Project	**IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>**
Title	**Proposed Text for Multicarrier Operation for Femtocell ABS for the IEEE802.16m/D3 (16.4)**
Date Submitted	**2010-01-08**
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Re:	LB comment to 802.16m Amendment Working Document D3
Abstract	This contribution provides a scheme allowing multi-carrier operation for Femtocell ABS**.**
Purpose	For discussion and approval by IEEE 802.16m TG
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Proposed Text for the IEEE 802.16m AWD (section 16.2.8.2.3.1.1 & 16.4):

Multicarrier Operation for Femtocell ABS

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1 Introduction

This contribution proposes a scheme that allows multicarrier operation for Femtocell ABS without increasing interference to macro/micro cells.

2 Multicarrier Operation

2.1 Multicarrier Operation for Femtocell ABS

Multicarrier operation may be supported by Femtocell ABS as depicted in Fig.1. All operational principles for multicarrier operation outlined in section 16.2.8 of D3 are applied to the multicarrier operation for Femtocell. In addition, the following principles shall also be applied to multicarrier operation for Femtocell in order to mitigate interference.

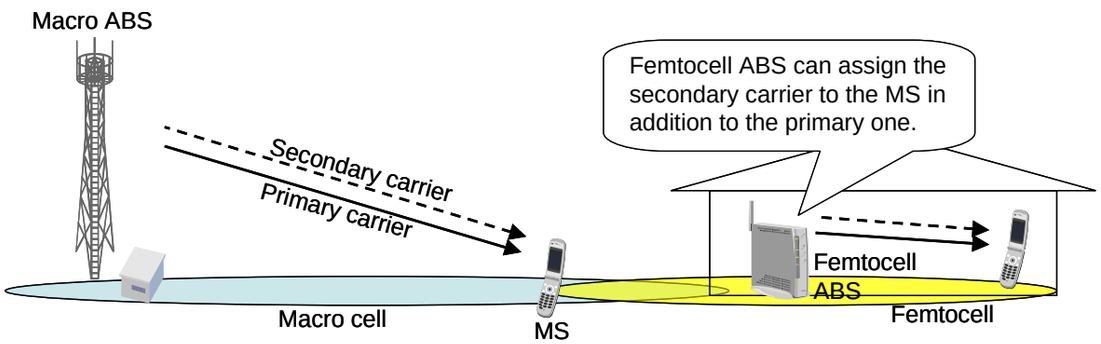

Fig.1 Illustration of the concept of multicarrier operation for Femtocell ABS

2.2 Interference in Multicarrier Operation for Femtocells

If Femtocell ABS happens to select a secondary carrier which is the same carrier as the one used by neighbor ABS, the interference from Femtocell to neighbor cells may subsequently increase. This may occasionally happen when multicarrier operation scheme is enabled for Femtocell since secondary carrier management does not consider the interference impact to the neighbor cells.

A scenario in which interference will increase in multicarrier operation for Femtocell ABS is described in Fig.2. RF2 is assigned to a MS connected to the macro ABS (macro MS) as a primary carrier. RF1 is assigned to a MS connected to the Femtocell ABS as a primary carrier. RF2 is to be assigned as a secondary carrier for the MS connected to the Femtocell ABS. If RF2 is assigned by the Femtocell ABS, the interference to the macro MS will increase and performance of the macro cell may subsequently be degraded.

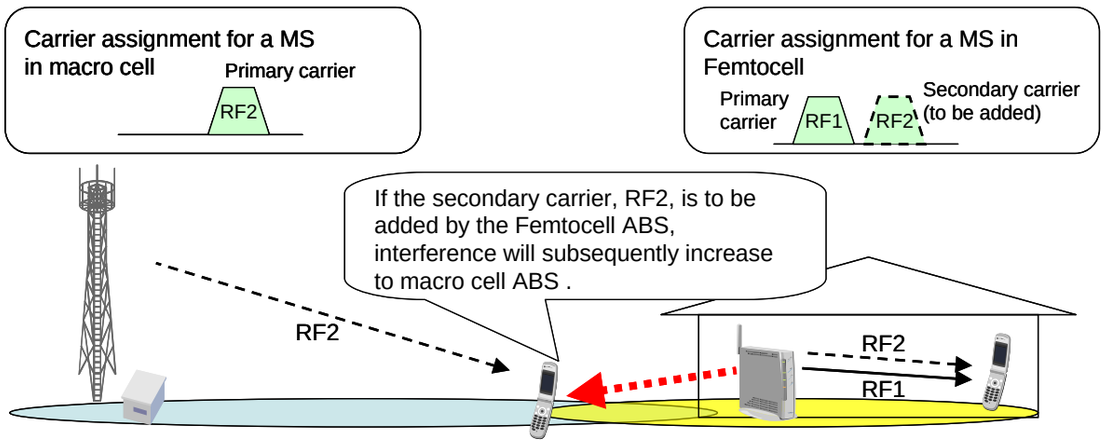

Fig.2 Illustration of the scenario that interference increases in multicarrier operation for Femtocell ABS

2.3 Proposed Scheme for Interference Mitigation in Multicarrier Operation

In case of multicarrier operation for Femtocell ABS, the Femtocell ABS should consider interference avoidance or mitigation when assigning the secondary carrier.

In assigning the secondary carrier, the Femtocell ABS should decide activating or deactivating of secondary carrier(s) based on factors such as load condition of each carrier of the neighbor ABS.

We propose to use DL and UL available resources for each carrier of the neighbor ABS as the co-channel interference indicator for the Femtocell ABS. The ABS should transmit the DL and UL available resource

condition for each carrier ("Available Radio Resource DL" and "Available Radio Resource UL") in AAI_MC-ADV messages as shown in Fig.3. "Available Radio Resource DL" and "Available Radio Resource UL" are represented by the percentage of non-assigned DL resources to the total usable DL radio resources. The Femtocell ABSs may receive the neighbor ABSs' load condition over the air connection, or over the backhaul connection. Femtocell ABSs monitor the load condition at the initial setting and then monitor it periodically. If the DL or UL available radio resource of the neighbor ABS for the carrier is small, then the Femtocell ABSs should avoid using this carrier as the secondary carrier.

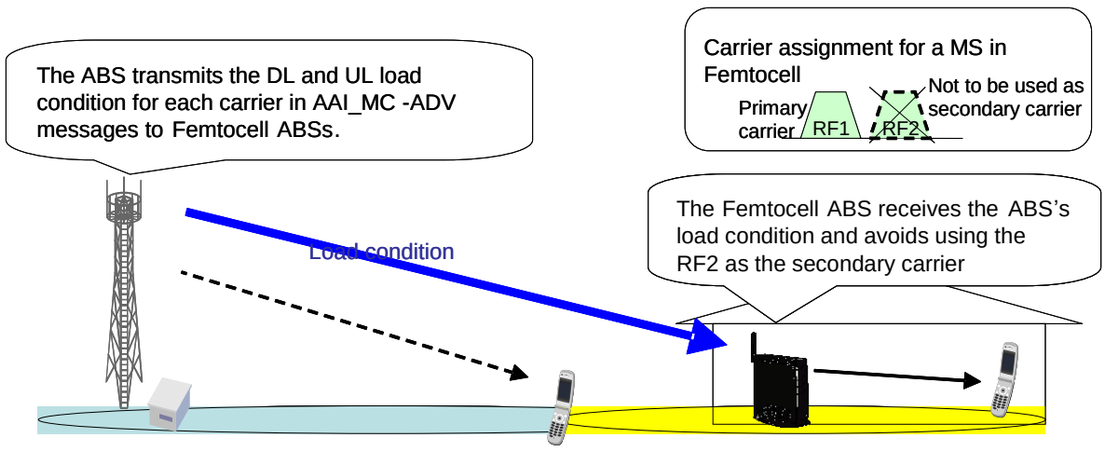

Fig.3 Proposed Scheme for interference mitigation in multi-carrier operation

3 Proposed Text

----------Start of Text 1----------

[Modify the Table 735 as follows]

16.2.8.2.3.1.1 AAI_MC-ADV (multicarrier Advertisement) Message

Table 735 AAI_MC-ADV MAC Control Message Format

Field	Size (bit)	Description
Multi-carrier configuration change count	4	A change count associated with a particular configuration for all possible carriers in the network. Incremented by 1 upon each update.

MC configuration broadcast flag	1	0: only broadcast serving BS specific info 1: broadcast multi-carrier definition from all available carriers in the network
If (MC configuration broadcast flag == 1) {		
Number of Carrier Groups	4	Groups of contiguous carriers
Uniformity Flag	1	0: All Carriers in one group have the same Protocol Version, Carrier Type Duplexing Mode and Transmit Power 1: Otherwise
For(i=1;i<=Number of Carrier Groups; i++){		
Carrier configuration index	6	Index associated to Table 764
Start frequency assignment index	6	Frequency assignment index of the first carrier in carrier group i
for(j=i;j<=Number of carriers'j++){		
Physical carrier index	3	
}		
If(Uniformity flag==1) {		
Carrier type	1	0: for fully configured 1: for partially configured
Duplexing mode	1	0: for TDD 1: for FDD
Transmit power	6	A-Preamble transmit power level
}		
Physical Carrier Index of Current Carrier	6	The carrier that ABS broadcast this message
}		
}		
}		
Serving BS Carrier Number	6	//start broadcasting serving BS specific info
For(i=0;i<=Serving BS Carrier Number-1; i++){		

Physical carrier index	6	
Number of MAC protocol versions supported: P	4	Greenfield: 1 Mixed-mode > 1
for(i=0;i<=P; i++){		
MAC protocol version	4	Consistent with REV.2 definition, with new MAC protocol version 9 defined for 16m MAC version.
Preamble Index	6	
}		
Available Radio Resource DL	**8**	**8-bit unsigned integer** **0x00 = 0%** **0x01 = 1%** **…** **0x64 = 100%** **All other values are Reserved.** **Available Radio Resource indicator DL SHALL indicate the average ratios of non assigned DL resources to the total usable DL radio resources.**
Available Radio Resource UL	**8**	**8-bit unsigned integer** **0x00 = 0%** **0x01 = 1%** **…** **0x64 = 100%** **All other values are Reserved.** **Available Radio Resource indicator DL SHALL indicate the average ratios of non assigned UL resources to the total usable UL radio resources.**
}		

----------Start of Text 2----------

[Insert text in subclause 16.4 as follows]

16.4 Support for Femto ABS

16.4.x Multicarrier Operation

Multicarrier operation may be supported by Femtocell ABS. All operational principles for multicarrier operation set out in section 16.2.8 are applied to the multicarrier operation for Femtocell ABS. In addition, the following principles shall also be adopted for multicarrier operation for Femtocell in order to mitigate interference.

In assigning the secondary carrier, the Femtocell ABS should decide activating or deactivating the secondary carrier(s) based on factors such as load condition of each carrier of the neighbor ABS.

The DL and UL available radio resource for each carrier shall be utilized as the load condition. The load condition for each carrier should be included in the AAI_MC-ADV MAC control message. The ABS should transmit the available radio resource for each carrier ("Available Radio Resource DL" and "Available Radio Resource UL")in AAI_MC-ADV messages. "Available Radio Resource DL" and "Available Radio Resource UL" are represented by the percentage of non-assigned DL resources to the total usable DL radio resources. The Femtocell ABSs may receive the neighbor ABSs' load condition over the air or over the backhaul connection. Femtocell ABSs monitor the load condition at the initial setting and then monitor it periodically. If the DL or UL available radio resource for a carrier from a neighbor ABS is small, then the Femtocell ABSs should avoid using this carrier as the secondary carrier.

----------End of the Text----------