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| Re: | IEEE 802.16 Working Group Letter Ballot #24a, on P802.16h/D2 | |
| Abstract | This contribution proposes to schedule periodic idle gaps for SSs to perform non-working channel measurements. | |
| Purpose | To schedule periodic idle gaps for SS so that it can perform non-working channel measurements without affecting normal traffic between SS and serving BS. | |
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# Scheduling Idle Gaps for SSs to Perform non-working Channel Measurements

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## Introduction

Channel measurements are very important for LE systems. To get better frequency efficiency and avoid interference, system must perform correct and timely channel measurements. BS is responsible for scheduling measurement periods for SSs. In current working group draft[1], for UCP, measurement periods are transmitted to SS via channel measurement IEs (8.4.5.3.5) or EQP IEs (8.4.5.3.29). Channel measurement IE schedules SS to perform channel measurement in current frame and EQP IEs schedules SS to perform channel measurement during EQPs.

Channel measurement IE specifies the measurement zone in only one frame. For each time BS wants SSs to perform channel measurement, it will send the MAC massage to SS. In some cases, BS may require SS to monitor continuously one channel. Using current channel measurement IEs may increase the overhead.

On the other hand, how the measurement periods are scheduled and transmitted has not been defined for coordinated coexistence protocol. For coexistence protocol, BS may request SS to perform channel measurement during slave sub-frame or CSI/CMI/CXCC slot. Slave sub-frame pattern and CSI/CMI/CXCC pattern are periodic and this makes periodic measurement zone more suitable.

## Proposed Scheme

**We propose** that BS schedules periodic measurement zones for SS to perform channel measurement. During scheduled measurement zone, BS shall not transmit MAC PDUs to that SS or request any uplink transmission from SS. BS should schedule measurement zone properly so that no effect on normal traffic transmission between BS and SS.

Upon receiving a measurement requirement, SS shall start to measure the indicated channel during the scheduled measurement zones. SS shall continue to measure the indicated channel during the scheduled measurement zones until the measurement interval ends or serving BS schedules SS to receive and/or send signal during measurement zone.

If the SS is requested to perform measurement in non-working channel, SS shall start to measure the indicated channel no later than **Max. Channel Switch Time** after the start of measurement zone and stop the measurement no later than **Max. Channel Switch Time** before the end of measurement zone.

BS may schedule more than one measurement pattern for one SS. Measurement zone of different measurement pattern shall not be overlapped.

A measurement pattern includes parameters listed below.

**Start Measurement Frame Offset:** The frame offset of first measurement frame number to the frame containing the channel measurement IE message.

**Number of Frames between two measurement zones:** Number of Frames between two continuous measurement zones.

**Start of Measurement Zone:** the OFDMA offset between the start of measurement zone and the frame header.

**End of Measurement Zone:** the OFDMA offset between the end of measurement zone and the frame header.

**Measurement Interval:** the total number of frame which contains the periodic measurement pattern.

Figure below gives an example of the measurement pattern.

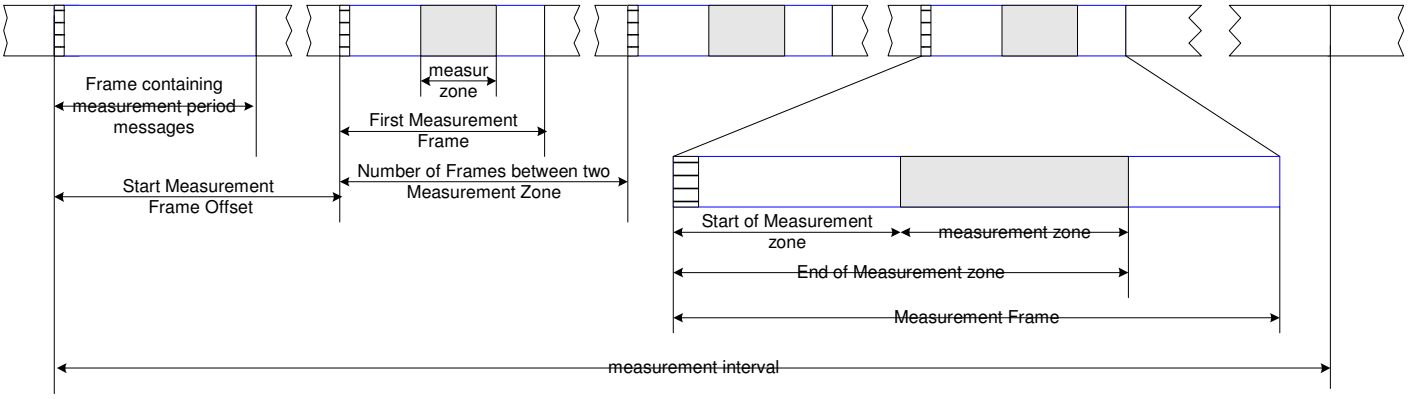


Figure 1 measurement pattern

## Examples

In this section, we give some examples of the measurement pattern parameters setting.

If we want SS to perform measurement during periodic quiet frame, we may set corresponding parameters as below:

Start Measurement Frame Offset: 0

Number of Frames between two measurement zones: 4

Start of Measurement Zone: 0

End of Measurement Zone: frame length in OFDMA symbol

If we want SS of system 1 to perform measurement during slave sub-frame of second CX-Frame in the figure h46 of draft 2, we may set corresponding parameter as below:

Start Measurement Frame Offset: 0

Number of Frames between two measurement zones: 4

Start of Measurement Zone: the OFDMA offset between the start of slave sub-frame and the frame header.

End of Measurement Zone: the OFDMA offset between the end of slave sub-frame and the frame header.

If we want SS to perform measurement during CSI slot, we may set corresponding parameter as below:

Start Measurement Frame Offset: 0

Number of Frames between two measurement zones: 1

Start of Measurement Zone: the OFDMA offset between the start of CSI slot, including necessary channel switch time and the frame header.

End of Measurement Zone: the OFDMA offset between the end of CSI slot, including necessary channel switch time and the frame header.

## Proposed Text

### 8.4.5.3.5 Channel Measurement IE

An extended IE with an extended DIUC value of 0x00 is issued by the BS to request channel measurement report (see 6.3.15). The IE includes an 8-bit Channel Nr value as shown in Table 280.

Table 280 OFDMA channel Measurement IE

| Syntax | Size | Notes |
|---|---|---|
| Channel_Measurement_IE() { | | |
| Extended DIUC | 4bits | CHM=0x00 |
| Length | 4bits | Length=0x04 |
| Channel Nr | 8bits | Channel Number (see 8.5.1)<br>Set to zero for license bands |
| ~~OFDMA Symbol Offset~~ | ~~8bits~~ | |
| CID | | Basic CID of the SS for which the channel measurement IE is directed. |
| Measurement Interval | 16bits | 0: indicate measurement interval is unlimited |
| Start Frame Number Offset | 8bits | The offset of frame which start measurement to the current frame |
| Number of Frames between two Measurement Zones | 8bits | Number of frames between two available measurement frames |
| Start of Measurement Zone | 8bits | OFDMA offset of the beginning of measurement zone |
| End of Measurement Zone | 8bits | OFDMA offset of the end of measurement zone |
| } | | |

***[Add a new section at the end of section 15.1.3.2]***

### 15.1.3.2.1 Channel Measurement in the Operating Stage

BS may request SS to measure one or more channels on its behalf in the operating stage. BS should schedule available measurement zone for SS via channel_measurement_IE (8.4.5.3.5). During scheduled measurement zone, BS shall not transmit MAC PDUs to that SS or request any uplink transmission from SSs. BS should schedule measurement zone properly so that no effect on normal traffic transmission between BS and SS.

Upon receiving a measurement requirement, SS shall start to measure the indicated channel during the scheduled measurement zones. SS shall continue to measure the indicated channel during the scheduled measurement zones until the measurement interval ends or serving BS schedules SS to receive and/or send signal during measurement zone.

If the SS is requested to perform measurement in non-working channel, SS shall start to measure the indicated channel no later than **Max. Channel Switch Time** after the start of measurement zone and stop the measurement no later than **Max. Channel Switch Time** before the end of measurement zone.

BS may schedule one or more measurement pattern for SS. Measurement zone of different measurement pattern shall not be overlapped.

## Conclusion

It is necessary for BS to schedule measurement zone for SS to perform measurement. The periodic measurement zone can decrease the signaling overhead and can be used to both UCP and CP. We suggest TG to consider the proposed periodic measurement zone concept and accept the proposed text.

## Reference

[1] IEEE 802.16h-D2: Air Interface for Fixed Broadband Wireless Access Systems: Amendment for Improved Coexistence Mechanisms for License-Exempt Operation
[2] IEEE 802.16-2004: Air Interface for Fixed Broadband Wireless Access Systems
[3] IEEE 802.16-2005: Air Interface for Fixed Broadband Wireless Access Systems: Amendment 2: Physical Media Access Control Layers for combined fixed and mobile operation in license band