|  |  |  |
| --- | --- | --- |
| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | **Text changes related to BS power management** | |
| Date Submitted | **2013-05-14** | |
| Source(s) | Jisoo Park, Jaesun Cha, Eunkyung Kim, Young-il Kim  ETRI | E-mail: [jsp@etri.re.kr](mailto:jsp@etri.re.kr)  \*<<http://standards.ieee.org/faqs/affiliationFAQ.html>> |
| Re: | In response to the IEEE 802.16 Working Group Call for Contributions: IEEE Project P802.16q Multi-tier Networks (IEEE 802.16-13-0064-01-000q) | |
| Abstract | The contribution proposes the text changes related to the BS power management. | |
| Purpose | To discuss and adopt the proposed texts in IEEE P802.16q AWD | |
| 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>>. | |

**Proposed text related to BS power management**

*Jisoo Park, Jaesun Cha, Eunkyung Kim, Young-il Kim*

*ETRI*

1. **Introduction**

This contribution proposes the text changes related to the BS power management defined in draft AWD document [1] in response to the IEEE 802.16 Working Group Call for Contributions on IEEE Project P802.16q Multi-tier Networks (IEEE 802.16-13-0064-01-000q).

In multi-tier networks, the various small cells such as pico, relay, micro and femto including macro has been needed to increase the capacity of the system in downtown, office, home, school, express highway, railway, etc. However, although it can improve the system capacity, it may increase the energy consumption of the BS as well as cause interference problem among multi-tier cells. Specially, if these multi-tier or neighbor BSs don’t cooperate with each other, it may make interference and be waste of energy in the system.

In specific time duration, there may be no attached mobile stations including idle state or very small traffic load of the system by different reason of going to sleep, leaving the places, etc. Moreover, there may be almost blank radio frames or subframes in DL and UL except for DL control signals (preamble, midamble, common pilot, common control information, etc.).

Some control signals (always-on signals) such as preamble, midamble, common pilot, common control channel are always on every radio frame or subframe in DL. These signals transmit periodically and repeatedly on radio, but may be unnecessary in specific period of almost blank frames or subframes regardless of whether it is a short time or long time. However, the transmission of always-on signals may cause interference for neighboring cells or multi-tier cells. In addition, the device power consumption of the base station may be wasted of energy in blank frames or subframes by required transmission power of these always-on signals.

In these cases, the base station may allocate the burst or control channels of DL and UL per a frame or subframe, and may not allocate any burst or control channels in assigned zero energy region.

In a zero energy region, if a base station does not modulate and transmit data subcarriers and common pilots to its subordinate mobile stations except preamble and midamble, it can promote efficiency in terms of reducing transmission power consumption and mitigating interference among neighbor BSs. So, in blank region of a frame or subframe, a BS may needed to try to saving transmission power for always-on signals such as common pilot, even if the BS operates in normal mode.

1. **References**
2. IEEE P802.16q, Part 16: Air Interface for Broadband Wireless Access Systems: Amendment for Multi-tier Networks, Jan. 16, 2013
3. **Proposed Texts on IEEE 802.16q AWD**

[Added texts and figures marked in blue font with underline and removed texts and figures ~~marked in red font with strikeout~~]

------------------------------------------- Start of Proposed Text Changes --------------------------------------------

***[Remedy #1: Adopt the following modification text in line 7 on page 11 section 7.4 in draft AWD*** [1] ***]***

1. 1. **Base Station Power Management**
      1. **General Description**

This subclause describes the power management functions of base stations for energy efficient operation. The power management function under this subclause details not only operation of single base station but also cooperative operations of adjacent base stations.

Base stations including macro and small base stations always operate in Normal mode when the base station power management is not supported at the base stations.

In Normal mode, a BS may allocate the burst or control channels as a resource allocation region in any portion of frame or subframe for DL. Also a BS may not allocate any burst or control channels as a zero energy region in any portion of a frame or subframe for DL.

A BS may allocate bursts and control channels in a specific region of a frame while allocating any bursts and control channels in the rest of the frame. The portion of the frame where bursts or control channels are allocated is referred to a resource allocation region and the rest of the frame is referred to a zero energy region.

The base station shall not modulate and transmit data subcarriers and common pilots to its subordinate mobile stations except preamble and midamble. The BS shall also indicate the information of zero energy region to all MSs, and the MSs shall discard any signal and not perform measurement using pilot in the zero energy region. The signal information of zero energy region may be broadcast manner such as gap allocation (DIUC = 13) in DL MAP. During the zero energy region, the BS may turn off the power of BS transceiver devices for saving transmission power and mitigating interference among neighbor BSs.

Base stations supporting the base station power management in this subclause can operate in one of the power saving operation modes such as Duty-cycled mode or Standby mode when the operation condition is met.

------------------------------------------- End of Proposed Text Changes --------------------------------------------