

Source: Sharp
Title: UL physical channel for CQI report
Agenda Item: 7.2.4
Document for: Discussion and Decision

1. Introduction

In RAN WG1#49, it was agreed that the total number of CQI bits (including overhead) in a PUCCH subframe per UE shall not exceed approximately 10 bits, and that the maximum number of bits for wideband CQI report is up to 5 bits. In the same meeting, it was confirmed that the CQI report is applicable to the MIMO scheme which is assumed to need larger-size feedback information. For the transmission of these CQI reports in a wide variety of sizes, RAN1 answered to RAN2 that the CQI report can be transmitted on PUSCH and the CQI report on PUSCH will be able to transmit more bits [2].

Until the Kobe meeting, RAN1 concentrated on how to use PUCCH for the CQI reporting, but now we have found that there is a fundamental design mismatch. There is a lack of capability in the PUCCH resource for the larger-sized CQI reports. The CQI reports for the OFDMA system have a very wide size-range and require a flexible approach. For meeting this requirement for larger CQI reports, multi-PUCCH frames or similar ideas are not capable of being effective or efficient solutions, they will cause PUCCH-resource scheduling difficulties. For a fundamental solution, we have to also utilize PUSCH resources for the larger CQI reports.

In this contribution, we propose a transmission method for the CQI reports on PUSCH or PUCCH that is the simplest way and has low complexity. By introducing this transmission method, the requirement on the PUCCH resource for transmitting the CQI reports is reduced. Furthermore, we also clarify the coordination scheme between the UE and the eNB. We believe that efficient UL physical channel usage for transmitting CQI reports for a wide variety of sizes on PUCCH/PUSCH combinations is required.

2. CQI transmission on PUSCH/PUCCH

The following are the points to be considered for CQI transmission on PUSCH or PUCCH.

(a) Low PDCCH overhead

- eNB needs to allocate the PUSCH or PUCCH resources for the transmission of the UL CQI reports. The PDCCH overhead for allocating PUSCH resources should be reduced.
- Since the CQI report is generated a regular basis, it is preferable to be able to apply persistent scheduling.

(b) DL Transmission method selection by the eNB

- While the measurement to decide the optimum DL transmission method (and the corresponding CQI report) is done on the UE side, the eNB should nevertheless select the DL transmission method and the allocation of UL resources for the CQI report according to

its scheduling needs. Therefore, it is preferred to introduce a scheme between the UE and the eNB for coordination of UL resources.

- Even for the MIMO rank report, it is preferable to transmit the possible maximum rank information from the UE to the eNB, and then have the eNB decide the rank according to coordination with other UE's.

(c) Low switching latency

- Latency for re-configuration for the CQI reports should be reduced.

3. Transmission method of the CQI reports

Based on the above points in section 2, we propose the following transmission method for the CQI reports.

Figure1 shows the transmission method of the CQI reports on PUSCH or PUCCH.

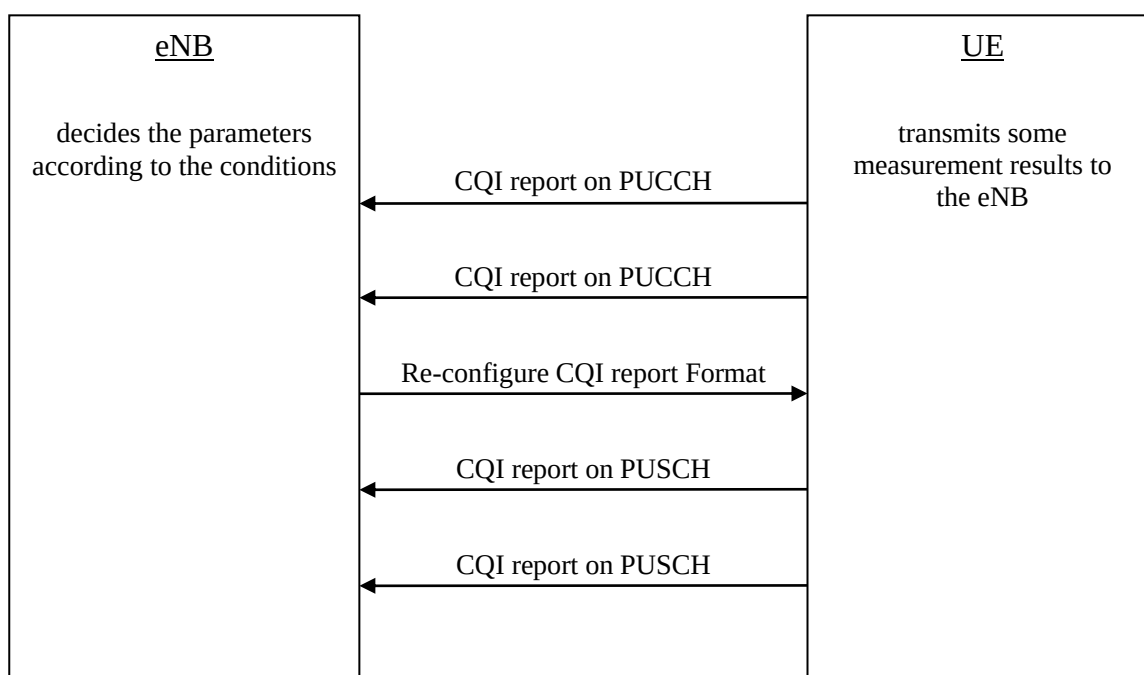


Figure1. The transmission of the CQI report on PUSCH/PUCCH

The eNB allocates PUSCH or PUCCH resource for the transmission of the CQI reports. The re-configuration for the CQI report format and parameters is performed by the UE based on the coordination scheme, which is decided by the eNB based on some measurement results from the UE. The eNB specifies the parameters according to the change of conditions such as reported measurement results from UE and eNB itself. Thus, if the eNB allocates the PUSCH resources, the UE transmits the CQI report on the PUSCH even if there is no data.

This transmission method of the CQI reports is the simplest way and has low complexity. Furthermore, the need for the PUCCH resources for transmitting the CQI report is reduced.

The CQI reports can be transmitted on the following two physical channels;

- Transmit on PUCCH with persistent CAZAC resource scheduling
- Transmit on PUSCH with persistent RB allocation

4. Conclusion

In this contribution, we have addressed the transmission method of the UL CQI reports on PUSCH or PUCCH. The following is the our proposal;

Proposal1: The PUSCH or PUCCH resource for the CQI reports is allocated by the eNB. If the PUSCH resource is allocated by eNB, the CQI report is transmitted on PUSCH even if there is no data.

Proposal2: A coordination scheme between the UE and the eNB should be introduced.

These proposals for the transmission of the CQI report achieve efficient UL physical channel scheduling of the UL CQI reports on PUSCH or PUCCH.

5. Reference

- [1]3GPP TR 25.913 v7.3.0
- [2]R1-072639, RAN WG1, "Reply LS on CQI feedback", RAN WG1 #49.
- [3]R1-072721, Sharp, "Clarify UL physical channel scheduling for CQI report", RAN WG1 #49bis.
- [4]R1-072708, Motorola, "Uplink Control Signaling with Persistent Scheduling", RAN WG1 #49bis.
- [5]R1-073156, NTT DoCoMo, Orange, AT&T, T-Mobile, China Mobile, Telecom Italia, Telefonica, TeliaSonera, KPN, Vodafone, "Initial List of eNB measurements", RAN WG1 #49bis.
- [6]R1-072590, Panasonic, Mitsubishi Electric, Philips, NTT Docomo, Huawei, "Proposed way forward for CQI Feedback Control and Content in E-UTRA", RAN WG1 #49.
- [7]R1-072077, Panasonic, "CQI Feedback Control and Content in E-UTRA", RAN WG1 #49.
- [8]R1-072391, Philips, NXP Semiconductors, "Control of CQI feedback signalling in E-UTRA", RAN WG1 #49.