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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** |
| Title | **Collision resolution method in frame synchronization operation for Talk-around direct communication in IEEE 802.16.1a/D5**  |
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| Re: | In response to Sponsor Ballot on P802.16a |
| Abstract | This contribution is a proposal to resolve synchronization collision in Talk-around direct communication in IEEE 802.16.1a/D5 |
| Purpose | To discuss and adopt the proposed text in the draft amendment document on GRIDMAN |
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**Collision resolution method in frame synchronization operation for Talk-around direct communication in IEEE 802.16.1a/D5**

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# Introduction

GRIDMAN AWD for IEEE 802.16.1a/D5 describes frame-level synchronization in Section 16.12.2.3.2.5.1 for TDC (Talk-around direction communication). However, there is no collision resolution method for TDC synchronization in the current AWD. If there is a collision in a TDC synchronization slot, a synchronization collision cannot be resolved in the current AWD.



Figure 1. Example of TDC synchronization collision in the current AWD.

When an HR-MS broadcasts a synchronization signal in a synchronization slot, the other adjacent HR-MS broadcasting a synchronization signal in the same synchronization slot can cause collisions of synchronization signals.



Figure 2. Example of TDC synchronization collision resolution method

The HR-MS broadcasting a SYNC-H preamble and SYNC-CH message periodically shall listen to a randomly selected synchronization slot every Wsync\_window. Then, the HR-MS can detect synchronization collision and resolve the collision problem.

This contribution provides details of resolving synchronization collision problem for TDC in IEEE 802.16.1a/D5.

# References

[1] IEEE 802.16-12-0132-00, GRIDMAN System Requirement Document including SARM annex, January 2012.

[2] IEEE P802.16.1aTM/D5, WirelessMAN-Advanced Air Interface for Broadband Access Systems - Draft Amendment: Higher Reliability Networks, June 2012.

# Proposed Text for the 802.16.1a AWD

Note:

The text in **BLACK** color: the existing text in the 802.16.1a AWD

The text in **~~RED~~** color: the removal of existing 802.16.1a AWD

The text in **BLUE** color: the new text added to the 802.16.1a AWD

[-----------------------------------------------Start of Text Proposal----------------------------------------------]

**[Remedy : Adopt the following proposed modification from line #10, page #167 to line #34, page #167]**

10 **6.12.2.3.2.5.1 Frame-level synchronization**

11 To share a common frame timing and configuration reference, an HR-MS listens to a synchronization

12 channel and receives synchronization preambles in the synchronization channel. The HR-MS selects a

13 reference time among candidate values including synchronization preambles, GPS, and HR-BS preambles.

14 When deciding to send a synchronization preamble on synchronization channel, the HR-MS sends it

15 periodically with a period *Tsync*.

Synchronization slots are synchronization channel where the HR-MS sends a synchronization preamble periodically with a period *Tsync*.

16 An HR-MS follows a priority rule to select a reference time in descending order of priority as the

17 followings:

18 1) HR-BS preamble

19 2) GPS

20 3) Synchronization preamble that has a) smaller value of the ‘hop counter’ field and b) larger value

21 of the received signal strengths in Synchronization channel message IE when the received

22 Synchronization channel message IE is compared with the Synchronization channel message IE

23 selected for the referenced time. The reference source is either HR-BS or GPS.

24 4) Synchronization preamble that has a) smaller value of the ‘hop counter’ field and b) larger value

25 of the received signal strengths in Synchronization channel message IE when the received

26 Synchronization channel message IE is compared with the Synchronization channel message IE

27 selected for the reference time. The reference source is HR-MS local clock.

28 5) HR-MS local clock.

29 An HR-MS follows a rule to select itself for broadcasting SYNC-CH preamble and SYNC-CH message if

30 the received signal strength of a SYNC-CH preamble selected for the reference time is less than value of

31 ‘Reference Signal Strength’ field in received SYNC-CH messages with hop counter of SYNC-CH

32 preamble selected for the reference time plus one. The selected HR-MS picks up a DC frame in which

33 synchronization channel is expected to be no signal randomly and broadcast SYNC-CH preamble and

34 SYNC-CH message periodically.

The HR-MS broadcasting a SYNC-CH preamble and SYNC-CH message periodically shall randomly pick up a synchronization slot every Wsync\_window to listen to the synchronization channel for collision resolution of synchronization. Wsync\_window is the duration of *W* times *Tsync*.

Wsync\_window = *W* x *Tsync* ,

where W is an integer.



**Figure xxx - An example of synchronization slots with Wsync\_window (W = 6)**

If the HR-MS detects signal in the selected synchronization slot, the following operation shall be done.
- Under the circumstances that the HR-MS received a SYNC-CH preamble and SYNC-CH message successfully and did not be selected to broadcast a SYNC-CH preamble and SYNC-CH message periodically, the HR-MS shall stop broadcasting them.
- In case of the other circumstances except the above, the HR-MS shall randomly pick up a new DC frame in which synchronization channel is expected to be no signal and broadcast a SYNC-CH preamble and SYNC-CH message periodically.

[----------------------------------------------End of Text Proposal------------------------------------------------]