Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Clarification on HR-MS neighbor discovery under direct communication over IEEE 802.16n**
Date Submitted	**2012-07-09**
Source(s)	Eunkyung Kim, Jaesun Cha, Anseok Lee, Wooram Shin, Kwangjae Lim ETRI Voice: +82-42-860-5415 E-mail: ekkim@etri.re.kr
Re:	"IEEE 802.16-12-400-00-Gdoc," in response to Letter Ballot Recirc #37b on P802.16n/D3
Abstract	Comments on neighbor discovery for direct communication in GRIDMAN Draft Standard
Purpose	To discuss and adopt the proposed text in the draft amendment document on GRIDMAN
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.
Copyright Policy	The contributor is familiar with the IEEE-SA Copyright Policy <http://standards.ieee.org/IPR/copyrightpolicy.html>.
Patent Policy and Procedures	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>.

Clarification on HR-MS neighbor discovery under direct communication over IEEE 802.16n

Eunkyung Kim, Jaesun Cha, Anseok Lee, Wooram Shin, Kwangjae Lim
ETRI

1. Introduction

According to the neighbor discovery procedure, HR-RNG-CMD is transmitted to HR-MS for neighbor discovery. In response to HR-RNG-CMD, an HR-MS transmits ranging signal in the assigned ranging channel and other HR-MS receives and measure the SINR of the ranging signal transmitted the HR-MS requested to transmit the ranging signal.

However, the text in 6.12.2.2.1.1 is not clear understand the procedure of neighbor discovery. Thus, the text shall be rewritten.

This document provides clarification on the procedure of HR-MS neighbor discovery to perform direct communication between HR-MSs in P802.16n.

2. References

[1] IEEE 802.16-12-0132-00, GRIDMAN System Requirement Document including SARM annex, January 2012.
[2] IEEE P802.16n™/D3, Air Interface for Broadband Wireless Access Systems - Draft Amendment: Higher Reliability Networks, June 2012.
[3] IEEE P802.16.1a™/D3, WirelessMAN-Advanced Air Interface for Broadband Access Systems - Draft Amendment: Higher Reliability Networks, June 2012.
[4] EEE P802.16Rev3/D6, IEEE Draft Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems," April 2012.
[5] IEEE P802.16.1™/D6, IEEE Draft for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems, April 2012.

3. Proposed Text on the IEEE 802.16n Amendment Draft Standard

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

[Remedy1: change line#11, page 28-line#16, page 30 in P802.16n/D3 as follows:]

6.3.2.3.99.22 HR-RNG-CMD message

HR-BS/RS sends HR-RNG-CMD message to instruct ~~one or group of~~ its associated HR-MS to carry out neighbor discovery or HR-MS-to-HR-MS periodic ranging. The field "Action" in HR-RNG-CMD message tells receiving HR-MS whether ~~it (them) should~~ to transmit or receive the specified ranging ~~signals~~signal. ~~The serving HR-BS/HR-RS can allocate ranging resources to both involved HR-MSs in a single assignment. This allows the receiving HR-MS to transmit back a ranging sequence right after successfully processing the ranging sequence transmitted by the other HR-MS.~~

Table 229v - HR-RGN-CMD message format

Syntax	Size (bit)	Notes
HR-RNG-CMD_Message_Format () {	-	-
Management Message Type=[TBD]	8	-
Rendezvous time	4	Indicates the time offset, in number of frames, when the HR-BS shall provide dedicated ranging opportunity for the transmission of this discovery ranging signal
Dedicated CDMA code	8	CDMA code assigned for discovery/ranging purpose, shall be taken from the code set for initial ranging
Transmission opportunity offset	4	The offset is in number of symbol duration
Action	2	0b00: ranging for neighbor discovery and reception node to carry out transmission 0b01: ranging for neighbor discovery and receiving node to carry out reception 0b10: DC/FTN periodic ranging transmission 0b11: *Reserved*
Reserved	6	Shall always be set to 0
if (Action == 0b00){		
Transmit power level	5	Unsigned integer from 0 to 31 in units of 1 dBm, where 0b00000 = 0dBm and 0b11111 = 31dBm
~~Reversed action offset~~	~~2~~	~~0b01-0b11: Indicates number of frames that this HR-MS should switch to receive the same ranging code in the same ranging slot~~ ~~0b00: no such reversed action.~~
Reserved	~~1~~3	Shall always be set to 0
}		
elseif(Action == 0b01){		

Table 229v - HR-RGN-CMD message format

Syntax	Size (bit)	Notes
Reporting mode	1	Indicates if the report mode is exclusive or triggered by threshold. 0b0: exclusive reporting 0b1: triggered-based reporting
~~if(Reporting mode == 0b0){~~		
~~Reversed action offset~~	~~2~~	~~0b01-0b11: Indicates number of frames that this HR-MS should switch to transmit the same ranging code in the same ranging slot~~ ~~0b00: no such reversed action.~~
~~If(Reversed action offset > 0b00){~~		
~~Transmit power level~~	~~5~~	~~Unsigned integer from 0 to 31 in units of 1 dBm, where 0b00000 = 0dBm and 0b11111 = 31dBm~~
~~}else{~~		
Reserved	~~1~~7	Shall always be set to 0
~~}~~		
~~else {~~ if(Reporting mode == 0b1) {		Reporting mode == 0b1
SINR threshold	2	Indicates the SINR threshold for the ranging signal above which report should be made by receiving station. The 2 bit value from 0b00 to 0b11 represent values among {–9, –8, –6, –4 } dB
~~Reversed action offset~~	~~2~~	~~0b01-0b11: Indicates number of frames that this HR-MS should switch to transmit the same ranging code in the same ranging slot~~ ~~0b00: no such reversed action.~~
~~If(Reversed action offset > 0b00){~~		
~~Transmit power level~~	~~3~~	~~Unsigned integer from 0 to 31 in units of 4 dBm, where 0b000 = 0dBm and 0b111 = 32dBm~~
~~}else{~~		
Reserved	~~3~~6	Shall always be set to 0

Table 229v - HR-RGN-CMD message format

Syntax	Size (bit)	Notes
}		
elseif(Action == 0b10){		For DC/FTN periodic ranging
Initial transmit power	3	Unsigned integer from 0 to 31 in units of 4 dBm, where 0b000 = 0dBm and 0b111 = 32dBm
Periodicity	2	Indicates the periodicity of periodic ranging: 0b00: transmit ranging signal every 2 frames 0b01: transmit ranging signal every 4 frames 0b10: transmit ranging signal every 16 frames 0b11: transmit ranging signal every 32 frames
~~Tx/Rx Offset~~	~~2~~	~~Indicate the offset between transmitting and receiving ranging from the other HR-MS:~~ ~~0b00: No offset, unidirectional ranging~~ ~~0b01: Offset = 1 frame~~ ~~0b10: Offset = 3 frame~~ ~~0b11: Reserved~~
Reserved	~~1~~3	Shall always be set to 0
}		
}		

An HR-MS ~~who~~that receives the HR-RNG-CMD message shall interpret the three parameters for rendezvous time, dedicated ranging code, and transmission opportunity offset in the same way as specified in 6.3.10.4.1.

When HR-RNG-CMD message is used to schedule ranging for neighbor discovery, it is transmitted with the basic CID of the receiving HR-MS.

~~When HR-RNG-CMD message is used to schedule periodic ranging between two HR-MSs involved in BS-controlled direct communication, it is transmitted with the basic CID allocated to one of the two sides of the direct communication link, as defined in 16.2.2.1.2. The HR-MS that has its basic CID used for the HR-RNG-CMD message shall transmit the ranging signal as defined by the field Rendezvous time and Periodicity. The other HR-MS, i.e., at the other side of the direct communication link, shall transmit the same ranging code, at the same location within a frame, and at an offset as defined by Tx/Rx Offset.~~

When HR-RNG-CMD message is used to schedule periodic ranging between two HR-MSs involved in BS-controlled FTN, it is transmitted using the basic or primary CID of the forwarded HR-MS. The forwarding HR-MS shall transmit the ranging signal as defined by the field Rendezvous time and Periodicity. ~~The forwarded HR-MS shall transmit the same ranging code, at the same location within a~~

~~frame, and at an offset as defined by Tx/Rx Offset.~~

[Remedy2: change line#2-23, page 77 in P802.16n/D3 as follows:]

16.2.2.1.1 HR-MS Neighbor Discovery

For associated HR-MSs to discover each other, ~~the serving~~ an HR-BS/HR-RS shall ~~schedule some HR-MSs~~ request an HR-MS to broadcast ranging signals so that other HR-MSs ~~can try to~~ may receive and verify their neighbor relationship. The process ~~can be described~~ is as follows:

- ~~The serving~~ An HR-BS/HR-RS sends HR-RNG-CMD message described in 6.3.2.3.99.22 to ~~schedule one or multiple registered HR-MSs~~ an HR-MS to broadcast a ranging sequence in an assigned channel.~~ranging sequences in assigned channels. Multiple HR-MSs may share the same ranging sequence or the same assigned channel.~~

- Using HR-RNG-CMD message, the ~~serving~~ HR-BS/HR-RS also schedules ~~some other HR-MSs~~ other HR-MS to listen on the channel for the ranging signal. ~~those channels scheduled for ranging signals.~~

~~- EachHR-MS that is scheduled to receive ranging sequences shall determine what sequences it can properly decode, together with related information such as estimations of time/frequency offsets and signal strength.~~

- The HR-MS receiving a ranging sequence that has met the reporting criteria defined by the "Reporting mode" and possibly "SINR threshold" as specified in AAI-HR-RNG-CMD message shall report ~~their measurements~~ the measurement to the ~~serving~~ HR-BS/HR-RS using AAI-HR-RNG-REP message described in 6.3.2.3.99.23.

~~The format of HR-RNG-CMD message is described in 6.3.2.3.99.22. The HR-BS unicasts HR-RNG-CMD message to a single HR-MS or multicasts the message to a group of HR-MSs that are supposed to broadcast the ranging signal. The HR-BS unicasts HR-RNG-CMD message to a single HR-MS or multicasts the message to a group of HR-MSs that are supposed to attempt to receive the ranging signal. The HR-BS can also broadcast the HR-RNG-CMD message to all of its subordinates HR-MS. In such a case, all HR-MS that are not involved in UL transmission during the ranging opportunity index shall attempt to receive the ranging signal.~~

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