IEEE P802.22
Wireless RANs

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| TGb LB1 CID 216 Comment Resolution  |
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Abstract

Proposed resolution for Comment ID 216, as listed in the TGb Letter Ballot 1 comment database, DCN: 22-13/158r0 (or latest revision).

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**Introduction**

This document proposes a resolution to CID 216 in the TGb LB1 ballot. The resolution to this comment will have an affect on how PHY Mode 1 and 2 and are handled when considering a mix of Legacy and Advanced CPEs.

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| 216 | Ranga Reddy | Self | 7 | 7.4a.3 | 1 | 18 | 37 | TR | Here the OFDM slot is defined as 4 symbols by 1 subchannel. If a slot is constructed this way, it breaks compatibility with legacy CPEs. Future deployments may have to consider legacy/1st generation CPEs connecting to R-CPEs or MR-BS directly. MAPs/MAP IEs define allocations in terms of slots. A legacy CPE will not be able to process MAPs issued by a R-CPE or MR-BS |

**Background**

This amendment introduces two PHY modes, 1 and 2. The OFDM slot structure of PHY Mode 1 is defined as 1 symbol by 1 subchannel. This PHY mode is backwards-compatible with the base standard (IEEE Std. 802.22-2011). The OFDM slot structure of PHY Mode 2 is defined as 4 symbols by 1 subchannel. This PHY mode is not backwards-compatible with the base standard. The difference in slot sizes between both modes is along the time domain, e.g. in terms of # of symbols.

The issue arise when there is a mixed deployment of Legacy & Advanced S-CPE’s w/in a cell or Access Zone. This issue poses the following questions:

1. How will PHY Mode usage be handled between the zones of both types, distributed & centralized, R-CPE’s where there is a mix of S-CPE types?
2. If both modes can be used simultaneously, how do we deal with translating slot allocations between zones where different PHY modes are engaged?
3. Do we even attempt to support simultaneous use of both PHY Modes?

**Discussion**

Let us first address the distinction between both types of R-CPE’s. When engaging centralized scheduling R-CPEs, the S-CPEs are dependent upon receiving the same FCH and MAPs as transmitted by the MR-BS. So, all S-CPEs in the cell all have to be on the same page with regard to how large a slot is in the time domain. So, in the case of centralized scheduling R-CPE, only one PHY mode can be engaged at a time. For centralized R-CPEs, this means that only PHY Mode 1 can be used if there are Legacy S-CPEs in the cell, and only PHY Mode 2 can be used if the cell consists entirely of Advanced S-CPEs.

When engaging distributed R-CPEs, we have more flexibility than we do have with centralized R-CPEs. This flexibility comes from the fact that Distributed R-CPE’s make their own scheduling decisions and transmit their own FCH/MAPs. This allows the PHY Mode for the AZ of the MR-BS and R-CPEs to be determined by the presence of Legacy S-CPEs in that zone. If Legacy S-CPEs exist in a zone, then the PHY Mode 1 would be engaged, other wise PHY Mode 2 would be engaged.

However, the flexibility allowed to us for mixing PHY Modes by using distributed R-CPEs requires us to be smart with translation the slot allocations the MR-BS gives to the (distributed) R-CPE, and the allocations then made by the (distributed) R-CPE to the S-CPEs it serves. The translation between allocations in each PHY modes is comparatively easy:

* going from PHY Mode 2 zone to PHY Mode 1 zone: # PHY mode 1 slots = 4 \* # PHY Mode 2 slots
* going from PHY Mode 1 zone to PHY Mode 2 zone: # PHY mode 2 slots = # PHY Mode 1 slots / 4

The translation described would happen when a MAP gives an allocation to the distributed R-CPE, and the R-CPE has to then translate that allocation into the requisite # of slots in the MAP allocations it transmits to the S-CPEs it serves. While the math of the translation is easy, it would require additional complexity in the scheduler, as well as bandwidth request mechanisms, and MAP definition/structure.

**Proposed Resolution**

For centralized R-CPEs, only one PHY Mode can be engaged throughout the MR-BS cell at given time. Due to the additional complexity that would be required to support multiple simultaneous PHY modes for distributed R-CPE zones, it is recommended that we also engage only one PHY Mode throughout the MR-BS cell at a given time. The PHY Mode engaged throughout the cell shall be determined by the existence of legacy S-CPEs.

We propose some additional text in the sections that describe the types of zones, clarifies the single PHY Mode per zone approach, and what is used to signal the type of zone.

**Proposed Text Modifcations to draft**

***Add the following text after line 13, pg 23, Section 7.4b.3.1***

If any Legacy S-CPEs exist in the MR-BS cell, PHY Mode 1 shall be used in the AZ. If no Legacy S-CPEs exist in the MR-BS cell, PHY Mode 2 shall be used in the AZ. Use of PHY Mode 1 in the AZ shall be signalled by transmission of the legacy FCH (see 7.5.2) in the AZ of the DS subframe. Use of PHY Mode 2 in the AZ shall be signalled by transmission by one of the Frame Control Header for PHY Mode 2 (see 7.5.2a) in the AZ of the DS subframe.

***Add the following text after line 59, pg 23, Section 7.4b.3.2***

If any Legacy S-CPEs exist in the MR-BS cell, PHY Mode 1 shall be used in all R-CPE CRZ. If no Legacy S-CPEs exist in the MR-BS cell, PHY Mode 2 shall be used in all R-CPE CRZ. Use of PHY Mode 1 in the CRZ shall be signalled by transmission of the legacy FCH (see 7.5.2) in the AZ of the DS subframe. Use of PHY Mode 2 in the AZ shall be signalled by transmission by the Frame Control Header for PHY Mode 2 (see 7.5.2a) in the AZ of the DS subframe.

***Add the following text after line 58, pg 24, Section 7.4b.3.3***

If any Legacy S-CPEs exist in the MR-BS cell, PHY Mode 1 shall be used in all DRZ or DRZ segments. If no Legacy S-CPEs exist in the MR-BS cell, PHY Mode 2 shall be used in all DRZ or DRZ segments.

Use of PHY Mode 1 in the DRZ or DRZ segment shall signalled as follows:

* Single segment: transmission of legacy FCH (see 7.5.2) in the DRZ segment of the DS subframe
* Two or Three segments: transmission of the DRZ-FCH with ‘PHY Mode Type’ field set to 1, in the DRZ segment of the DS subframe

Use of PHY Mode 2 in the DRZ or DRZ segment shall be signalled by setting the ‘PHY Mode Type’ field to 2 in the DRZ-FCH transmitted in the DRZ or each DRZ segment.

***Add the following field to “DRZ Frame control header format (DRZ-FCH)” Table C1, page 31***

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| --- | --- | --- |
| PHY Mode Type | 8 bits | 0x00 = PHY Mode 10x01 = PHY Mode 20x02-0xFF: Reserved |

**References:**

[1] IEEE P802.22b WRAN Amendment: Enhancement for broadband services and monitoring applications Draft 1.0 WG Letter Ballot Template, DCN 22-13/158r2, https://mentor.ieee.org/802.22/dcn/13/22-13-0158-02-000b-802-22b-letter-ballot-1-comment-database.xls