3GPP TSG-RAN WG2 Meeting #109bis-e draft R2-2003925

Online, 20 – 30 March 2020

**Agenda item: 7.1.4**

**Source: Huawei**

**Title: Summary of Channel Quality report open issues**

**WID: LTE\_eMTC5-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document contains a summary of Quality report in Msg3 documents from agenda item 7.1.4 as referenced in Section 4 in order to facilitate decision making at RAN2#109bis-e.

# 2 Summary

## 2.1 Summary of issues

The following proposals are covered in this section

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [1] | Ericsson | Proposal 1 All the bits are used for QR “R+F2+E”.  Contains text proposal providing 8 value mapping for using the 3 bits (7 values + no report)   |  |  |  |  | | --- | --- | --- | --- | | dl-MeasReport field | Rmax == 1 | 1 < Rmax <= 16 | Rmax >= 32 | | 000 | No measurement/Not Supported | No measurement/Not Supported | No measurement/Not Supported | | 001 | Aggregation level 1 | Repetition level 1 | Repetition level 4 | | 010 | Aggregation level 2 | Repetition level 2 | Repetition level 8 | | 011 | Aggregation level 4 | Repetition level 4 | Repetition level 16 | | 100 | Aggregation level 8 | Repetition level 8 | Repetition level 32 | | 101 | Aggregation level 16 | Repetition level 16 | Repetition level 64 | | 110 | Aggregation level 24 and Repetition level 1 | Repetition level 32 | Repetition level 128 | | 111 | Aggregation level 24 and Repetition level 2 | Repetition level 64 | Repetition level 256 | |
| [2] | Qualcomm | Proposal 1: Support 2-bit CQI based on solution 1 (using R and F2 bits only) in a MAC header with uplink LCID= any CCCH. |
| [3] | Qualcomm | Contains text proposal providing 4 value mapping for using 2 bits (3 values + no report)   |  |  | | --- | --- | | Codepoint/Index | Value | | 00 | No short DCQR | | 01 | Short DCQR 1 | | 10 | Short DCQR 2 | | 11 | Short DCQR 3 | |
| [4] | Huawei | Contains text proposal providing 4 value mapping for using 3 bits (4 values + presence bit)   |  |  |  | | --- | --- | --- | | F2 | E | Comment | | 0 | 0 | FFS/reserved | | 0 | 1 | CQI 1 | | 1 | 0 | CQI 2 | | 1 | 1 | CQI 3 | |

### 2.1.2 Needs further discussion

All of the contributions to this meeting focus on a single issue, which is how to use the R+F2+E bits to convey a 2 bit quality report.

Note the agreement from RAN2#107

* For non-EDT, R+F2+E MAC subheader is used for 2-bit DL quality report.

After RAN2#107, the proposal in [2] to update the agreement to use only R+F2 has been discussed several times, and the various technical pros and cons have already been debated, with no clear consensus to change the agreement.

Since in this meeting there are 2 companies proposing to use all 3 bits in line with existing agreements, and 1 company proposing to use only 2 bits, it is proposed:

**Proposal S1-1: Confirm that R+F2+E are used.**

**Company views (to be completed during the meeting)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
| Qualcomm | No | As stated previously and in [2] the previous agreement implies R+F2+E are candidates for 2-bit DL quality report.  In RAN2/#109 two email discussions were conducted on this topic and in both cases more companies supporting solution using R+F2 bits only.  In this meeting **11** companies have co-sourced the proposals in [2] to use R+F2 bits only for 2-bit CQI. |
| Sequans | No | We also understood the original agreement to mean a subset of R+F2+E may also be used. We prefer the R+F2 solution and have co-sourced the proposals in [2] |
| Huawei, HiSilicon | Yes | It looks impossible to unintentionally misinterpret the previous agreement: nowhere was it written “a subset of” or “chosen from the candidates” and the “+” operator is very widely understood, especially in our field.  We think the use of R+F2+E offers several advantages, as we have explained previously.  However, for the sake of progress and given the number of companies who would like to revert the agreement we can accept to go with the QC et.al. proposal + TP. |
| Nokia | No | In our view, the agreement does not mean that all the bits are supposed to be used. Moreover use of all 3 bits for Rel-16 feature impacts the future extension for other features along with 2 bit CQI report. |
| ZTE | No | Same understanding as above QC, Sequans and Nokia. We prefer the R+F2 solution as it is simple and consumes as few bits as possible. We also have co-sourced the proposals in [2]. |
| Ericsson | Yes | We need to make judgement technically, what is the benefit for the UE and for NW and what is available. For non-EDT, as shown in our paper; the 3-bits can be used and it has benefits. |

The proposal in [1] to utilise all 3 bits to convey additional codepoints is a new proposal. While this makes the most of the 3 bits for the purpose of channel quality reporting, the drawbacks with this proposal compared to both [2]/[3] and [4] are even more severe since it means that none of R, F2 + E are available for future extensions.

**Proposal S1-2: Confirm that the reported values consist of 2-bits (4 codepoints).**

**Company views (to be completed during the meeting)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
| Qualcomm | Yes | We agree with rapporteur that 3-bit solution is even less forward compatible when there are two or more MAC headers in the MAC PDU.  We agree the 2-bit report with the code points as defined by RAN1 i.e. R=0 & F2=0 to mean no report. |
| Sequans | Yes | 2-bit Quality report design was handled by RAN1 as an accessory solution and 3 values should be enough for that. While we are sympathetic to wanting the additional values, we do not think this warrants the forward compatibility problems of the new 3-bit solution. |
| Huawei | Yes | RAN1 made an agreement on codepoints just based on copy/paste from NB-IoT without understanding the number of bits available in MAC or how to encode the header, however we would anyway suggest that 2 bit value is enough whether or not we have a presence bit. |
| Nokia | Yes | Use of 2 bits with one code point for no report is as per RAN1 agreement. |
| ZTE | Yes | Agree with Qualcomm. |
| Ericsson |  | What is the forward compatibility issue here? It is only for non-EDT.  Whether one uses R, F2 or uses R, F2 and E it is the same.  If we are worried about consuming bits then we should follow Huawei’s cautious approach which was already agreed.  But only R and F2 is useless as shown in our paper. |

The last remaining question is what to do with the additional codepoint, since RAN1 re-used the NB-IoT 3-value mapping without considering or knowing the number of available bits/codepoints. It is possible to either reserve for future use or introduce an additional codepoint. From RAN2 point of view reserving or defining is equivalent, but the mapping should be decided by RAN1 and RAN4.

**Proposal S1-3: Send LS to RAN1 and RAN4 to indicate the short channel quality report has 4 available codepoints.**

**Company views (to be completed during the meeting)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
| Qualcomm | No | RAN1 has already defined what the 4 code points mean and RAN2 just needs to confirm this. That is, 3-code points for short CQI and 1 code point to mean no CQI report. |
| Sequans | No | Agree with Qualcomm |
| Huawei, HiSilicon | Dependent on S1-1/2 | We do not agree that RAN2 should just accept any decision made in RAN1, especially when those decisions relate to MAC header encoding which is clearly RAN2 scope.  However if RAN2 concludes to confirm the codepoints according to the RAN1 agreements then we obviously don’t need an LS.  If we stick with the current RAN2 agreement then we need an LS. |
| Nokia | No | We don’t see need to send LS to RAN1 where RAN1 has already agreed for the set of code-points for 2 bit CQI. |
| ZTE | No | Agree with Qualcomm. |
| Ericsson | Yes | The decision will not trigger any new work for RAN1. It is mainly RAN4 group who has to provide the CQI mapping. They have to do it either for 2 bit or 3 bit. It is same. |

# 3 Conclusions (to be updated following offline)

**Needs further discussion:**

**Proposal S1-1: Confirm that R+F2+E are used.**

**Proposal S1-2: Confirm that the reported values consist of 2-bits (4 codepoints).**

**Proposal S1-3: Send LS to RAN1 and RAN4 to indicate the short channel quality report has 4 available codepoints.**

# 4 List of referenced documents

1. [R2-2003134](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003134.zip) Solution for the short quality reporting for eMTC Ericsson discussion Rel-16
2. [R2-2003182](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003182.zip) Msg3 Quality report way forward on open issue Qualcomm Incorporated discussion Rel-16 LTE\_eMTC5-Core
3. [R2-2003183](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003183.zip) Introduce 2-bit CQI based on Solution 1 Qualcomm Incorporated draftCR Rel-16 36.321 16.0.0 LTE\_eMTC5-Core
4. [R2-2003343](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109bis-e/Docs/R2-2003343.zip) TP for 2-bit Quality report in Msg3 Huawei, HiSilicon discussion Rel-16 LTE\_eMTC5-Core