Uplink Power Control Enhancement for 802.16e OFDMA PHY

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Jun Wu,Wenzhong Zhang,Mary Chion,	Voice:	858-554-0387
Yonggang Fang,Keqiang Zhu,Irving Wang		
ZTE San Diego Inc	Fax:	858-554-0894
10105 Pacific Heights Blvd	E-mail:	jwu@ztesandiego.com
San Diego, CA 92121, USA		

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IEEE C802.16e-04/230r3

Purpose:

Assist in clarifying C802.16e-04_230r3.pdf contribution document.

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The problem to be addressed

- In OFDMA system, the residual frequency offset results in the non-orthogonality of subcarrier, thus the inter-carrier interference (ICI).

- The power imbalance of subcarriers shall be caused by severe multipath in NLOS, even if there is power control based on the average power of SS.

- These two factors results in the effect, which the stronger subcarriers will kill the weak subcarriers.

The problem to be addressed (cont.)
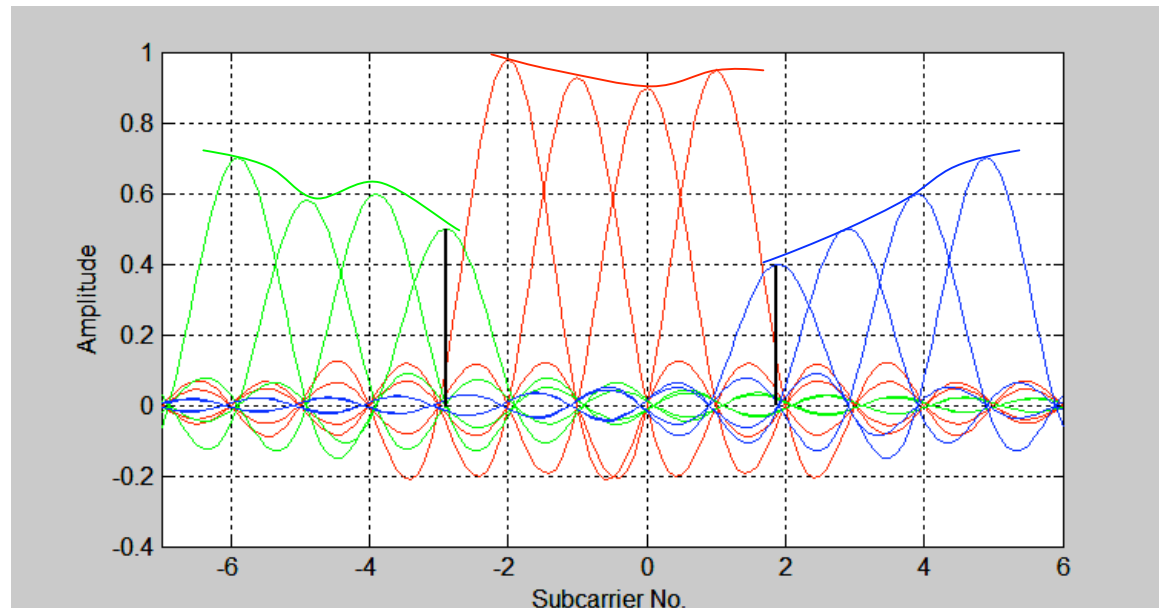
- **Each tile has 4 consecutive subcarriers by 3 OFDM symbols, we show part of subcarriers in one OFDM symbol in the Figure above.**

- **The existing power control machnism keeps the average power equal. In subcarrier level, the power imbalance still exists.**

The Solution

- The solution: the existing user-based power control + our proposed enhanced power control

- The enhanced power control is based on the power measurement of tile, which is more accurate. It helps to reduce the power imbalance between subcarriers, thus eliminates the near-far effect.

- The performance is evaluated by simulation. The simulation parameters follow the OFDMA uplink PHY in 802.16 D5. Assume that the 70 users communicate with BS simultaneously, and each user occupies one subchannel with _ convolutional coded 16QAM.

The simulation results
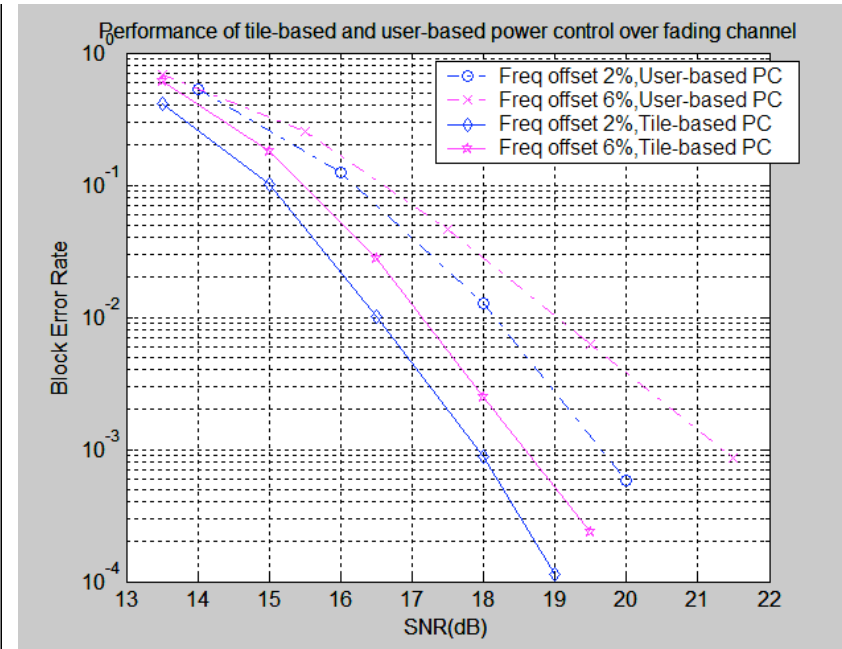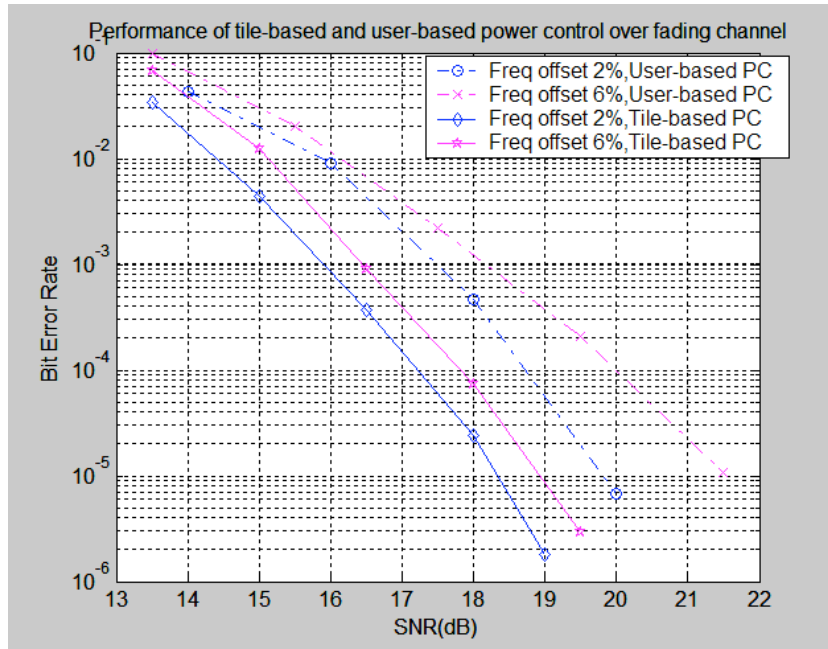
Bit error rate and block error rate comparison

for user-based and tile-based power control

Proposed Text

- **An Enhanced Power Control IE is defined, which uses the exteneded UIUC=15 with subcode 0x01.**

Syntax	Size	Notes
Enhanced_Power_Control_IE(){		
Extended UIUC	4 bits	Enhanced Fast Power Control = 0x01
Length	4 bits	Length(n)=ceil((14+7*n)/8), n is integer between 1 to 16
Power Adjustment Group Bitmap	14 bits	Each bit indicates if there is a power adjustment in the current group. "1"- there are at least one tile need to adjust power;"0"- all the tiles in current group keep unchanged.
for (i=1; i<=n; i++) {		n=Number of tiles which need to be adjusted, 1<=n<=16
The flag for group changing	1 bit	"1"-the group changed;"0"- the group keep unchanged
Tile index within group	5 bits	The indexes of tile within each group
Power correction	1 bits	Power correction indication, 0: -3dB, 1: +3dB
}		
}		