TSG-RAN Working Group 1 meeting #9
Dresden, Germany
November 30 – December 3, 1999

TSGR1#9(99)L34

Agenda item: AH16
Source: NTT DoCoMo
Title: CR for parity bit attachment to 0 bit transport block
Document for: Decision

Introduction

In the midnight meeting for physical channel BER, R1-99j78 was discussed, and followings were reached consensus:

1) Parity bits can be attached to 0 bit-TrBk to measure quality for outer loop TPC.
2) The parity bit pattern is same as CRC parity bit pattern of TrBk size =0, i.e. all parity bit equals to 0.
3) Necessity of the parity bits attachment should be designated from higher layer to L1 via TFS. The number of TrBks =0 of TFS designates that the parity bits need not be attached to 0 bit-TrBk. TrBk size =0 of TFS designats that the parity bits shall be attached to 0 bit-TrBk.

Attached CR is according to above consensus.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

***Document* R1-99L34**
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.

25.212 CR 025r1 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: NTT DoCoMo **Date:** 1999-11-26

Subject: CR for parity bit attachment to 0 bit transport block

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	X
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: Simulation results of correspondences between the physical channel BER on DPCCH and BER after decoding shows that the physical channel BER on DPCCH is not enough for outer loop TPC during DPCCH OFF. In order to improve puter loop TPC performance, parity bit attachment for 0 bit-transport block is proposed to measure BLER during DTX.

Clauses affected:

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:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

4.2.1 Error detection

Error detection is provided on transport blocks through a Cyclic Redundancy Check. The CRC is 24, 16, 12, 8 or 0 bits and it is signalled from higher layers what CRC length that should be used for each TrCH.

4.2.1.1 CRC Calculation

The entire transport block is used to calculate the CRC parity bits for each transport block. The parity bits are generated by one of the following cyclic generator polynomials:

$g_{CRC24}(D) = D^{24} + D^{23} + D^{6} + D^{5} + D + 1$

$g_{CRC16}(D) = D^{16} + D^{12} + D^{5} + 1$

$g_{CRC12}(D) = D^{12} + D^{11} + D^{3} + D^{2} + D + 1$

$g_{CRC8}(D) = D^{8} + D^{7} + D^{4} + D^{3} + D + 1$

Denote the bits in a transport block delivered to layer 1 by $a_{im1}, a_{im2}, a_{im3}, \ldots, a_{imA_i}$, and the parity bits by $p_{im1}, p_{im2}, p_{im3}, \ldots, p_{imL_i}$. A_i is the length of a transport block of TrCH *i*, *m* is the transport block number, and L_i is 24, 16, 12, 8, or 0 depending on what is signalled from higher layers.

The encoding is performed in a systematic form, which means that in GF(2), the polynomial

$$a_{im1}D^{A_i+23} + a_{im2}D^{A_i+22} + \ldots + a_{imA_i}D^{24} + p_{im1}D^{23} + p_{im2}D^{22} + \ldots + p_{im23}D^{1} + p_{im24}$$

yields a remainder equal to 0 when divided by $g_{CRC24}(D)$, polynomial

$$a_{im1}D^{A_i+15} + a_{im2}D^{A_i+14} + \ldots + a_{imA_i}D^{16} + p_{im1}D^{15} + p_{im2}D^{14} + \ldots + p_{im15}D^{1} + p_{im16}$$

yields a remainder equal to 0 when divided by $g_{CRC16}(D)$, polynomial

$$a_{im1}D^{A_i+11} + a_{im2}D^{A_i+10} + \ldots + a_{imA_i}D^{12} + p_{im1}D^{11} + p_{im2}D^{10} + \ldots + p_{im11}D^{1} + p_{im12}$$

yields a remainder equal to 0 when divided by $g_{CRC12}(D)$ and polynomial

$$a_{im1}D^{A_i+7} + a_{im2}D^{A_i+6} + \ldots + a_{imA_i}D^{8} + p_{im1}D^{7} + p_{im2}D^{6} + \ldots + p_{im7}D^{1} + p_{im8}$$

yields a remainder equal to 0 when divided by $g_{CRC8}(D)$.

If no transport blocks are input to the CRC calculation ($M_i = 0$), no CRC attachment shall be done.

If the size of a transport block is zero ($A_i = 0$), CRC shall be attached, i.e. all parity bits equal to zero.

4.2.1.1.1 Relation between input and output of the Cyclic Redundancy Check

The bits after CRC attachment are denoted by $b_{im1}, b_{im2}, b_{im3}, \ldots, b_{imB_i}$, where $B_i = A_i + L_i$. The relation between a_{imk} and b_{imk} is:

$b_{imk} = a_{imk}$ $\quad k = 1, 2, 3, \ldots, A_i$

$b_{imk} = p_{im(L_i+1-(k-A_i))}$ $\quad k = A_i + 1, A_i + 2, A_i + 3, \ldots, A_i + L_i$