TSG-RAN Working Group 1(Radio) meeting #7bis ***TSGR1#7bis(99)e98***

Kyongju, Korea, 04 – 05 October 1999

Agenda Item:

Source: Nokia

Title: Text proposal for downlink long scrambling code of TS25.213 v2.3.0

Document for: Discussion in AH10

Introduction

The purpose of this text proposal on downlink scrambling code is to clarify the definition of scrambling codes for downlink according toTS25.213 v2.3.0. The m-sequence *x* is set free from the code parameter *n* and the initial condition for *x* is changed by one backward shift for the upper register. It is expected that by the proposed changes the difference in the definitions of uplink and downlink scrambling codes is cleared. Furthermore, these changes do not impact on the option of masking techniques for generating codes.

5.2.2 Scrambling code

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

The scrambling code sequences are constructed by combining two real sequences into a complex sequence. Each of the two real sequences are constructed as the position wise modulo 2 sum of 38400 chip segments of two binary *m*-sequences generated by means of two generator polynomials of degree 18. The resulting sequences thus constitute segments of a set of Gold sequences. The scrambling codes are repeated for every 10 ms radio frame. Let *x* and *y* be the two sequences respectively. The *x* sequence is constructed using the primitive (over GF(2)) polynomial $1+X^7+X^{18}$. The y sequence is constructed using the polynomial $1+X^5+X^7+X^{10}+X^{18}$.

The ~~*x*~~ sequence dependings on the chosen scrambling code number *n* ~~and~~ is denoted ~~*x*~~z_n, in the sequel. Furthermore, let $x_{\#}(i)$ ~~and~~, *y(i)* , and $z_n(i)$ denote the *i*:th symbol of the sequence $x_{\#}$ ~~and~~, *y*, and z_n, respectively

The *m*-sequences $x_{\#}$ ~~-~~and *y* are constructed as:

Initial conditions:

x_0 *is constructed with* $x_0(0)=1$, $x_0(1)=x(2)=\ldots=x_0(16)=0$,$x_0(17)=01$

$y(0)=y(1)=\ldots=y(16)=y(17)=1$

Recursive definition of subsequent symbols:

$x_{\#}(i+18)=x_{\#}(i+7)+x_{\#}(i)$ *modulo 2,* $i=0,\ldots,2^{18}-20$,

$y(i+18)=y(i+10)+y(i+7)+y(i+5)+y(i)$ *modulo 2,* $i=0,\ldots,2^{18}-20$.

~~x_n is constructed with the following equation.~~

~~$x_n(i)=x_0((i+n)$ modulo $2^{18}-1)$, $i=0,\ldots,2^{18}-2$~~

The n:th Gold code sequence z_n , $n=0,1,2,\ldots,2^{18}-2$, is then defined as

$z_n(i)=x_{\#}(i+n)+y(i)$ *modulo 2,* $i=0,\ldots,2^{18}-2$.

These binary code words are converted to real valued sequences by the transformation ‘0’ -> ‘+1’, ‘1’ -> ‘-1’.

Finally, the n:th complex scrambling code sequence C_{scramb} is defined as (the lowest index corresponding to the chip scrambled first in each radio frame): (where N is the period in chips and M is 131,072)

$C_{scramb}(i)=z_n(i)+j\,z_n(i+M)$, $i=0,1,\ldots,N-1$.
Note that the pattern from phase 0 up to the phase of 38399 is repeated.