3GPP TSG RAN WG1#9 **Tdoc R1-(99)i00**
Dresden, Germany
November 30th - December 3rd, 1999 **Meeting No. 9**
Agenda Item:.

Source: Nokia

Use of Spreading factor 512 with UTRA FDD

Introduction

Earlier is has been agreed to include the spreading factor 512 in UTRA FDD downlink. The 25.211 defines the timing adjustment step for all spreading factors to be 256. As this is not suitable without restrictions to spreading factor 512, a more detailed statement for the operation in connection with spreading factor 512 in soft handover is proposed to be added. This was presented last time at the WG1#7 meeting in Hannover, but the restriction was noted to be to strict and is thus modified here in line with the comments made. The issue dates back to the merging discussions of different specifications early 1999.

Background of the restrictions (from R1-99C92)

The use of spreading factor 512 is expected to be limited to the special cases, like with CPCH or perhaps with AICH as has been proposed. None of there uses involves soft handover, thus making the timing adjustment step to conform to the spreading factor 512 would only make it difficult to achieve single slot power control delay in soft handover. Spreading factor 512 may be also used on DCH with DSCH, where DCH may be in soft handover.

Therefore having restrictions in code allocation with spreading factor 512 for the case of soft handover is not expected to cause practical problems for the system operation. The following restriction has been proposed on the reflector in connection with the discussions on 25.211. The following definition was given on the reflector:

"In case entering the SHO with SF 512, the Node B shall allocate for the SF 512 the branch with contains both the codes that can be derived from the SF 256 code on the branch above"

This can be spelled out with more specification style as follows for 25.213, with the comments given in the WG1#7 taken into account as follows:

"*With the spreading factor 512 a specific restriction is applied. When the code word $C_{ch,512,n}$, with n=0,2,4….510, is used in soft handover, then the code word $C_{512,n+1}$ is not allocated in the Node Bs where timing adjustment is to be used. Respectively if $C_{ch,512,n}$, with n=1,3,5….511 is used, then the code word $C_{512,n-1}$ is not allocated in the Node B where timing adjustment is to be used . This restriction shall not apply for the softer handover operation or in case UTRAN is synchronised to such a level that timing adjustments in soft handover are not used with spreading factor 512".*

This is proposed to be included to 25.213 for the channelization code section (subsection of the code generation and allocation), see attached CR.

Conclusions

The proposed definition is proposed to be added to 25.213 to avoid uncertainty of the use of spreading factor 512 in connection with timing adjustment.

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Dresden, Germany, 30th Nov-3 rd Dec 1999

Document R1-99i00
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.213 CR 009 Current Version: 3.0.0

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

For submission to:	TSG RAN#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: Nokia **Date:** 22.11.1999

Subject: Restriction for spreading factor 512 allocation in the UTRA FDD Downlink

Work item:

Category:				**Release:**	
	F	Correction		Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature	X	Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: The time adjustment is 256 chips in UTRA FDD in soft handover. To allow similar step with spreading factor 512, restrictions on the code allocation in case if having spreading factor 512 are introduced.

Clauses affected: 5.2.1

Other specs affected:		
Other 3G core specifications		→ List of CRs:
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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5.2 Code generation and allocation

5.2.1 Channelization codes

The channelization codes of figures 8 and 9 are the same codes as used in the uplink, namely Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between downlink channels of different rates and spreading factors. The OVSF codes are defined in figure 4 in section 4.3.1.

The channelization code for the Primary CPICH is fixed to $C_{ch,256,0}$ and the channelization code for the Primary CCPCH is fixed to $C_{ch,256,1}$.The channelization codes for all other physical channels are assigned by UTRAN.

With the spreading factor 512 a specific restriction is applied. When the code word $C_{ch,512,n}$, with n=0,2,4….510, is used in soft handover, then the code word $C_{512,n+1}$ is not allocated in the Node Bs where timing adjustment is to be used. Respectively if $C_{ch,512,n}$, with n=1,3,5….511 is used, then the code word $C_{512,n-1}$ is not allocated in the Node B where timing adjustment is to be used. This restriction shall not apply for the softer handover operation or in case UTRAN is synchronised to such a level that timing adjustments in soft handover are not used with spreading factor 512.

When compressed mode is implemented by reducing the spreading factor by 2, the OVSF code of spreading factor SF/2 on the path to the root of the code tree from the OVSF code assigned for normal frames is used in the compressed frames. For the case where the scrambling code is changed during compressed frames, an even numbered OVSF code used in normal mode results in using the even alternative scrambling code during compressed frames, while an odd numbered OVSF code used in normal mode results in using the odd alternative scrambling code during compressed frames. The even and odd alternative scrambling codes are described in the next section.

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated such a way that the OVSF code(s) below the smallest spreading factor will be from the branch of the code tree pointed by the smallest spreading factor used for the connection. This means that all the codes for UE for the PDSCH connection can be generated according to the OVSF code generation principle from smallest spreading factor code used by the UE on PDSCH.

In case of mapping the DSCH to multiple parallel PDSCHs, the same rule applies, but all of the branches identified by the multiple codes, corresponding to the smallest spreading factor, may be used for higher spreading factor allocation.

5.2.2 Scrambling code

A total of 2^{18}-1 = 262,143 scrambling codes, numbered 0…262,142 can be generated. However not all the scrambling codes are used. The scrambling codes are divided into 512 sets each of a primary scrambling code and 15 secondary scrambling codes.

The primary scrambling codes consist of scrambling codes n=16*i where i=0…511. The i:th set of secondary scrambling codes consists of scrambling codes 16*i+k, where k=1…15.

There is a one-to-one mapping between each primary scrambling code and 15 secondary scrambling codes in a set such that i:th primary scrambling code corresponds to i:th set of scrambling codes.

Hence, according to the above, scrambling codes k = 0, 1, …, 8191 are used. Each of these codes are associated with an even alternative scrambling code and an odd alternative scrambling code, that may be used for compressed frames. The even alternative scrambling code corresponding to scrambling code k is scrambling code number k + 8192, while the odd alternative scrambling code corresponding to scrambling code k is scrambling code number k + 16384.

The set of primary scrambling codes is further divided into 64 scrambling code groups, each consisting of 8 primary scrambling codes. The j:th scrambling code group consists of primary scrambling codes 16*8*j+16*k, where j=0..63 and k=0..7.

Each cell is allocated one and only one primary scrambling code. The primary CCPCH is always transmitted using the primary scrambling code. The other downlink physical channels can be transmitted with either the primary scrambling code or a secondary scrambling code from the set associated with the primary scrambling code of the cell.

The mixture of primary scrambling code and secondary scrambling code for one CCTrCH is allowable.