be distinguished, the detection performance significantly increases compared to the old scheme described in TR25.928.
3. Easy and low complexity detection of the P-CCPCH channels on time slot #0.

In the present WCR for 25.223 the DwPCH indicates the presence of the MIB. This is a non-3GPP conform indication of higher layer information by a physical channels. This is also not done for the SCH in 3.84 Mcps TDD. As according to the new proposal the P-CCPCH and not the MIB is indicated, this problem is solved.

3. Proposal

We propose to add/modify following paragraphs in the working CR for TS25.223 as the description of the modulation of the SYNC-DL in the 1.28Mcps TDD.

----- Beginning of text proposal for working CR for 25.223 -----

9.1 The downlink pilot timeslot (DwPTS)

The contents of DwPTS is composed of 64 chips of a SYNC-DL sequence, cf. [B.1 Basic SYNC-DL sequence] and 32 chips of guard period (GP). The SYNC-DL code is not scrambled

There should be 32 different basic SYNC-DL codes for the whole system.

For the generation of the complex valued SYNC-DL codes of length 64, the basic binary SYNC-DL

codes $\mathbf{s} = \{s_1, s_2, \dots, s_{64}\}$ of length 64 shown in Table A are used. The relation between the elements \underline{s}_i and \mathbf{s} is given by:

$$\underline{s}_i = (j)^i s_i \quad s_i \in \{1, -1\} \quad i=1, \dots, 64 \quad (1)$$

Hence, the elements \underline{s}_i of the complex SYNC-DL code $\underline{\mathbf{s}}$ are alternating real and imaginary.

The ~~burst in the DwPTS SYNC-DL~~ is QPSK modulated and the phase of the SYNC-DL is used to signal the ~~position presence of the MIB~~ of the ~~BCH in P-CCPCH~~ in the multi-frame of the resource units of code $c_{Q^{16}}^{(k?1)}$ and $c_{Q^{16}}^{(k?2)}$ in time slot #0.

9.1.1 Modulation of the SYNC-DL

The SYNC DL sequences are modulated with respect to the midamble ($m^{(1)}$) in time slot #0.

Four consecutive phases (phase quadruple) of the SYNC-DL are used to indicate the presence of the P-CCPCH in the following 4 sub-frames. In case the presence of a P-CCPCH is indicated, the next following sub-frame is the first sub-frame of the interleaving period. As QPSK is used for the modulation of the SYNC-DL, the phases 45, 135, 225, and 315° are used.

The total number of different phase quadruples is 2 (S1 and S2). A quadruple always starts with an even system frame number ((SFN mod 2) = 0). Table X is showing the quadruples and their meaning.

Table X Sequences for the phase modulation for the SYNC-DL

<u>Name</u>	<u>Phase quadruple</u>	<u>Meaning</u>
<u>S1</u>	<u>135, 45, 225, 135</u>	<u>There is a P-CCPCH in the next 4 sub-frames</u>

Textproposal for working CR for 25.223

<u>S2</u>	<u>315, 225, 315, 45</u>	<u>There is no P-CCPCH in the next 4 sub-frames</u>
	<u>Others</u>	<u>Error</u>

----- End of text proposal for working CR for 25.223 -----