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Title	**Corrections for CINR measurement**
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Re:	Recirculation of P802.16 REVe/D6
Abstract	Clarifications on CINR measurement
Purpose	Adoption of suggested changes into P802.16e/D6
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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, and the relationship between REP-REQ/RSP and fast feedback channel (CQICH) operation. In this contribution, we propose the clarification to get rid of such ambiguities.

Motivations

1. In the current spec., REP-REQ indicates what kind of CINR estimation SS shall report through REP-RSP. REP-REQ can indicate 2 kinds of CINR estimation: the normal subchannel and band AMC subchannel. The indication of the normal subchannel asks SS to report the CINR estimation for the PUSC, FUSC or optional FUSC permutation region or equivalent. For the frequency reuse factor, reuse factor 1 or 3 can be applied for PUSC and the reuse factor = 1 can be applied for FUSC and optional FUSC. The ambiguity comes from the compound indicator for the normal subchannel because the PUSC with reuse factor 3 can be used together with other reuse 1 permutation within a frame. In other words, SS shall determine the target CINR estimation permutation at its own discretion when the normal subchannel is indicated. In such configuration, BS should know the reuse factor where the CINR is estimated. In other words, the MCS level is too week against the channel condition when the CINR for the reuse N configuration is reported and used in determination of MCS level for the reuse 1 configuration. The MCS level is too robust when the CINR of the reuse 1 configuration is used for the reuse N configuration. The current spec. does not provide how to feedback the estimation of CINR for the different frequency reuse configuration in normal subchannel. For band AMC, it does not have any ambiguity because the permutation itself is indicated.

2. Even when SS determines the target CINR measurement permutation region, SS still have freedom to measure the estimation from the preamble or directly from the subcarriers in the target permutation region. For example, a 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 there exists trade-off between the easiness of the implementation and the reflection of the loading, depending on the location of the measurement, it is reasonable not to specify the location of the measurement in the spec. Instead, it is better for MS to notify the measurement location or the loading condition. Such information can be used in DL scheduling at BS.

3. The problems above apply to both of REP-REQ/RSP MAC message and fast feedback channel (CQICH).

4. For the AAS operation, also the report of CINR measurement is necessary. The conventional REP-REQ/RSP and CQICH schemes can be used for this purpose. However, depending on the AAS operation scenario which is vendor-specific, the CINR measurement shall be done for the symbols that are beamformed or not beamformed. It is also not defined in the current specifications.

Suggested Remedies

1. For resolving the ambiguity of the normal subchannel indicator, we propose that REP-REQ indicates the specific target permutation region. The candidates of the target permutation regions are as follows:
   A. PUSC with frequency reuse factor = 3
   B. PUSC with frequency reuse factor = 1
   C. FUSC
   D. Optional FUSC
   E. Band AMC
   F. Safety channel

2. In response to REP-REQ, SS shall send the estimate of CINR through REP-RSP. The estimate of CINR can be measured directly from the permutation region specified in REP-REQ or it can be the equivalent of the estimate measured indirectly from other symbols (ex. Preamble). However, SS shall indicate BS the measurement condition. We are proposing to indicate whether the amount of cell loading is reflected on the estimate or not in the REP-RSP (Actually, we choose the loading condition instead of measurement location).

3. When fast feedback channel (CQICH) is allocated before any REP-RSP message transmission, the estimation of CINR of the first permutation zone with reuse 1 configuration in a frame shall be sent by the allocated fast feedback channel. Because of the no REP-RSP, BS shall assume that the estimate does not reflect the actual cell loading. When the REP-RSP or the unsolicited REP-RSP is sent, the fast feedback channel (CQICH) shall send the (equivalent) estimate as indicated in REP-RSP (permutation and loading reflection) from the same frame when REP-RSP is sent. The subsequent fast feedback channel shall continue to use the same estimation conditions before any other REP-RSP.

4. **The remedy above shall be dealt in maint TG due to the backward compatibility except Band AMC. Because partial usage of subchannel for band AMC is only defined in 16e, we confined the modification to Band AMC related items in this contribution.**

Suggested Text changes

11.11 REP-REQ management message encodings
[Add the following entry to table in 11.11 at pp. 512 line 20]

Channel Type Request for Band AMC	1.4	1	Bit #0 = 1: Report the (equivalent) estimation of CINR in band AMC Channel region with partial usage of subchannel. Bit #7: AAS CINR measurement indicator: When the last bit of Channel Type request is '0' the CINR measurement directed by the bit #0 shall be done for the symbols that are not beamformed. Otherwise, the CINR measurement directed by the bit #0 shall be done for the symbols that are beamformed.

11.12 REP-RSP management message encodings
[Replace the last table with the following, page 512 line 52]

REP-REQ Channel Type Request for Band AMC	Name	Type	Length	Value
Bit #0 = 1	Band AMC channel	2.x	5	First 12 bits for the band indicating bitmap and Next 25 bits for CINR reports (5 bits per each band). When the last bit of Channel Type request for Band AMC is '0' the CINR measurement shall be done for the symbols that are not beamformed. Otherwise, the CINR measurement shall be done for the symbols that are beamformed. Bit#37,38: reserved, Bit#39: Cell loading indicator: '0'- it is assumed that the region is fully loaded. '1'-the cell loading is reflected on the estimation.