

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >
Title	<b>Corrections for CINR report</b>
Date Submitted	<b>2005-04-22</b>
Source(s)	<p>Jaehye Cho, Seungjoo Maeng, Jaeho Jeon, <a href="mailto:jaehye1.cho@samsung.com">jaehye1.cho@samsung.com</a>  Soonyoung Yoon, Jeong-Heon Kim, Jaehyok Lee, Myungkwang Byun, Inseok Hwang, Panyuh Joo, Jiho Jang, Sanghoon Sung, Hoon Huh, janghoon yang, ByoungHa Yi  Samsung Electronics Co. Ltd.</p> <p>Choongil Yeh, Hyoungsoo Lim, Yuro Lee, <a href="mailto:lim@etri.re.kr">lim@etri.re.kr</a>  Jongee Oh, DongSeung Kwon,  ETRI</p>
Re:	IEEE P802.16-2004/Cor1-D2
Abstract	Corrections for CINR measurement.
Purpose	Adoption of suggested changes into IEEE P802.16-2004/Cor1-D2
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## Introduction

In the current spec. the CINR report is carried with REP-RSP MAC message or fast feedback channel (CQICH). However, there are still some ambiguities regarding the frequency reuse factor, whether the loading is reflected on the estimate or not. In this contribution, we propose the clarification to get rid of such ambiguities.

## Motivations

1. In the current spec., various permutation schemes that possibly use different frequency reuse factor can be placed within a frame. However, the current reporting scheme does not provide an appropriate signaling method.
2. It can be done, in two ways. The estimation of CINR can be measured from preamble or a specific permutation zone. MS can measure the estimate of CINR from a preamble for the reuse factor 1 and 3. MS can also measure the estimate of the CINR from data subcarriers reflecting the reuse factor on the permutation zone that carries the data traffic. For the preamble, the known pilots ease the implementation of the estimator but the estimate only reflects the full loading case. For the data subcarriers, the estimate may reflect the actual amount of loading but one needs more computation due to no knowledge on the signal. ~~Because preamble precedes in every frame and can provide robust CINR measurement, it is desirable to mandate the CINR measurement from preamble.~~
3. When preamble is used to estimate the CINR, one can get the CINR for the different frequency reuse factors. In other words, the modulated subcarriers of preamble symbol reflect the CINR for the reuse 3 configuration due to its 3 segment preamble structure. On the other hand, the un-modulated subcarriers of preamble symbol include only the interference and noise components due to its 3 segment preamble structure. Combining the CINR for the reuse 3 configuration and the interference/noise, one can get the equivalent CINR for the reuse 1 configuration. The 2 kinds of CINR estimates can be used for the different permutation zones with different frequency reuse factors. However, any indication method is not provided in the current spec.
4. When the CINR estimation is to be measured from the permutation zones, one has to specify where to measure the estimate.
5. The problems above apply to both of REP-REQ/RSP MAC message and fast feedback channel (CQICH).
6. For the MIMO operation, also the report of CINR measurement is necessary. The conventional REP-REQ/RSP and CQICH schemes can be used for this purpose. However, more than 1 REP-RSP TLV may be needed when the horizontal encoding is used for MIMO.
7. Additionally, though the CQICH is supported by normal MAP and H-ARQ MAP, the current CQICH operation scenario is confined only for H-ARQ enabled MSS.

## Suggested Remedies

1. We defined new SBC fields for SS to negotiate SS's additional capability of CINR measurement. ~~estimate the CINR for a permutation zones besides the mandatory CINR measurement from preamble.~~
  - A. CINR measurement from the preamble
  - B. CINR measurement for a specific permutation zone from data subcarriers
  - C. CINR measurement for a specific permutation zone from pilots.
2. We modify the REP-REQ/RSP TLVs to indicate the report scheme for the preamble measurement or the permutation zone measurement.
  - A. For the measurement from the preamble, BS can request SS to report the CINR estimate from the preamble for the different frequency reuse factors or the CINR estimate for band AMC zone.
  - B. For the measurements from the specific permutation zones, the REP-REQ shall include the CINR type configuration which indicates the zone for which the CINR is to be estimated. The zone is identified by its type (PUSC with 'use all SC=0', PUSC with 'use all SC=1', FUSC, Optional FUSC, Band AMC, Safety channel), and PRBS ID. PRBS ID identifies a specific permutation zone among the possible multiple zones with the same permutation scheme. The BS shall not request a CINR report on a zone type that is not supported by the SS. For PUSC with 'use all SC=1', the SS may be instructed to report CINR estimate for only a subset of the major groups.
3. For the CQICH IE (CQICH allocation IE and CQICH control IE), the similar indication scheme is proposed as for the REP-REQ message. Because the reporting of CINR for Band AMC is related with REP-REQ/RSP, there is no specific indication to report the CINR for Band AMC.
4. For the MIMO operation, SS can send the series of REP-RSP TLVs with same type to report the CINR estimate for the horizontal encoding. It is only possible when REP-REQ requests to report a specific zone because the CINR estimate for the horizontal encoding shall be measured after the post-processing for a spatial multiplexing.
5. This document is based on C80216maint-04\_46r1 which clarifies some ambiguities of the current CINR report.
6. We propose to modify the current operation scenario (6.3.17.4) to be applied for the normal MAP case. The current text is only deals with CQICH operation allocation from H-ARQ MAP.
7. In the spec. it is described that the fast feedback channel (CQICH) can be allocated to SS only with FAST\_FEEDBACK MAC subheader. In fact it can be allocated by CQICH allocation IE. It is corrected.
8. For the average statistics, forgetting factor is defined in the range  $[1/32, 16/32]$ . In some situation (ex. H-ARQ application), the instantaneous estimation of CINR may be more desirable. We propose to change the range to  $[1/16, 16/16]$ .

**Suggested Text changes**

[Add the following text the end of section 6.3.2.2.6 at pp.13 line 5]

When the feedback type is '00', and no CINR type parameters were provided by a previous CQICH IE, the reported the estimation of CINR measured from preamble for frequency reuse configuration=1 in the frame. Otherwise, the CINR type parameters provided by a previous CQICH IE shall be used.

**6.3.2.3.43.5 CQICH Control IE**

[Modify the table 95 of section 6.3.2.3.43.5 at pp 24, line 42]

**Table 95. CQICH\_Control IE format**

Syntax	Size	Notes
CQICH_Control_IE () {	—	—
CQICH indicator	1 bit	If the indicator is set to 1, the CQICH Control IE follows.
if CQICH indicator == 1 {	—	—
Allocation Index	6 bits	Index to the channel in a frame the CQI report should be transmitted by the SS.
Period (=p)	2 bits	A CQI feedback is transmitted on the CQI channels indexed by the (CQI Channel Index) by the SS in every $2^p$ frames.
Frame offset	3 bits	The MSS starts reporting at the frame of which the number has the same 3 LSB as the specified frame offset. If the current frame is specified, the MSS should start reporting in 8 frames
Duration (=d)	4 bits	A CQI feedback is transmitted on the CQI channels indexed by the (CQI Channel Index) by the SS for $2^{d-1}$ frames. If d is 0000, the CQICH is de-allocated. If d is 1111, the MSS should report until the BS command for the MSS to stop.
<u>CINR type included</u>	<u>1 bit</u>	
<u>If (CINR type included=1){</u>		
<u>  CINR type</u>	<u>1 bit</u>	<u>0: CINR measurement from preamble (refer to 8.4.11.3)</u> <u>1: CINR measurement from permutation zones (refer to 8.4.11.3)</u>
<u>  If (CINR type=0) {</u>		<u>CINR measurement from preamble</u>
<u>    Report type</u>	<u>1 bit</u>	<u>The report type of CINR estimate measured from preamble</u> <u>0b 0 – Frequency reuse factor=1 configuration.</u> <u>0b 1 – Frequency reuse factor=3 configuration.</u>
<u>  }</u>		
<u>  else {</u>		<u>CINR measurement from permutation zones</u>
<u>    Report type</u>	<u>1 bit</u>	<u>0: CINR measurement from pilot subcarriers (refer to 8.4.11.3)</u> <u>1: CINR measurement from data subcarriers (refer to 8.4.11.3)</u>
<u>  Zone type</u>	<u>3 bits</u>	<u>The type of zone over which CINR is to be reported</u> <u>0b 000 – PUSC with ‘use all SC = 0’</u> <u>0b 001 – PUSC with ‘use all SC = 1’</u> <u>0b 010 – FUSC</u> <u>0b 011 – Optional FUSC</u> <u>0b 100 – Safety Channel region</u> <u>0b 101 – AAS zone</u> <u>0b 110-111 – Reserved</u>
<u>  Zone PRBS_ID</u>	<u>2 bits</u>	<u>The PRBS_ID of the zone over which CINR is to be reported</u>
<u>  If (Zone type = 0b 001) {</u>		
<u>    Major group indication</u>	<u>1 bit</u>	<u>If ‘0’ then CINR report may refer to any subchannels in the PUSC zone.</u>
<u>  If (Major group indication = 1) {</u>		
<u>    PUSC Major group bitmap</u>	<u>6 bits</u>	<u>Reported CINR shall only be estimated for the subchannels of PUSC major groups for which the corresponding bit is set.</u> <u>Bit #k refers to major group k.</u>
<u>  }</u>		

<u>  </u>		
<u>  </u>		
<u>  </u>		
<u>Averaging parameter included</u>	<u>1 bit</u>	
<u>If (Averaging parameter included = 1)</u>		
<u>  </u>		
<u>  Averaging parameter</u>	<u>4 bits</u>	<u>Averaging parameter <math>\alpha_{avg}</math> used for deriving CINR estimates reported through CQICH. This value is in multiples of 1/16 ranging [1/16,16/16] in increasing order.</u>
<u>  </u>		
<u>  Padding</u>	<u>Var</u>	<u>Number of bits required to align to nibble length for this “if” clause, shall be set to zero.</u>
<u>  </u>		
<u>  Else {</u>		
<u>    Reserved</u>	<u>3 bits</u>	<u>Shall be set to zero.</u>
<u>  </u>	<u>–</u>	<u>–</u>
<u>  </u>		

[Add the following text at the end of **6.3.2.3.43.5**]

**CINR type included**

Indicates whether an update to the CQI report configuration exists in the IE. A value of ‘0’ indicates that the SS shall perform CINR measurements using the latest received CQI configuration.

**CINR type**

Indicates where the CQI report shall be measured. SS can measure the estimation of the CINR from the preamble (‘0’) or the permutation zone indicated (‘1’).

**Averaging parameter included**

Indicate whether the averaging parameter  $\alpha_{avg}$  is exists in the IE. A value of ‘0’ indicates that the SS shall perform CINR measurements using the latest received averaging parameter.

[Change the subclause number as follows in Page 51 line 45 and reassign new subclause numbers for the subsequent subclauses]

### ~~6.3.18~~~~17.4~~ ~~CQICH Operations~~ DL CINR report operation

[Delete the text from pp 51 line 45 to pp 51 line 62]

[Add the following text before the first paragraph]

This subclause is only for OFDMA mode. DL CINR report is carried with REP-RSP MAC message or fast feedback channel (CQICH). In this section, the operation of two schemes is described. CINR measurement can be performed on the preamble or a permutation zone. CINR measurement for a permutation zone can be done with pilots or data subcarriers. The SS shall implement preamble based CINR measurement scheme and can negotiate its other measurement capabilities with BS (Refer to 11.8.3.7).

#### 6.3.18.1 DL CINR report with REP-REQ/REP-RSP

The REP-RSP message shall be sent by the SS in response to a REP-REQ message from the BS to report DL CINR estimation. Additionally, a SS can send an unsolicited REP-RSP to report the estimation of DL CINR.

REP-REQ indicates where the CINR measurement shall be performed: preamble or a specific permutation zone. For the measurement from the preamble, BS can request SS to report the CINR estimate from the preamble for the different frequency reuse factors or band AMC CINR. For the measurement from the specific permutation zones, the REP-REQ indicates the CINR type configuration, which includes the zone for which the CINR is to be estimated. The zone is identified by its type (PUSC with 'use all SC=0', PUSC with 'use all SC=1', FUSC, Optional FUSC, Band AMC, Safety channel, AAS zone), and PRBS ID. The BS shall not request a CINR report on a zone type that is not supported by the SS. For PUSC with 'use all SC=1', the SS may be instructed to report CINR estimate for only a subset of the major groups.

For the MIMO operation, SS can send the series of REP-RSP TLVs of the same type to report the CINR estimate for the horizontal encoding. Each TLV corresponds to a layer in the ascending order. When the AAS zone is indicated for the CINR measurement, SS shall report the CINR estimate only for the pilot and data subcarriers allocation for the SS.

*[All existing text within 6.3.17.4 should go under the following title (6.3.18.2)]*

#### 6.3.18.2 Fast feedback channel (CQICH) operation

[Modify the text as follows in 6.3.17.4]

~~This section describes the operation scenarios and requirements of CQICH, which is designed for H-ARQ enabled SS. After an SS turns on its power, the only appropriate subchannels that can be allocated to the MSS are all kinds of subchannels SS can support except the band AMC subchannel. To determine the M/C level of normal subchannels, the average CINR measurement is enough for the BS to determine the M/C levels of uplink and downlink.~~ As soon as the BS and the SS know the capabilities of both entities modulation and coding, the BS may allocate a CQICH subchannel using a CQICH IE (CQICH allocation IE or CQICH Control IE)~~a CQICH Control IE~~. CQICH IE may indicate where the CINR measurement shall be performed: preamble or a specific permutation zone. For the measurement from the preamble, BS can request SS to report the CINR estimate from the preamble for the different frequency reuse configuration. For the measurement from the specific permutation zones, the CQICH IE indicates the CINR type configuration, which includes the zone for which the CINR is to be estimated. The zone is identified by its type (PUSC with 'use all SC=0', PUSC with 'use all SC=1', FUSC, Optional FUSC, Safety channel, AAS zone), and PRBS ID. The BS shall not request a CINR report on a zone type that is not supported by the SS. For PUSC with 'use all SC=1', the SS may be instructed to report CINR estimate for only a subset of the major groups. See section 8.4.11.3 for details. For the differential CINR report of Band AMC mode, a separate procedure is defined for the report configuration change. The first CQICH IE sent to the SS shall indicate the CINR type configuration. Then, the MSS reports the average CINR ~~of the BS preamble~~ as indicated in the CQICH IE. ~~From then on, the BS is able to determine the M/C level. The CINR measurement encoding and quantization onto the Fast-Feedback channel is defined in section 8.4.5.4.10. A CINR measurement is quantized into 16 levels and encoded into 4 information bits.~~

When the AAS zone is indicated for the CINR measurement, SS shall report the CINR estimate only for the pilot and data subcarriers allocation for the SS.

At any time, the BS may de-allocate the SS' CQICH by putting another CQICH ~~Control~~ IE with Duration  $d = 0000$ . Before the CQICH life timer which is set at the receipt of the CQICH ~~Control~~ IE expires, sending another CQICH ~~Control~~ IE overwrites all the information related to the CQICH such as Allocation Index, Period, Frame offset, and Duration. Hence, unless the BS refreshes the timer, the SS should stop reporting as soon as the timer expires. However, in case of sending the MAP IE for re-allocation or deallocation, the BS should make sure if the previous CQICH is released before it

is re-allocated to another SS.

The SS sends the REP-RSP message in an unsolicited fashion to BS to trigger Band AMC operation. The triggering conditions are given by TLV encodings in UCD messages. The REP-RSP (see 11.12 for the TLV encodings) includes the CINR measurements of ~~five~~ four best bands. Only when an SS reports its BS the CINR measurements of Band AMC channels, its logical definition is differently made as follows. If the number of bands is 48 (2048 FFT in 20 MHz), the two contiguous bands are paired and renumbered the same as a 24 band system. Then, if the LSB of an SS MAC address is 1, it only uses the odd-numbered bands. If not, it only uses the even-numbered bands. Hence, for example, the LSB of an SS MAC address is 1, (4m+2, 4m+3) bands are paired and the paired band is the m-th band of the SS. Similarly, for an even-numbered SS, (4m, 4m+1) bands are paired and the paired band is the m-th band of the SS.

The BS acknowledges the trigger by allocating Band AMC subchannels. From the next frame when the SS sent the REP-RSP, the SS starts reporting the differential of CINR for five four selected bands (increment: 1 and decrement: 0 with a step of 1 dB) on its CQICH. The CINR shall be measured as indicated in the REP-RSP message. If the BS does not allocate the Band AMC subchannels or send REP-REQ to indicate reporting Band AMC CINR within the specified delay (CQICH Band AMC Transition Delay) in the UCD message, the SS reports the updated average CINR as indicated in the latest CQICH IE. ~~of the preamble for normal subchannel allocations.~~

When the BS wants to trigger the transition to Band AMC mode or update the CINR reports, it sends the REP-REQ message (see 11.11 for the TLV encodings). When the SS receives the message, it replies with REP-RSP. When the BS receives the REP-RSP, it should synchronize the selection of bands reported and their CINR. Unless the BS allocates normal subchannels or the CQICH IE indicates to report CINR report except the Band AMC zone, the SS reports the differential increment compared to the most up-to-date report from the next CQI reporting frame.

#### 8.4.5.4.10 FAST\_FEEDBACK channels

[Modify the text as follows in pp. 107 line 28]

Fast feedback slots may be individually allocated to SS for transmission of PHY related information that requires fast response from the SS. The allocations are done in unicast manner through the FAST\_FEEDBACK MAC subheader (see refer to 6.3.2.2.6), CQICH Control IE(refer to 6.3.2.3.43.5) or CQICH Allocation IE(refer to 8.4.5.4.12) and the transmission takes place in a specific UL region designated by UIUC = 0.

##### 8.4.5.4.10.1 Fast DL measurement feedback

[Modify the text as follows in Page 107 line 52]

~~When the FAST\_FEEDBACK subheader Feedback Type field is '00' t~~The SS shall report the ~~S/N~~ CINR it measures on the DL. The following formula shall be used:

[Add the following text at the end of the section]

For band AMC operation, SS shall report differential of CINR of four selected bands (increment: 1 and decrement: 0 with a step of 1 dB) on its fast feedback channel.

#### 8.4.5.4.12 CQICH Allocation IE Format

[Modify the table 300 as follows at pp.111 line5]

Table 300—CQICH alloc IE format

Syntax	Size	Notes
CQICH_Alloc_IE() Ⓡ {		
Extended DIUC	4 bits	CQICH = 0x03
Length	4 bits	Length of the message in bytes (variable)
CQICH_ID	variable	Index to uniquely identify the CQICH resource assigned to the SS The size of this field is dependent on system parameter defined in DCD.
Allocation offset	6 bits	Index to the fast feedback channel region marked by UIUC = 0.
Period (p)	2 bits	A CQI feedback is transmitted on the CQICH every 2 <sup>p</sup> frames.
Frame offset	3 bits	The SS starts reporting at the frame of which the number has the same 3 LSB as the speci-fied frame offset. If the current frame is spec-ified, the SS should start reporting in 8 frames

<b>Duration (d)</b>	3 bits	A CQI feedback is transmitted on the CQI channels indexed by the CQICH_ID for 10 x 2dframes. If d == 0, the CQI-CH is deallocated. If d == 0b111, the SS should report until the BS command for the SS to stop.
<u>CINR type included</u>	<u>1 bit</u>	
<u>If (CINR type included=1){</u>		
<u>CINR type</u>	<u>1 bit</u>	<u>0: CINR measurement from preamble (refer to 8.4.11.3)</u> <u>1: CINR measurement from permutation zones (refer to 8.4.11.3)</u>
<u>If (CINR type=0) {</u>		<u>CINR measurement from preamble</u>
<u>Report type</u>	<u>1 bit</u>	<u>The report type of CINR estimate measured from preamble</u> <u>0b 0 – Frequency reuse factor=1 configuration.</u> <u>0b 1 – Frequency reuse factor=3 configuration.</u>
<u>}</u>		
<u>else {</u>		<u>CINR measurement from permutation zones</u>
<u>Report type</u>	<u>1 bit</u>	<u>0: CINR measurement from pilot subcarriers (refer to 8.4.11.3)</u> <u>1: CINR measurement from data subcarriers (refer to 8.4.11.3)</u>
<u>Zone type</u>	<u>3 bits</u>	<u>The type of zone over which CINR is to be reported</u> <u>0b 000 – PUSC with ‘use all SC = 0’</u> <u>0b 001 – PUSC with ‘use all SC = 1’</u> <u>0b 010 – FUSC</u> <u>0b 011 – Optional FUSC</u> <u>0b 100 – Safety Channel region</u> <u>0b 101 – AAS zone</u> <u>0b 110-111 – Reserved</u>
<u>Zone PRBS_ID</u>	<u>2 bits</u>	<u>The PRBS_ID of the zone over which CINR is to be reported</u>
<u>If (Zone type =0b 001) {</u>		
<u>PUSC Major group config indication</u>	<u>1 bit</u>	<u>If ‘0’ then CINR report may refer to any subchannels in the PUSC zone.</u>
<u>If (Major group config indication=1) {</u>		
<u>PUSC Major group bitmap</u>	<u>6 bits</u>	<u>Reported CINR shall only be estimated for the subchannels of PUSC major groups for which the corresponding bit is set.</u> <u>Bit #k refers to major group k.</u>
<u>}</u>		
<u>}</u>		
<u>}</u>		
<u>}</u>		
<u>Averaging parameter included</u>	<u>1 bit</u>	
<u>If (Averaging parameter included = 1) {</u>		
<u>Averaging parameter</u>	<u>4 bits</u>	<u>Averaging parameter <math>\alpha_{avg}</math> used for deriving CINR estimates reported through CQICH. This value is in multiples of 1/16 ranging [1/16,16/16] in increasing order.</u>
<u>}</u>		
<b>MIMO_permutation_feedback_cycle</b>	2bits	0b00 = No MIMO and permutation mode feedback 0b01 = The MIMO and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every four frames. The first indication is sent on the fourth CQICH frame. 0b10 = The MIMO mode and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every 8 frames. The first indication is sent on the 8th CQICH

		frame. 0b11 = The MIMO mode and permutation mode indication shall be transmitted on the CQICH indexed by the CQICH_ID every 16 frames. The first indication is sent on the 16 <sup>th</sup> CQICH frame.
Padding	Variable	Number of bits required to align to byte length, shall be set to zero.
}		

*[Add the following text to page 85, line 47]*

**CINR type included**

Indicates whether an update to the COI report configuration exists in the IE. A value of '0' indicates that the SS shall perform CINR measurements using the latest received COI configuration.

**CINR type**

Indicates where the COI report shall be measured. SS can measure the estimation of the CINR from the preamble ('0') or the permutation zone indicated ('1').

**Averaging parameter included**

Indicate whether a new averaging parameter  $\alpha_{avg}$  exists in the IE. A value of '0' indicates that the SS shall perform CINR measurements using the latest received averaging parameter.

**8.4.11.3 CINR mean and standard deviation**

[Modify the first paragraph as follows in **page 150, line 28**]

When CINR measurements are mandated by the BS, an SS shall obtain a CINR measurement (implementation- specific). From a succession of these measurements, the SS shall derive and update estimates of the mean and/or the standard deviation of the CINR, and report them via REP-RSP messages and/or report the estimate of the mean of the CINR via the fast feedback channel (CQICH).

[Add the text at the end of first paragraph in **page 150, line 28**]

If CINR report from the preamble was instructed by CQICH IE or by the REP-RSP message, then the reported CINR shall be an estimate of the CINR over the subcarriers of the preamble OFDMA symbol. For the frequency reuse configuration=3, the reported CINR shall be the estimate of the CINR over the modulated subcarriers of the preamble OFDMA symbol. For the frequency reuse configuration=1, the reported CINR shall be the estimate of the CINR over the all subcarriers of the preamble OFDMA symbol except the guard subcarriers and DC subcarrier. In other words, the signal on the unmodulated subcarriers except the guard subcarriers and DC subcarrier shall be considered as noise and interference for the CINR estimate of the frequency reuse configuration=1. For the reported CINR, preamble boosting shall be compensated for in both desired signal and interference and noise calculation.

If CINR report on data subcarriers was instructed, then the reported CINR shall be an estimate of the CINR over the pilot or data subcarriers of the zone on which CINR reporting was instructed by the CQICH IE or by the REP-RSP message. When repetition code is applied, it is considered part of the coding, and the CINR value doesn't include the SNR improvement resulting from repetition. The reported value shall represent the CINR on non-boosted data subcarriers of the zone on which measurement was requested; hence pilot boosting shall be compensated for in both desired signal and interference and noise calculation. If the BS instructs CINR reporting on an AAS zone, then the SS shall report the estimate of the CINR on pilot or data subcarriers of slots allocated it.

[Modify the 2<sup>nd</sup> and 3<sup>rd</sup> paragraph as follows in **page 150, line 28**]

For the REP-RSP, the following encoding shall be used unless different encoding scheme is defined. Mean and standard deviation statistics for CINR shall be reported in units of dBm and dB respectively. To prepare such reports, statistics shall be quantized in 1 dB increments, ranging from a minimum of -10 dB (encoded 0x00) to a maximum of 53 dB (encoded 0x3F). Values outside this range shall be assigned the closest extreme value within the scale.

The method used to estimate the CINR of a single message is left to individual implementation, but the relative and absolute accuracy of a CINR measurement ~~derived from a single message~~ shall be  $\pm 1$  dB and  $\pm 2$  dB, respectively. The specified accuracy shall apply to the range of CINR values starting from 3 dB below SNR of the most robust rate, to 10 dB above the SNR of the least robust rate. See Table 336. ~~In addition, the range over which these single packet measurements are measured should extend 3 dB on each side beyond the -10 dB to 53 dB limits for the final reported, averaged statistics.~~

[Modify the text below eq. 144 in **page 150, line 28**]

where  $r[k,n]$  received sample  $n$  within message measured at time index  $k$  in the unit of frame;  $s[k,n]$  the corresponding detected or pilot sample (with channel state weighting) ~~corresponding to received symbol~~. The message time index is incremented every frame. The SS shall maintain separate message time index counters and mean CINR estimates for REP-RSP-based reports and for Fast-Feedback-based reports. When the CINR type is changed, the SS shall reset the corresponding message time index to zero.

[Delete the text below eq. 146 in **page 150, line 28**]

~~$k$  is the time index for the message (with the initial message being indexed by  $k=0$ , the next message by  $k=1$ , etc.);~~

[Add the following text at the end of the section at **page 119, line 28**]

The averaging parameter ( $\alpha_{avg}$ ) may be sent as a DCD message TLV for REP-RSP or CQICH based CINR reports. Unless specified otherwise, the default averaging parameter ( $\alpha_{avg}$ ) is . When the averaging parameter ( $\alpha_{avg}$ ) is given to a SS through REP-REQ, this value shall only be used for deriving CINR estimates reported through REP-RSP, and can further only be changed through another REP-REQ message. When the averaging parameter is given to a SS through the CQICH IE (CQICH allocation IE or CQICH Control IE), this value shall only be used for deriving CINR estimates through Fast-Feedback channel (CQICH), and can further only be changed through another CQICH\_IE. An averaging parameter value sent through DCD shall not override the averaging parameter value sent in a dedicated REP-REQ or CQICH\_IE message.

## 11.4.1 DCD channel encodings

[Add the following entry in Table 358, p. 163, line 40]

Name	Type	Length	Value	PHY scope
<a href="#">RSSI and CINR averaging parameter</a>	<a href="#">21</a>	<a href="#">1</a>	<a href="#">Bit #0~3: Averaging parameter <math>\alpha_{avg}</math> for CINR and RSSI measurements not indicated by REP-REQ (e.g. FAST FEEDBACK, CQICH), in multiples of 1/16 (range [1/16, 16/16], 0x0 for 1/16, 0xF for 16/16).</a>	<a href="#">OFDMA</a>

## 11.8.3.7.9 OFDMA SS CINR measurement capability

[Add the table as follows at pp.170, line 51]

Type	Length	Value	Scope
<a href="#">160</a>	<a href="#">1</a>	<a href="#">Bit #0: CINR measurement for a permutation zone from pilot subcarriers</a> <a href="#">Bit #1: CINR measurement for a permutation zone from data subcarriers</a> <a href="#">Bit #2~7: Reserved; shall be set to zero</a>	<a href="#">SBC-REQ (see 6.3.2.3.23)</a> <a href="#">SBC-RSP (see 6.3.2.3.24)</a>

## 11.11 REP-REQ management message encodings

[Modify the table as follows, page 171 line 16]

Report type	<a href="#">1.1</a>	<a href="#">1</a>	<a href="#">Bit #0=1 Include DFS Basic report</a> <a href="#">Bit #1=1 Include CINR report</a> <a href="#">Bit #2=1 Include RSSI report</a> <a href="#">Bit #3~6 <math>\alpha_{avg}</math> \ in multiples of 1/32 16 (range [<del>1/32, 16/32</del>] [1/16, 16/16])</a> <a href="#">Bit #7=1 Include current transmit power report</a>
Channel number	<a href="#">1.2</a>	<a href="#">1</a>	<a href="#">Physical channel number (see 8.5.1) to be reported on. (license-exempt bands only)</a>
<del>Channel</del> <a href="#">Zone-specific CINR type request</a>	<a href="#">1.3</a>	<del><a href="#">1</a></del> <a href="#">2</a>	<del><a href="#">00=Normal subchannel,</a></del> <del><a href="#">01=Band AMC Channel,</a></del> <del><a href="#">10=Safety Channel,</a></del> <del><a href="#">11=Reserved,</a></del> <a href="#">Bit #0 = 1: Report the CINR estimate for PUSC zone with 'use all SC=0'</a> <a href="#">Bit #1 = 1: Report the CINR estimate for PUSC zone with 'use all SC=1'</a> <a href="#">Bit #2 = 1: Report the CINR estimate for FUSC</a> <a href="#">Bit #3 = 1: Report the CINR estimate for Optional FUSC</a> <a href="#">Bit #4 = 1: Report the CINR estimate for band AMC</a> <a href="#">Bit #5 = 1: Report the CINR estimate for Safety Channel region</a> <a href="#">Bit #6 = 1: Report the CINR estimate for AAS zone</a>  <a href="#">Bit #7: Report type: 0-Report the CINR estimate from the pilot subcarrier, 1-Report the CINR estimate from the data subcarrier (refer to 8.4.11.3)</a>  <a href="#">Bits #8-9: PRBS_ID of the zone for which CINR should be estimated. Ignored for Safety Channel.</a> <a href="#">Bits #10-15: When bit #1 is '1', reported CINR shall only be estimated for the subchannels of PUSC major groups for which the corresponding bit is set. Bit #(k+10) refers to major group k. Ignored if bit #1 is '0'. Except the case that Bit#1 is not 1, they shall be set to zeros and ignored.</a>
<a href="#">Preamble CINR type request</a>	<a href="#">1.4</a>	<a href="#">1</a>	<a href="#">Bit #0=1: Report the estimation of CINR measured from preamble for frequency reuse configuration=1</a> <a href="#">Bit #1=1: Report the estimation of CINR measured from preamble for frequency reuse configuration=3</a> <a href="#">Bit #2 = 1: Report the estimation of CINR measured from preamble for band AMC</a> <a href="#">Bit #3~7: Reserved (shall be set to zero)</a>

**11.12 REP-RSP management message encodings**

[Delete table from pp 171 line 29 to pp 171, line 39]

[Replace the third table with the following, page 171 line 1]

REP-REQ <u>Zone-specific CINR Channel</u> Type request	Name	Type	Length	Value
<u>Channel type=00</u>	<u>Normal subchannel Report</u>	<u>2.1</u>	<u>4</u>	<u>First 5 bits for the CINR measurement report and the rest for don't care</u>
<u>Channel type=01</u>	<u>Band AMC Report</u>	<u>2.2</u>	<u>5</u>	<u>First 12 bits for the band indicating bitmap and Next 25 bits for CINR reports (5 bits per each band)</u>
<u>Channel type=10</u>	<u>Safety Channel Report</u>	<u>2.3</u>	<u>5</u>	<u>The first 20 bits for the reported bin indices and the next 20 bits for CINR reports (5bits for each bin)</u>
<u>Bit #0 = 1</u>	<u>PUSC zone with 'use all SC=0'</u>	<u>2.1</u>	<u>1</u>	<u>Bit #0-4: CINR estimate for PUSC zone with 'use all SC=0' and PRBS_ID indicated by 'CINR type request' bits #8-9. Bit #5: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier Bit #6-7: reserved</u>
<u>Bit #1 = 1</u>	<u>PUSC zone with 'use all SC=1'</u>	<u>2.2</u>	<u>1</u>	<u>Bit #0-4: CINR estimate for PUSC zone with 'use all SC=1' and PRBS_ID indicated by 'CINR type request' bits #8-9. CINR reported corresponds to a subset of major groups as specified in 'CINR type request' bits #10-15. Bit #5: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier Bit #6-7: reserved</u>
<u>Bit #2 = 1</u>	<u>FUSC zone</u>	<u>2.3</u>	<u>1</u>	<u>Bit #0-4: CINR estimate for FUSC zone with PRBS_ID indicated by 'CINR type request' bits #8-9 Bit #5: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier Bit #6-7: reserved</u>
<u>Bit #3 = 1</u>	<u>Optional FUSC zone</u>	<u>2.4</u>	<u>1</u>	<u>Bit #0~4: CINR estimate for Optional FUSC with PRBS_ID indicated by 'CINR type request' bits #8-9. Bit #5: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier Bit #6-7: reserved</u>
<u>Bit #4 = 1</u>	<u>Band AMC zone</u>	<u>2.5</u>	<u>5</u>	<u>CINR estimate for Band AMC zone with PRBS_ID indicated by 'CINR type request' bits #8-9. First 12 bits for the band indicating bitmap and Next 20 bits for CINR reports (5 bits per each band). Bit #32: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier. Bit#33-39: reserved.</u>
<u>Bit #5 = 1</u>	<u>Safety channel</u>	<u>2.6</u>	<u>5</u>	<u>The first 20 bits for the reported bin indices and the next 20 bits for CINR reports (5 bits for each bin).</u>
<u>Bit #6 = 1</u>	<u>AAS zone</u>	<u>2.7</u>	<u>1</u>	<u>Bit #0~4: CINR estimate for AAS zone with PRBS_ID indicated by 'CINR type request' bits #8-9. Bit #5: Report type: 0 - CINR estimate from the pilot subcarrier, 1- CINR estimate from the data subcarrier Bit #6-7: reserved</u>

[Add the following table at the end of 11.12, page 171 line 40]

REP-REQ	Name	Type	Length	Value
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<u>Preamble CINR type request</u>				
<u>Bit #0 = 1</u>	<u>The estimation of CINR measured from preamble for frequency reuse configuration=1</u>	<u>3.1</u>	<u>1</u>	<u>Bit #0~4: The estimation of CINR measured from preamble for frequency reuse configuration=1. Bit #5~7: reserved.</u>
<u>Bit #1 = 1</u>	<u>The estimation of CINR measured from preamble for frequency reuse configuration=3</u>	<u>3.2</u>	<u>1</u>	<u>Bit #0~4: The estimation of CINR measured from preamble for frequency reuse configuration=3. Bit #5~7: reserved.</u>
<u>Bit #2 = 1</u>	<u>The estimation of CINR measured from preamble for Band AMC zone.</u>	<u>3.3</u>	<u>4</u>	<u>The estimation of 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).</u>

[Add the following text at the end of the last table]

For the type 2.x and 3.x, the following 5 bit CINR measurement encoding shall be used:

$$\text{Payload bits} = \begin{cases} 0, & \text{CINR} \leq -3\text{dB} \\ n, & (n-4) < \text{CINR} \leq (n-3), \quad 0 < n < 31 \\ 31, & \text{CINR} > 27 \end{cases}$$


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