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Re:	Response to IEEE 802.16m-08/003r7 " IEEE 802.16m System Description Document (SDD)"
Abstract	This document proposes a method to generate randomized interleaver patterns and some principles for patterns' allocation in CSSI.
Purpose	For discussion and approval by TGm.
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Generation and allocation of interleaver patterns for CSSI

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1. Introduction

CSSI (Cell/Sector-Specific Interleaving) can be used to randomize the inter-cell/sector interference, so that a substantial performance gain in suppressing the inter-cell/sector interference can be made, following with the increasing of cell/sector edge transmission rate further.

Simple random interleaving is suitable for the CSSI, which can provide sufficient number of interleaver patterns with satisfactory anti-fading performance and correlation property.

In this document, a method to generate randomized interleaver patterns is introduced, and some principles for patterns' allocation are proposed.

2. Generation and allocation of cell/sector-specific interleaver patterns

Usually, an interleaver is used as a component of a channel encoder to enhance the coding gain, or as a channel interleaver to combat the time/frequency coherent fading by scrambling burst errors into random errors. However, CSSI can also be used to randomize the inter-cell/sector interference. Simple random interleaving is suitable for the CSSI, which can provide sufficient number of interleaver patterns with satisfactory anti-fading performance and correlation property. A method to generate randomized interleaver patterns is introduced below:

Considering an interleaver with length L, and m is the minimum k which satisfies 2^k>L, we will introduce an positive integer parameter α, which is less than 2^m. The input sequence is $\{x_i\}$, each element can be a coded bit.

Let I_j denote the original index of the input sequence for the j^{th} output element, i.e., the output sequence $\{y_j\}$ is $\{y_0 \quad y_1 \quad y_2 \quad \cdots \quad y_{L-1}\} = \{x_{I_0} \quad x_{I_1} \quad x_{I_2} \quad \cdots \quad x_{I_{L-1}}\}$.

Let the m sequence generator with order m be $g_m(x)$, and can be written in binary form g_m, e.g., $g_3(x)=x^3+x^2+1$ can be written as $g_m=1101(B)$.

The I_j, j=0~L-1 can be generated by the following steps, the operator $\oplus$ means bit-by-bit module 2 sum. a<<b means the left shifting a by b bits. A>>b means the right shifting a by b bits.

s=α;

j=0;

for k=0: 2^m-1

    t=s-1;

    if t<L

        I_j=t;

        j=j+1;

    end if;

    if s>>(m-1)==1

        s=(s<<1)$\oplus g_m$;

    else

        s=s<<1;

    end if;

end;

Different generating seeds α will lead to different interleaving patterns for different cells/sectors. The number of the different interleaver patterns generated with the above method is up to the length of interleaver.

Regarding the allocation of cell/sector-specific interleavers, different interleaver patterns can be allocated to different cells/sectors, by generating the interleavers with the corresponding seeds. A base station or subscriber station can identify the interleaver pattern (seed) of each cell/sector by checking its interleaver pattern ID.

In principle, hundreds of distinct seeds can be provided. However, using a distinct pattern for each cell/sector in the system is unnecessary. Hence, it is recommend to reuse a relatively small number of interleaver patterns (seeds) generation seed. The reuse of the seeds can be realized in a manner similar to that of frequency reuse in a cellular system.

3. Proposed Text for SDD

Insert the following text into Interference mitigation using cell/sector-specific interleaving (i.e. Chapter 20 in [X]):

---------- Text Start ----------

20.4 Interference mitigation using cell/sector-specific interleaving

20.4.x Allocation of Interleaver Patterns

Regarding the allocation of cell/sector-specific interleavers, different interleaver patterns can be allocated to different cells/sectors, by generating the interleavers with the corresponding seeds. A base station can identify the interleaver pattern (seed) of each cell/sector by checking its interleaver pattern ID.

In principle, hundreds of distinct seeds can be provided. However, using a very distinct pattern for each cell/sector in the system is unnecessary. Hence, it is recommend to reuse a relatively small number of interleaver patterns (seeds) generation seed. The reuse of the seeds can be realized in a manner similar to that of frequency reuse in a cellular system.

---------- Text End ----------