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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | **Proposed Outline of BS Power Management in IEEE 802.16q Networks** | |
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| Re: | Call for Contributions: Multi-tier Networks (16-12-0690-02-Gdoc) | |
| Abstract | This contribution proposes an outline of base station power management in IEEE P802.16q AWD. | |
| Purpose | To discuss and adopt the proposed texts in IEEE P802.16q AWD | |
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# Proposed Outline of BS Power Management in IEEE 802.16q Networks

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# Introduction

The IEEE 802.16q is an amendment of the IEEE 802.16 system to support enhanced cooperation among base stations in multi-tier networks. One of the main features of IEEE 802.16q amendment is the base station power management for energy efficient operation of the wireless networks including macro and small base stations.

The proposed ToC (Table of Ccontents) regarding the base station power management function is follows:

***17.4 Base Station Power Management***

***17.4.1 General Description***

***17.4.2 Duty-cycled Mode***

***17.4.3 Standby Mode***

***17.4.4 Cooperation of Base Stations for Power Management***

This contribution contains an outline of the base station power management function of IEEE 802.16q system including general description and power saving operation modes according to the proposed ToC.

# References

[1] IEEE 802.16-12-0615-02-000q, “Consolidated proposed text towards an initial draft System Requirements on IEEE 802.16q Multi-tier Networks”

[2] IEEE 802.16-12-0690-02-Gdoc, “Call for Contributions: IEEE P802.16q Amendment for Multi-tier Networks”

[3] IEEE 802.16-2012, “IEEE Standard for Air Interface for Broadband Wireless Access Systems”

# Proposed Texts on IEEE 802.16q AWD

----------------- Start of the text proposal --------------------------------------------------------------------------------------

# Support of Multi-tier Networks

## Base Station Power Management

### 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.

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.

### Duty-cycled Mode

Duty-cycled mode is one of power saving operation mode in which a base station changes its operation state between active period and inactive period. A base station in the inactive period does not transmit/receive data to/from its subordinate mobile stations. A base station may enter Duty-cycled mode when the base station has small number of subordinate mobile stations and small traffic demands from the mobile stations.

The base station in the Duty-cycled mode goes into the inactive period when all of its associated mobile stations are in unavailability interval. The inactive period of the base station shall be informed to the mobile stations to prevent UL attempts of mobile stations during inactive period of the base station.

To increase the inactive period of the base station (i.e. a common unavailability interval of mobile stations), base station may adjust the configurations of Sleep mode (i.e. start frame number, window sizes, etc.) of associated mobile stations.

### Standby Mode

Standby mode is an another power saving operation mode in which a base station deactives its air interface to conserve energy consumption. A base station may enter Standby mode when the base station has no subordinate mobile stations.

Base stations in Standby mode wake up (i.e. change its operation mode into the Normal mode) when predefined inactive period timer expires or the network requests changes of state of the base station.

### Cooperation of Base Stations for Power Management

The base stations cooperate with other adjacent base stations and/or NCMS (Network Control and Management System) to increase the power saving performance and to prevent the performance degradation (e.g. throughput decreases and coverage holes) due to the power saving operation of base stations.

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