TSG-RAN Working Group 1 meeting No. 5
June 1-4, Cheju, Korea

TSGR1-598/99

Agenda item:

Source: Nokia

Title: Text proposal for RACH preambles

Document for: Decision

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1 Introduction

Nokia has proposed long codes to be used for RACH preambles. This document provides corresponding text proposal for 25.2 series of 3GPP specifications.

2 Text proposal for 25.211

The following text is proposed to replace the subclause 5.2.2.1.2 in 25.211:

5.2.2.1.2 RACH preamble part

The preamble part of the random-access burst consists of a a 4096 chip long code generated the same way as long scrambling code for dedicated channel. The code is modulated by *signature* of length 16. The symbols in the signature are complex and of the formsymbols ±1(1+j). Each preamble symbol is spread with a 256 chip real Orthogonal Gold code. The resulting spreading factor is 256 for the preamble part. There are a total of 16 different signatures, based on the Orthogonal Gold code set of length 16 (see 25.213 for more details).

3 Text proposal for 25.213

The following text is proposed to replace the subclauses 4.3.3.1 and 4.3.3.4:

4.3.3.1 Preamble codes

The spreading code for the preamble part is cell specific and is broadcast by the base station. More than one preamble code can be used in a base station if the traffic load is high. The preamble codes must be code planned, since two neighbouring cells should not use the same preamble code.

The code generating method is the same as for dedicated channel. Only the first 4096 chips of the code is used if chip rate is 4.096 MHz. First 8192 or 16384 chips are used if chip rate is 8.192 MHz or 16.384 MHz, respectively.

The code used is a real-valued 256 chip Orthogonal Gold code. All 256 codes are used in the system.

The code sequences are constructed with the help of two binary *m*-sequences of length 255, *x*, and *y*, respectively. The *x* sequence is constructed using the polynomial $1+X^2+X^3+X^4+X^8$. The *y* sequence is constructed using the polynomial $1+X^3+X^5+X^6+X^8$.

Let $n_7 \ldots n_0$ be the binary representation of the code number *n* (decimal) with n_0 being the least significant bit. The *x* sequence depends on the chosen code number *n* and is denoted x_n in the sequel. Furthermore, let $x_n(i)$ and $y(i)$ denote the *i*:th symbol of the sequence x_n and *y*, respectively

The *m*-sequences x_n and *y* are constructed as:

Initial conditions:

$x_n(0)=n_0$, $x_n(1)= n_1$, … $=x_n(6)= n_6$, $x_n(7)= n_7$

$y(0)=y(1)= … =y(6)= y(7)=1$

Recursive definition of subsequent symbols:

$x_n(i+8) =x_n(i+4) + x_n(i+3) + x_n(i+2) + x_n(i)$ *modulo 2, i=0,…,* 246,

$y(i+8) = y(i+6)+ y(i+5)+ y(i+3)+y(i)$ *modulo 2, i=0,…,* 246.

The definition of the *n*:th code word follows (the left most index correspond to the chip transmitted first in each slot):

$C_{RACH,n} = < 0, x_n(0)+y(0), x_n(1)+y(1), …,x_n(254)+y(254) >$,

All sums of symbols are taken modulo 2.

The preamble spreadingcode is described in Figure 8.

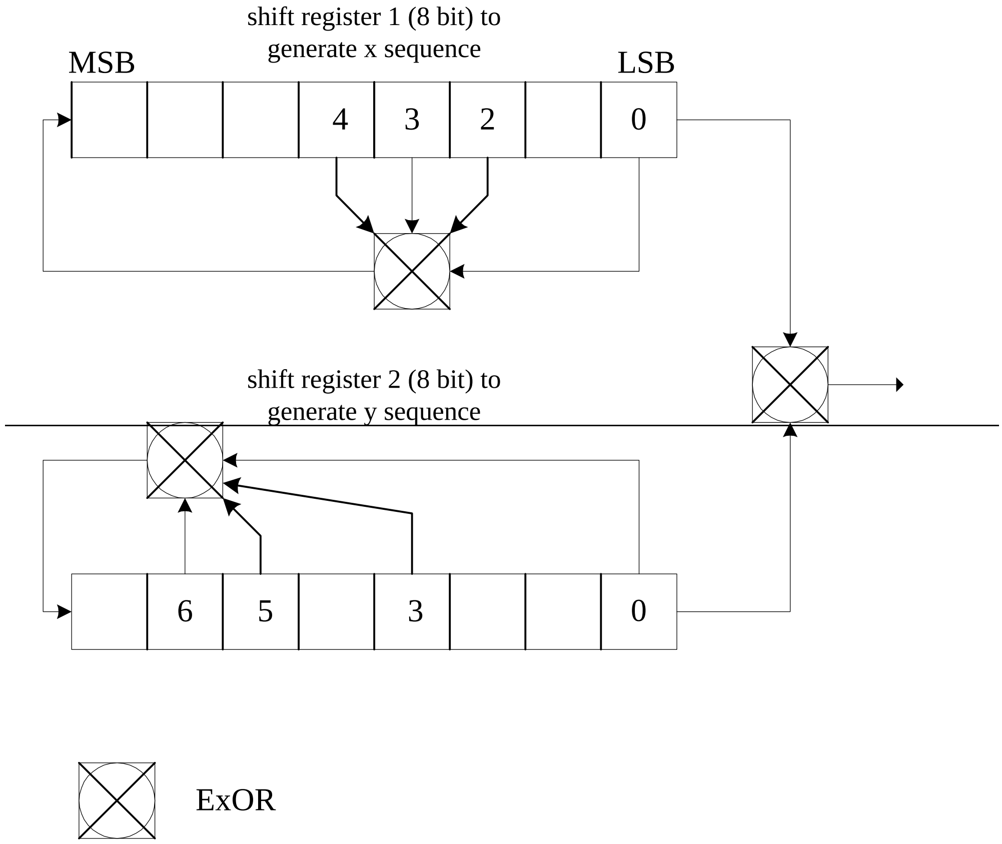

Figure 8. Preamble spreadingcode generator

Note that the code words always start with a constant ‘0’ symbol.

Before modulation and transmission these binary code words are converted to real valued sequences by the transformation ‘0’ -> ‘+1’, ‘1’ -> ‘-1’.

4.3.3.4 Scrambling code for the message part

In addition to spreading, the message part is also subject to scrambling with a 10 ms complex code. The scrambling code is cell-specific and is the same as used for preamble spreading but phases 4096..45055 are used (phases 0..4095 are used in preamble spreading) if chip rate is 4.096 MHz.

has a one-to-one correspondence to the spreading code used for the preamble part.

The scrambling codes used are from the same set of codes as is used for the other dedicated uplink channels when the long scrambling codes are used for these channels. The first 256 of the long scrambling codes are used for the random access channel. The generation of these codes is explained in Section 4.3.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the other dedicated uplink channels and is described in Section 4.3.2.