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Re:	IEEE 802.16j-07/007r2: “Call for Technical Comments and Contributions regarding IEEE Project 802.16j”
Abstract	This contribution proposes format of relay neighborhood channel measurement report
Purpose	Text proposal for 802.16j Baseline Document
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Relay Neighborhood Channel Measurement Report

Background

According to IEEE 802.16-2004, IEEE 802.16e-2005 standard and IEEE 802.16 Corrigendum 2 Draft 2, a BS request an MS to report its channel measurement by using the messages defined in 6.3.2.3.33. Those are described as follows:

6.3.2.3.33 Channel measurement Report Request/Response (REP-REQ/RSP)

If the BS, operating in bands below 11 GHz, requires RSSI and CINR channel measurement reports, it shall send the channel measurements Report Request message. The Report Request message, it shall additionally be used to request the results of the DFS measurements the BS has previously scheduled. Table 62 shows the REP-REQ message.

Table 62—Channel measurements Report Request (REP-REQ) message form

Syntax	Size	Notes
Report_Request_Message_Format() {		
Management Message Type = 36	8 bits	
Report Request TLVs	variable	
}		

The REP-REQ message shall contain the following TLV encoded parameters:

Report Request

The channel measurement Report Response message shall be used by the SS to respond to the channel measurements listed in the received Report Requests. Where regulation mandates detection of specific signals by the SS, the SS shall also send a REPRSP in an unsolicited fashion upon detecting such signals on the channel it is operating in, if mandated by regulatory requirements. The SS may also send a REP-RSP containing channel measurement reports, in an unsolicited fashion, or when other interference is detected above a threshold value. In cases where specific signal detection by an SS is not mandated by regulation, the SS may indicate 'Unmeasured. Channel not measured'' (see 11.12) in the REP-RSP message when responding to the REP-REQ message from the BS. Table 63 shows the REP-RSP message.

Table 63—Channel measurement Report Response (REP-RSP) message format

Syntax	Size	Notes
Report_Request_Message_Format() {		
Management Message Type = 37	8 bits	
Report Request TLVs	variable	
}		

The REP-RSP shall contain the following TLV encoded parameters:

Report

Compound TLV that shall contain the measurement Report in accordance with the Report Request (see 11.11).

Upon sending a REP-RSP message, an SS shall reset all its measurement counters for each channel on which it reported.

11.11 REP-REQ management message encodings

Name	Type	Length	Value
Report request	1	variable	Compound

The Report Command consists of the following parameters:

Name	Type	Length	Value
Report request	1.1	1	Bit #0 = 1 Include DFS Basic report Bit #1 = 1 Include CINR report Bit #2 = 1 Include RSSI report Bit #3–6 α_{avg} in multiples of 1/32 (range [1/32, 16/32]) Bit #7 = 1 Include current transmit power report
Channel number	1.2	1	Physical channel number (see 8.5.1) to be reported on. (license-exempt bands only)
Channel Type request	1.3	1	00 = Normal subchannel, 01 = Band AMC Channel, 10 = Safety Channel, 11 = Sounding
Zone-specific physical CINR request	1.4	3	Bits #0-2: Type of zone on which CINR is to be reported 0b000: PUSC zone with 'use all SC=0' 0b001: PUSC zone with 'use all SC=1' / PUSC AAS zone 0b010: FUSC zone 0b011: Optional FUSC zone 0b100: Safety Channel region 0b101: AMC zone (for DL AAS zone or AMC Zone with dedicated pilots) 0b110 – 0b111: Reserved Bit #3: 1 if zone for which CINR should be estimated is STCzone, 0 otherwise. Bit #4: 1 if zone for which CINR should be estimated is AAS zone or zone with dedicated pilots, 0 otherwise. Bits #5-6: PRBS_ID of the zone for which CINR should be estimated. Ignored for Safety Channel. Bit #7: Data/pilot-based CINR measurement: 0 - Report the CINR estimate from pilot subcarriers, 1 - Report the CINR estimate from data subcarriers Bits #8-13: Reported CINR shall only be estimated for the subchannels of PUSC major groups for which the corresponding bit is set. Bit #(k+7) refers to major group k. Only applicable for CINR measurement on a PUSC zone Bits #14-17: α_{avg} in multiples of 1/16 (range is [1/16,16/16]) Bit #18: 0 - report only mean of CINR 1 - report both mean and standard deviation of CINR Bits #19-23: Reserved, shall be set to zero
Preamble physical CINR request	1.5	1	Bits #0-1: Type of preamble physical CINR measurement 0b00 - Report the estimation of CINR measured from preamble for frequency reuse configuration=1

			0b01 - Report the estimation of CINR measured from preamble for frequency reuse configuration=3 0b10 - Report the estimation of CINR measured from preamble for band AMC 0b11 - Reserved Bits #2-5: α_{avg} in multiples of 1/16 (range is [1/16,16/16]) Bit #6: 0 - report only mean of CINR 1 - report both mean and standard deviation of CINR Bit #7: Reserved, shall be set to zero
Zone-specific effective CINR request	1.6	2	Bits #0-2: Type of zone on which effective CINR is to be reported 0b000: PUSC zone with 'use all SC=0' 0b001: PUSC zone with 'use all SC=1' / PUSC AAS zone 0b010: FUSC zone 0b011: Optional FUSC zone 0b100: Reserved 0b101: AMC zone (for DL AAS zone or AMC Zone with dedicated pilots) 0b110 - 0b111: Reserved Bit #3: 1 if zone for which effective CINR should be reported is STC zone, 0 otherwise. Bit #4: 1 if zone for which effective CINR should be estimated is AAS zone or zone with dedicated pilots, 0 otherwise. Bits #5-6: PRBS_ID of the zone for which effective CINR should be reported. Ignored for Safety Channel. Bit #7: Data/pilot-based effective CINR measurement: 0 - Report the CINR estimate from pilot subcarriers, 1 - Report the CINR estimate from data subcarriers Bits #8-13:Reported effective CINR shall only be estimated for the subchannels of PUSC major groups for which the corresponding bit is set. Bit #(k+7) refers to major group k. Only applicable for CINR measurement on a PUSC zone Bit #14-15:Reserved, shall be set to zero
Preamble effective CINR request	1.7	1	Bits #0-1: Type of preamble-based effective CINR measurement 0b00 - Report the estimation of effective CINR measured from preamble for frequency reuse configuration=1 0b01 - Report the estimation of effective CINR measured from preamble for frequency reuse configuration=3 0b10-11 - Reserved Bit #2-7: Reserved, shall be set to zero
Channel selectivity repor	1.8	1	Bit #0: 1 - include frequency selectivity report Bit #1-7: Reserved, shall be set to zero

11.12 REP-RSP management message encodings

Name	Type	Length	Value
Report	1	variable	Compound

Channel Type Report in WirelessMAN OFDMA PHY	2	variable	Compound
Current transmitted power	147	1	See 8.3.7.4 and 11.1.1

The Report Command consists of the following parameters:

REP-REQ Report type	Name	Type	Length	Value
bit #0 = 1	Channel number	1.1	1	Physical channel number (see 8.5.1) to be reported on
bit #0 = 1	Start frame	1.2	2	16 LSBs of Frame number in which measurement for this channel started
bit #0 = 1	Duration	1.3	3	Cumulative measurement duration on the channel in multiples of Ts. For any value exceeding 0xFFFFFF, report 0xFFFFFF
bit #0 = 1	Basic report	1.4	1	Bit #0: WirelessHUMAN detected on the channel Bit #1: Unknown transmissions detected on the channel Bit #2: Specific Spectrum detected on the channel Bit #3: Unmeasured. Channel not measured
bit #1 = 1	CINR report	1.5	2	1 byte: mean (see also 8.2.2, 8.3.9, 8.4.11) for details) 1 byte: standard deviation
bit #2 = 1	RSSI report	1.6	2	1 byte: mean (see also 8.2.2, 8.3.9, 8.4.11) for details) 1 byte: standard deviation

REP-REQ Channel Type request	Name	Type	Length	Value
Channel Type = 00	Normal subchannel Report	2.1	1	5 LSBs CINR measurement report. The rest of the bits are reserved (set to zero).
Channel Type = 01	Band AMC Report	2.2	4	First 12 bits for the band indicating bitmap and Next 20 bits for CINR reports (5 bits per each band)
Channel Type = 10	Safety Channel Report	2.3	5	The first 20 bits for the reported bin indices and the next 20 bits for CINR reports (5 bits for each bin)

REP-REQ Channel Type request (binary)	Name	Type	Length	Value
01	Enhanced Band AMC Report	2.4	5	First 12 bits for the band indicating bitmap and next 25 bits for CINR measurement (5 bits per each band)
11	Sounding Report	2.5	1	Average SINR 8 bits in the same format used in 8.4.11.3

For REP-REQ Channel Type request type 1.3, with value 0b01 = Band AMC Channel, enhanced CQICH enabled MS shall report with type 2.4; otherwise, SS and MS shall report with type 2.2.

REP-REQ Zone-specific physical CINR	Name	Type	Length	Value

request				
Bits #0-2 = 0b000	PUSC zone with ‘use all SC=0’	2.6	1 or 2	Bit #0-4: Mean of physical CINR estimate for PUSC zone with ‘use all SC=0’ and PRBS_ID indicated in ‘zone-specific physical CINR request’. Bit #5: Report type: 0–CINR estimated from pilot subcarriers, 1–CINR estimated from data subcarriers Bit #6-7: Reserved, shall be set to zero Bit #8-12: Standard deviation of CINR estimate for PUSC zone with ‘use all SC=0’ and PRBS_ID indicated in ‘zone-specific CINR request’. Bit #13-15:Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2
Bits #0-2 = 0b001	PUSC zone with ‘use all SC=1’	2.7	1 or 2	Bit #0-4: Mean of physical CINR estimate for PUSC zone with ‘use all SC=1’ and PRBS_ID indicated in ‘zone-specific physical CINR request’. CINR reported corresponds to a subset of major groups as specified in ‘CINR type request’. Bit #5: Report type: 0 - CINR estimated from pilot subcarriers, 1- CINR estimated from data subcarriers Bit #6-7: Reserved, shall be set to zero Bit #8-12: Standard deviation of CINR estimate for PUSC zone with ‘use all SC=1’ and PRBS_ID indicated in ‘zone-specific CINR request‘. CINR reported corresponds to a subset of major groups as specified in ‘CINR type request’. Bit #13-15: Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2
Bits #0-2 = 0b010	FUSC zone	2.8	1 or 2	Bit #0-4: Mean of physical CINR estimate for FUSC zone with PRBS_ID indicated in ‘zone-specific physical CINR request’. Bit #5: Report type: 0 - CINR estimated from pilot subcarriers, 1- CINR estimated from data subcarriers Bit #6-7: Reserved, shall be set to zero Bit #8-12: Standard deviation of CINR estimate for FUSC zone with PRBS_ID indicated in ‘zonespecific CINR request’. Bit #13-15: Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2.
Bits #0-2 = 0b011	Optional zone	2.9	1 or 2	Bit #0-4: Mean of physical CINR estimate for Optional FUSC with PRBS_ID indicated in ‘zonespecific physical CINR request’. Bit #5: Report type: 0 - CINR estimated from pilot

				subcarriers, 1- CINR estimated from data subcarriers Bit #6-7: Reserved, shall be set to zero Bit #8-12: Standard deviation of CINR estimate for Optional FUSC with PRBS_ID indicated in 'zonespecific CINR request'. Bit #13-15:Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2.
Bits #0-2 = 0b100	Safety channel	2.10	5	The first 20 bits for the reported bin indices and the next 20 bits for CINR reports (5 bits for each bin).
Bits #0-2 = 0b101	AMC zone	2.11	1 or 2	Bit #0-4: Mean of physical CINR estimate for AMC AAS zone or AMC zone with dedicated pilots with PRBS_ID indicated in 'zone specific physical CINR request'. Bit #5: Report type: 0 - CINR estimated from pilot subcarriers, 1- CINR estimated from data subcarriers Bit #6-7: Reserved, shall be set to zero Bit #8-12: Standard deviation of CINR estimate for AMC AAS zone or AMC zone with dedicated pilots. Bit #13-15:Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2.

REP-REQ Preamble physical CINR request	**Name**	**Type**	**Length**	**Value**
Bits #0-1 = 0b000	The estimation of physical CINR measured from preamble for frequency reuse configuration=1	2.12	1 or 2	Bit #0-4: The mean of physical CINR estimation measured from preamble for frequency reuse configuration= 1. Bit #5-7: Reserved, shall be set to zero. Bit #8-12: The standard deviation of CINR estimation measured from preamble for frequency reuse configuration=1. Bit #13-15:Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2.
Bits #0-1 = 0b001	The estimation of physical CINR measured from preamble for frequency reuse configuration=3	2.13	1 or 2	Bit #0-4: The mean of physical CINR estimation measured from preamble for frequency reuse configuration = 3. Bit #5-7: Reserved, shall be set to zero. Bit #8-12: The standard deviation of CINR estimation measured from preamble for frequency reuse configuration = 3. Bit #13-15:Reserved, shall be set to zero NOTE—The second byte shall only be sent if length = 2.

Bits #0-1 = 0b010	The estimation of physical CINR measured from preamble for Band AMC zone.	2.14	4	The estimation of physical CINR measured from preamble for band AMC subchannel. First 12 bits for the band indicating bitmap and Next 20 bits for CINR reports (5 bits per each band).
Bits #0-1 = 0b010	The enhanced estimation of physical CINR measured from preamble for Band AMC zone.	2.15	5	The enhanced estimation of physical CINR measured from preamble for Band AMC subchannel. First 12 bits for the band indicating bitmap and Next 25 bits for CINR reports (b bits per each band)

For REP-REQ preamble physical CINR request type 1.5 with Bits #0-1=0b10, enhanced CQICH enabled MS shall report with type 2.15; otherwise, SS and MS shall report with type 4.3

REP-REQ zone specific effective CINR request request	**Name**	**Type**	**Length**	**Value**
Bits #0-2 = 0b000	PUSC zone with 'use all SC=0'	2.16	1	Bit #0-3: Effective CINR for PUSC zone with 'use all SC=0' and PRBS_ID indicated by 'Effective CINR request'. Encoding is defined in 8.4.5.4.10.5. Bit #4: Report type: 0 - effective CINR estimated from pilot subcarriers, 1- effective CINR estimated from data subcarriers Bit #5-7: 3 least significant bits of CQICH_ID
Bits #0-2 = 0b001	PUSC zone with 'use all SC=1' / PUSC AAS zone	2.17	1	Bit #0-3: Effective CINR for PUSC zone with 'use all SC=1' (or PUSC AAS zone) and PRBS_ID indicated by 'Effective CINR request'. Encoding is defined in 8.4.5.4.10.5. Bit #4: Report type: 0 - effective CINR estimated from pilot subcarriers, 1- effective CINR estimated from data subcarriers Bit #5-7: 3 least significant bits of CQICH_ID
Bits #0-2 = 0b010	FUSC zone	2.18	1	Bit #0-3: Effective CINR for FUSC zone with PRBS_ID indicated by 'Effective CINR request'. Encoding is defined in 8.4.5.4.10.5. Bit #4: Report type: 0 - effective CINR estimated from pilot subcarriers, 1- effective CINR estimated from data subcarriers Bit #5-7: 3 least significant bits of CQICH_ID
Bits #0-2 = 0b011	Optional FUSC zone	2.19	1	Bit #0-3: Effective CINR for Optional FUSC zone with PRBS_ID indicated by 'Effective CINR request'. Encoding is defined in 8.4.5.4.10.5. Bit #4: Report type: 0 - effective CINR estimated from pilot subcarriers, 1- effective CINR estimated from data subcarriers Bit #5-7: 3 least significant bits of CQICH_ID

Bits #0-2 = 0b101	AMC zone	2.20	1	Bit #0-3: Effective CINR for AMC AAS zone or AMC zone with dedicated pilots with PRBS_ID indicated by 'Effective CINR request'. Encoding is defined in 8.4.5.4.10.5. Bit #4: Report type: 0 - effective CINR estimated from pilot subcarriers, 1- effective CINR estimated from data subcarriers Bit #5-7: 3 least significant bits of CQICH_ID

REP-REQ preamble effective-CINR request	**Name**	**Type**	**Length**	**Value**
Bits #0-1 = 0b00	The estimation of effective CINR measured from preamble for frequency reuse configuration = 1	2.21	1 or 2	Bit #0-3: Effective CINR based on measurement from preamble with frequency reuse configuration = 1. Encoding is defined in 8.4.5.4.10.5. Bit #4-7: 4 least significant bits of CQICH_ID
Bits #0-1 = 0b01	The estimation of effective CINR measured from preamble for frequency reuse configuration = 3	2.22	1 or 2	Bit #0-3: Effective CINR based on measurement from preamble with frequency reuse configuration= 3. Encoding is defined in 8.4.5.4.10.5. Bit #4-7: 4 least significant bits of CQICH_ID

NOTE—CQICH_ID applies to triggered update (see 6.3.18.2) for CQI channel allocated with a CQICH_ID, and shall be zero in all other cases.

REP-REQ Channel selectivity report	**Name**	**Type**	**Length**	**Value**
Bits #0 = 1	Frequency selectivity report	2.23	3	Bit #0–7: a Bit #8–15: b Bit #16–23: c

For the types 2.1 through 2.5, the following 5 bit, CINR measurement encoding shall be used:

$$\text{Padload bits} = \begin{cases} 0 & CINR \le -3dB \\ n & (n-4)dB < CINR \le (n-3)dB, \quad 0 < n < 31 \\ 31 & CINR > 27dB \end{cases} \tag{154a}$$

For the TLVs with types 2.6 through 2.15, the following 5 bit physical CINR measurement encoding shall be used:

$$\text{Padload bits} = \begin{cases} 0 & CINR \le -3dB \\ n & (n-4)dB < CINR \le (n-3)dB, \quad 0 < n < 31 \\ 31 & CINR > 27dB \end{cases} \tag{154b}$$

Conclusion

This contribution describes format of relay neighborhood channel measurement report message. In order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the baseline working document IEEE 802.16j-06/026r2 are listed below.

Text Proposal

6.3.2.3.33 Channel measurement Report Request/Response (REP-REQ/RSP)

Add new sections 6.3.2.3.33

6.3.2.3.33.1 Relay Neighbor Channel Measurement Report Request/Response (REP-REQ/RSP)

11.11 REP-REQ management message encodings

Insert the following rows into Table at 11.11 REP-REQ:

Name	***Type***	***Length***	***Value***
Report request	1	variable	Compound
R-amble report request	2	variable	Compound

Insert the following Table at end of section 11.11:

Name	***Type***	***Length***	***Value***
R-amble physical CINR request	2.1	1	Bits #0-1: Type of R-amble physical CINR measurement 0b00 - Report the estimation of CINR measured from R-amble for frequency reuse configuration=1 0b01 - Report the estimation of CINR measured from R-amble for frequency reuse configuration=3 0b10 - Report the estimation of CINR measured from R-amble for band AMC 0b11 - Reserved Bits #2-5: α_{avg} in multiples of 1/16 (range is [1/16,16/16]) Bit #6: 0 - report only mean of CINR 1 - report both mean and standard deviation of CINR Bit #7: Reserved, shall be set to zero
Preamble effective CINR request	2.2	1	Bits #0-1: Type of R-amble-based effective CINR measurement 0b00 - Report the estimation of effective CINR measured from R-amble for frequency reuse configuration=1 0b01 - Report the estimation of effective CINR measured from R-amble for frequency reuse configuration=3 0b10-11 - Reserved Bit #2-7: Reserved, shall be set to zero

Name	***Type***	***Length***	***Value***

Amble Index	2.3	N_NBR_List	8 bit index of R-amble for each RS shall transmit R-amble in downlink relay zone

11.11 REP-REQ management message encodings

Insert the following rows into Table at 11.11 REP-REQ:

Name	Type	Length	Value
Report	1	variable	Compound
Channel Type Report in WirelessMAN OFDMA PHY	2	variable	Compound
R-amble report response	3	variable	Compound
Current transmitted power	147	1	See 8.3.7.4 and 11.1.1

Insert the following Table at end of section 11.12:

Name	***Type***	***Length***	***Value***
Amble Index	3.1	N_NBR_List	8 bit index for each R-amble in downlink relay zone.
R-amble report response (CINR mean)	3.2	N_NBR_List	8 bits CINR mean measurement per neighbor relay
R-amble report response (CINR standard deviation)	3.3	N_NBR_List	8 bits CINR standard deviation measurement per neighbor relay

Insert the following text at end of section 11.12:

For the types 3.1 and 3.2, the following 8 bit, CINR measurement encoding shall be used:

$$\text{Padload bits} = \begin{cases} 0 & CINR \le -3dB \\ n & (0.125(n-1)-3)dB < CINR \le (0.125n-3)dB, \quad 0 < n < 255 \\ 255 & CINR > 28.75dB \end{cases} \qquad (154c)$$