3GPP TSG-RAN2 #109-e R2-200xxxx

Electronic Meeting, February 24th – March 6th 2020

Agenda Item: 7.1.13 Other

Source: NTT DOCOMO Inc. (offline email discussion rapporteur)

Title: Report of [AT109e][410][eMTC] CE Mode Threshold Adjustments for non-BL and BL UE (DoCoMo)

Document for: Decision

# Scope of the offline email discussion

This document contains the responses and summary of the offline email discussion [AT109e][410][eMTC] CE Mode Threshold Adjustments for non-BL and BL UE (DoCoMo). The scope is outlined below.

* [AT109e][410][eMTC] CE Mode Threshold Adjustments for non-BL and BL UE (DoCoMo)

 Intended outcome: To check whether there is support, and, if so, list of proposals that are easily agreeable, almost agreeable and need further discussion. The outcome can be provided in R2-2001875

 Deadline: Wednesday, Feb. 26th 18:00 CET

 Schedule: Thursday, Feb. 27th 13:30 - 15:30 CET

# Offline email discussion

## Is there support to resolve the issues?

Companies are requested to provide input to the table below based on the Tdoc in [1].

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree that the issues described in Section 2.2 of the discussion paper can occur and should be resolved?** | **Comments** |
| **Sierra Wireless** | **Yes** |  |
| **Ericsson** | **No** | **In general, we think this is an optimization which can have some merits, but also we doubt this would be easy or practical to configure. The power class of the UE is already taken into account in S-criterion, so there can be some differences in the thresholds already.****Als, this optimization is not in the Rel-16 scope and we are already rather busy on finalizing all the objectives.**  |
| **Qualcomm** | **May be** | The cell radius over which the UE considers itself to be in coverage depends on a number of parameters, such as UE power class (Ppowerclass), maximum Tx power permitted in the cell (P-max), Qrxlevmin, QrxlevminCE, QRxlevminCE1.If P-max and Qrxlevmin have the same values in SB1 and SIB1-BR then it’s the UE power class (Ppowerclass) that will determine that actual radius for normal coverage, CE mode A and CE mode B. For example, if P-max is 23 dBm then Pcompensasion = 0 dB for 23dBm power class UE and 3dBm for 20 dBm power class UE thus 20dB UE will have smaller cell radius for each of the coverage zones (normal coverage, CE Mode A, CE mode B) compared to UE with 23dBm power class.In the end, a UE with lower power class will have smaller cell radius compared to UE with higher power class. You cannot expect, for example, transmissions from a UE with lower power class to be able to reach the eNB with the same number of repetitions as a UE with higher power class assuming both UEs experience same Rxlev (except when they are both in good coverage and Tx power is not the limiting factor). This is precisely the reason way Poffset was introduced for 14dBm UEs.Therefore, we are not sure whether the highlighted issue is real. |
| **Intel** | **No in Rel-16** | We have sympathy with the intention of improving the non-BL UE coverage by defining a different threshold for cell reselection. However, we think that just redefining the threshold for cell reselection may not solve the whole issue as it will require also further discussion on RACH as well as paging to cover the new coverage.In view that it is at the late stage of the WI, we think that such improvement of non-BL UE should be postponed to Rel-17. |
| **Apple** | **No** | Ideally Pcompensation (and hence the power class) in the Srxlev calculation should factor into account disparity if any.  |
| **NTT DOCOMO, Inc.** | **Yes** |  |

## Evaluating the options

We proposed three potential options for resolving the issues, as excerpted below.

|  |  |
| --- | --- |
| **Option 1:** Separate Thresholds Based on non-BL or BL | **Pros:*** Among the three options, resolves the issue in the simplest way.
* When considering impact to existing UE, BL UE may continue to read the legacy parameters. From Rel-16 onwards, non-BL UE would read the newly introduced parameters.
* Among the three options, impact to broadcasted system information is lowest.
* Among the three options, overall impact to the specification is lowest.
 |
| **Cons:*** Existing non-BL UE that support CE Mode would need to have their implementations modified in order to read the newly introduced parameter.
* Low granularity for future fine-tuning by operators.
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| **Option 2:** Separate Thresholds Based on UE Category | **Pros:*** Finer granularity is possible compared to Option 1.
* Existing devices whose category is not listed in the above extensions may continue to read the legacy parameters with no impact.
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| **Cons:*** The above proposed ASN.1 resolves the issue for lower category UE, but if operators want to have complete control over each category, a separate field would need to be introduced for each category.
* The impact to existing UE that support CE Mode would be dependent on the number of fields introduced, as UE would need to utilize a different field depending on their own category. In the above proposal, there may be implementation impact to existing Cat1/Cat1bis/CatM devices since they would need to read the newly introduced fields.
* Among the three options, moderate impact to broadcast system information.
 |
| **Option 3:** Separate Thresholds based on Power Class | **Pros:*** Finer granularity is possible compared to Option 1 and 2
* Existing devices whose power class is not listed in the above extensions may continue to read the legacy parameters with no impact.
 |
| **Cons:*** Similar to Option 2, a separate IE may be needed for each power class.
* Similar to Option 2, the impact to existing UE that support CE mode would be dependent on the number of fields introduced, as UE would need to utilize a different field depending on their power class. In the above proposal, there may be implementation impact to existing power class 3/5/6 devices since they would need to read the newly introduced fields.
* Among the three options, moderate impact to broadcast system information.
 |

Companies are requested to provide input to the table below based on the Tdoc in [1].

|  |  |  |
| --- | --- | --- |
| **Company** | **Which option is preferable for resolving this issue?** | **Comments** |
| **Sierra Wireless** | **Option 1** | **It is a Pro is that the legacy BL-UEs do not need to be updated, which may not be practical. Whereas Non-BL UEs are typically more capable of receiving and applying updates.** |
| **NTT DOCOMO, Inc.** | **Option 1** |  |

# Conclusion

6 companies provided input to the discussion, with 2 companies indicating support and 4 against. Among companies against it, there is doubt that this can be captured as an optimization within the scope of Rel-16. Additionally, there is the notion that there is no issue with the existing coverage equations or that other solutions may be available.

We think that further exploration of the problem scenario and potential solutions may be necessary, and so therefore, we propose to postpone this discussion and revisit it in a future release if an issue becomes more apparent.

**Proposal 1: RAN2 to postpone discussion on the issue described in R2-2000515.**

# References

[1] [R2-2000515](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2000515.zip) CE Mode Threshold Adjustments for non-BL and BL-UE, NTT DOCOMO Inc., February 2020.