

IEEE 802.16 Presentation Submission Template (Rev. 9)

Document Number:

IEEE S802.16m-07/211

Date Submitted:

2007-11-07

Source:

Isamu YOSHII, Katsuhiko HIRAMATSU
Matsushita Electric(Panasonic)

Voice: +81-50-3687-6548

E-mail: yoshii.isamu@jp.panasonic.com

Venue:

IEEE 802.16 Session #52, Atlanta, USA

Base Contribution:

C802.16m-07/211

Purpose:

For discussion of inter cell interference mitigation

Notice:

This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.

Release:

The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

Patent Policy:

The contributor is familiar with the IEEE-SA Patent Policy and Procedures:

<<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <<http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>.

Introduction

- Improving the cell edge user throughput is an important aspect in the system requirement. Legacy systems employ bit repetition to improve the signal-to-interference power ratio (SIR) in the cell edge area.
- This contribution presents interference mitigation with Coordinated Symbol Repetition (CSR) among cells, aiming at improved cell edge user throughput.
- We propose CSR as a new main functionality for interference mitigation.

Interference mitigation method with Coordinated Symbol Repetition (CSR)

- If same signals are transmitted on frequency f_1 and f_2 and interference on f_1 and f_2 are identical, an MMSE receiver can cancel them.
- A frequency domain interleaver can be employed as long as the repeated symbol mapping is identical among the neighboring cells.

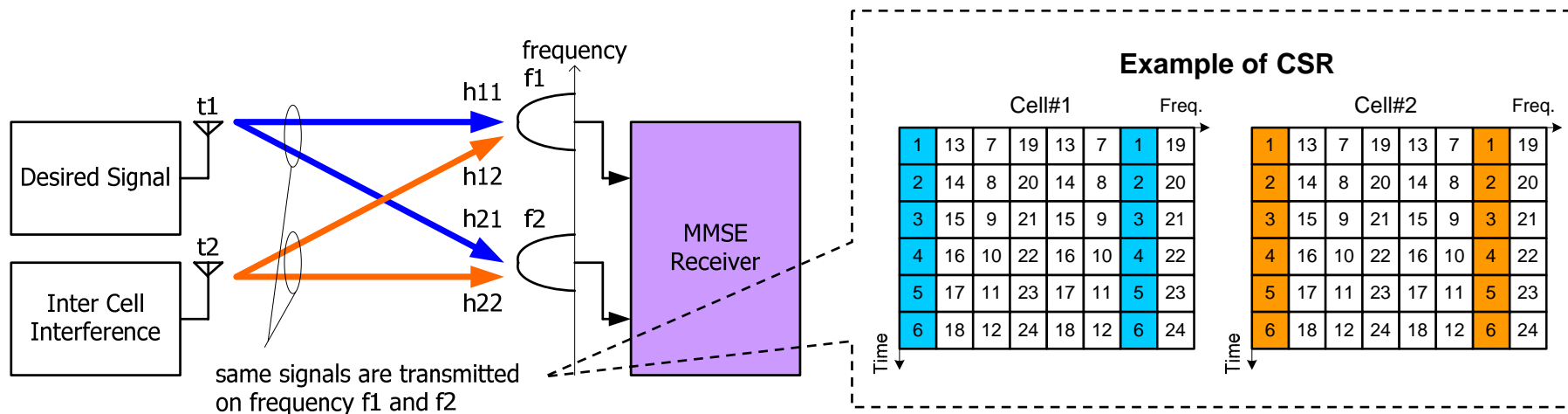


Fig.1 Interference mitigation with the CSR.

Comparison to legacy bit repetition interference mitigation

- An MMSE receiver in *legacy bit repetition* can mitigate $(N-1)$ interference signals while that in *interference mitigation with CSR* can mitigate $(N \cdot RF - 1)$ interference signals thanks to extension into space and frequency domain. (N : Number of reception antennas, RF : Repetition Factor)
- Interference mitigation with CSR has as RF times freedom as that of the legacy bit repetition and needs less numbers of reception antennas to mitigate same number of interference signals.

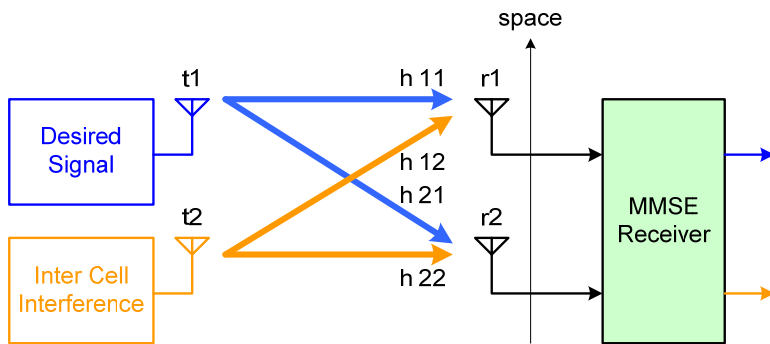


Fig.2(a) An MMSE receiver in *legacy bit repetition* ($N=2$)

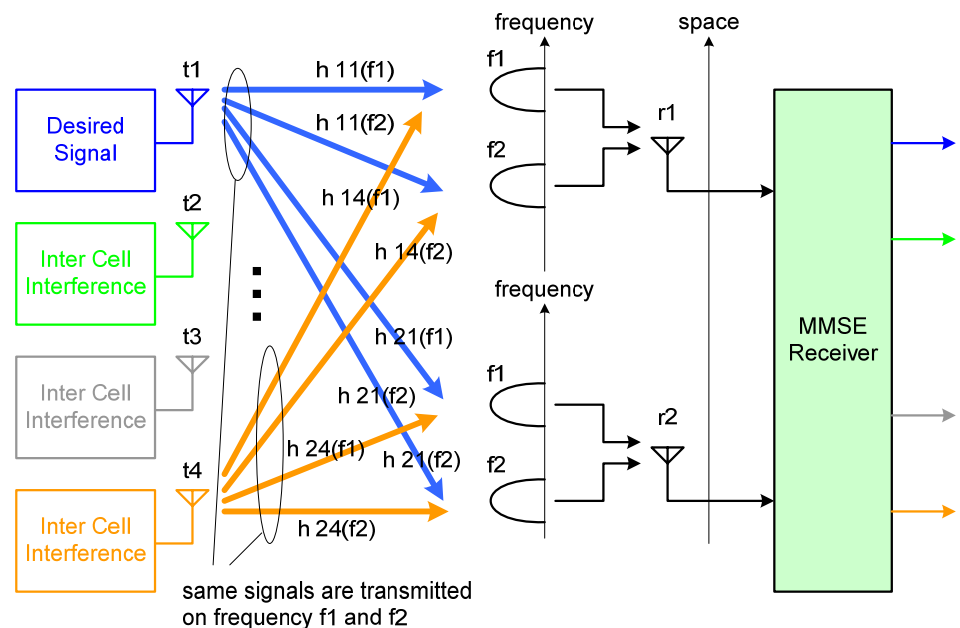


Fig.2(b) An MMSE receiver in *interference mitigation with CSR* ($N=2, RF=2$)

Comparative evaluation

- The interference mitigation with CSR mitigates the inter cell interference by means of MMSE reception, while legacy bit repetition without interference mitigation has “floor” saturation.

Table 1 Simulation assumption.[*]

Cell layout	Desired cell and 1 interference cell
# of reception ntennas	1 [**]
Transmission BW	10MHz
Sub-carrier spacing	15kHz
Sampling frequency	15.36MHz
FFT size	1024
Channel environments	Typical Urban 3km/h
Channel estimation	Ideal
Decoder algorithm	Max-Log-MAP with 8 iterations
Modulation	QPSK
Channel coding	Turbo code as 1/3
Repetition	<ul style="list-style-type: none"> •Legacy bit repetition •Symbol repetition
Bit repetition	Rate matching repeats to 1/4
Symbol repetition	Puncturing to 1/2 by bit level and then symbol level repetition to 1/4 (RF=2)

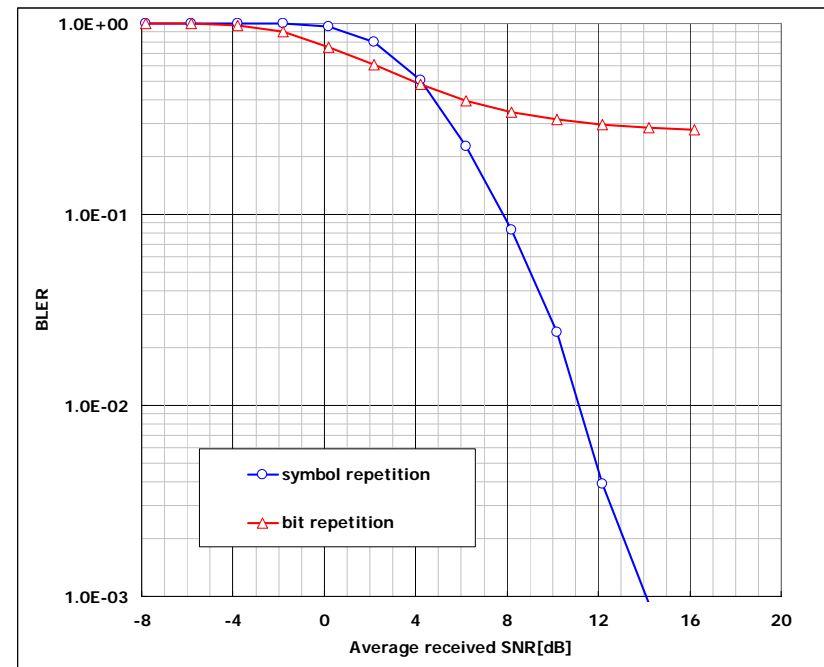


Fig. 3 Block error rate (BLER).

[*]Note that although simulation assumption is not 16m reference, characteristic tendency is same.

[**] We assumed one reception antenna since the effect of interference mitigation in both two reception antennas with RF=2 case and one reception antenna with RF=2 case.

Conclusion

- Improving cell edge throughput is a key issue to achieve the system requirement.
- Interference mitigation with CSR serves better inter cell interference mitigation ability than legacy bit repetition without interference mitigation.
- We believe that interference mitigation should be discussed in SDD.
- We propose to adopt interference mitigation with CSR as new main functionality on interference mitigation to SDD discussion.