**3GPP TSG RAN WG1 #100bis R1-** **200xxxx**

**e-Meeting, April 20th – 30th, 2020**

**Agenda item:** 6.2.2.4

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Email discussion [100b-e-LTE-NB\_IoTenh3-Coex-NR-04]

**Document for:** Discussion and Decision

# Background

This document contains the discussion for the following:

[100b-e-LTE-NB\_IoTenh3-Coex-NR-04] Email approval of the reply LS for R1-2001518 for both eMTC and NB-IoT by 4/23 – Alberto (Qualcomm)

The following tdocs have been submitted to this agenda item regarding this LS:

* [R1-2001848](ftp://ftp.3gpp.org/tsg_ran/WG1_RL1/TSGR1_100b_e/Docs/R1-2001848.zip) Discussion on RAN2 LS on NR coexistence ZTE
* [R1-2002502](ftp://ftp.3gpp.org/tsg_ran/WG1_RL1/TSGR1_100b_e/Docs/R1-2002502.zip) On the LS on NR coexistence for NB-IoT/eMTC Ericsson
* [R1-2002602](ftp://ftp.3gpp.org/tsg_ran/WG1_RL1/TSGR1_100b_e/Docs/R1-2002602.zip) Draft reply LS on NR coexistence Huawei, HiSilicon
* [R1-2002175](ftp://ftp.3gpp.org/tsg_ran/WG1_RL1/TSGR1_100b_e/Docs/R1-2002175.zip) Coexistence of LTE-MTC with NR Qualcomm Incorporated
* [R1-2002177](ftp://ftp.3gpp.org/tsg_ran/WG1_RL1/TSGR1_100b_e/Docs/R1-2002177.zip) Coexistence of NB-IoT with NR Qualcomm Incorporated

# Question 1

***Question 1: For NB-IoT, which, if any, resource reservation parameters for NR are likely to be the same across different carriers?***

***Question 1.1: If some resource reservation parameters for NR can be same across different NB-IoT carriers then can all the parameters be the same for all the NB-IoT carriers configured via dedicated signalling?***

* **Ericsson:** Not all carriers have the same configuration, but not every carrier will have a different configuration – RAN2 can configure each carrier selected from a small set (e.g. two) of different configurations. Additionally, it should be possible to disable resource reservation for a given carrier.
* **ZTE:** None of the resource reservation parameters are likely to be the same for different carriers (regardless of these being configured by dedicated signaling or not).
* **Huawei:** It should be allowed that all the resource reservation parameters are different.
* **Qualcomm:** Periodicity/startPosition/subframe(slot) level resource/time domain reservation can be cell common. Bitmaps may be different for different carriers – a default parameter can be provided in SIB, which may be overridden by dedicated signaling.

**Q1-1: Is it acceptable to have common values for periodicity / startPosition / time domain reservation across different carriers?**

* + **Option 1: They are likely to be common, but they may be different.**
  + **Option 2: RAN2 can assume that these values are common.**
  + **Option 3: None of these values are likely to be common.**

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| **Company name** | **Comment** |
| ZTE | Option 3  Different coexistence scenarios may occur for different non-anchor carriers. Some NB-IoT non-anchor carriers may be in the frequency region that NR SSB locates while other NB-IoT non-anchors carriers are not overlapped with NR SSB frequency region. In addition, since high priority periodic NR service in one frequency region may be different from another frequency region, to meet the flexible reservation requirement of each NB-IoT carrier, periodicity/startPosition/time domain reservation across different carriers should allow different configurations. |
| Qualcomm | Option 2 |
| Nokia, NSB | Our view is that it should be possible to configure different parameters for different carriers. Some parameters like periodicity and startPosition may be common across some carriers.  Option 1 is closest to our view, but we would still like the ability to configure each carrier independently. |
| Ericsson | If there are many NB-IoT non-anchor carriers, it seems quite likely that some of them may be able to share the same resource reservation configuration (including all time-domain parameters including periodicity and start position), but it seems to restrictive to assume that they all can do it. Therefore, it would be good to adopt a signaling solution where one group of carriers can share the same configuration while another group of carriers can share another configuration. It can be discussed how flexible the solution should be, but it would be good to have at least a couple of different configurations to choose from for each carrier. It is not entirely clear to us to which one of Options 1, 2, and 3 this approach corresponds, if any.  RAN2 can work out the details of the signaling solution. Perhaps there is some solution that can support all of Options 1, 2, and 3. |
| Huawei, HiSilicon | The configuration by these parameters are mainly used to avoid the collision between NB-IoT transmission and NR transmissions. The coexistence scenario may be different for different NB-IoT carriers in both downlink and uplink. Thus eNB should be able to configure these parameters independently, and it should be allowed that all the resource reservation parameters are different.  As currently we cannot assume which coexistence scenario is more likely, it seems that option 3 is more flexible and preferable. |
| Ericsson 2 | From the provided comments, there seems to be limited appetite for extensive signaling reduction for NB-IoT resource reservation configuration. Our understanding is that if there is no reduction, the configuration for multiple non-anchor carriers will be too big to fit in SIB and the only possibility will be to signal the configuration in dedicated signaling, while if the signaling can be reduced then perhaps there could be a possibility to signal the configuration(s) in SIB (and only have the UE-specific enabling in dedicated signaling). That is why we suggested to consider an approach with a small set of configurations (perhaps 2 or 3) and indicate per non-anchor carrier which one of these few configurations that applies to each non-anchor carrier. With this form or signaling reduction available to RAN2, perhaps RAN2 can see a way to put it all in SIB (except for the UE-specific enabling which will need to be in dedicated signaling but that should only be a couple of bits or so). So, this is a bit of a decision point – do we want to point out a way that could possibly allow RAN2 to put the resource reservation configuration in SIB, or do we want to close that door for good right here and now in the RAN1 reply LS to RAN2? |
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**Q1-2: Is it acceptable to have any of the following signaling optimizations?**

* + **Option 1: Override SIB parameters by unicast RRC.**
  + **Option 2: Signal a small set of configurations in SIB. Each carrier includes a pointer to one of these configurations**

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| **Company name** | **Comment** |
| ZTE | It seems the question is out of the scope of LS response. |
| Qualcomm | Option 1, Option 2 could also be acceptable |
| Nokia, NSB | We don’t support Option 1. We feel Option 2 is somewhat limiting but may be acceptable. |
| Ericsson | Option 1 is expected to be partly supported in the sense that RAN1 has already requested in the L1 parameter list in in [R1-2001479](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001479.zip) that the enabling of the configuration is done using UE-specific signaling.  Option 2 may be an attractive option in our view, as discussed in our reply to previous question). |
| Huawei, HiSilicon | We have similar view with ZTE that this question is out of the scope of reply LS, the detailed signaling design is up to RAN2. |
| Ericsson 2 | See “Ericsson 2” comment to the previous question. |
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# Question 2

***Question 2: For NB-IoT and eMTC, which, if any, parameters are likely to be the same for uplink and downlink?***

* **Ericsson, ZTE:** It cannot be assumed that any parameters are likely to be the same.
* **Huawei:**
  + For NB-IoT and eMTC, periodicity / startPosition/subframeBitmap/slotBitmap may be common for uplink and downlink.
  + For eMTC, symbolBitmap may be the same for downlink and uplink.
* **Qualcomm:** It is desirable to configure uplink and downlink separately.

**Q2-1: On common values for periodicity / startPosition / subframeBitmap/slotBitmap for uplink and downlink, plus additionally symbolBitmap for eMTC:**

* + **Option 1: They are likely to be common, but they may be different.**
  + **Option 2: RAN2 can assume that these values are common.**
  + **Option 3: None of these values are likely to be common.**

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| **Company name** | **Comment** |
| ZTE | Option 3  Potential intention of introducing DL resource reservation is to avoid collision with NR SSB, NR CORESET and NR DL SPS. Potential intention of UL resource reservation may be to avoid collision with NR SRS and NR UL SPS. Even for SPS, since the characteristic of DL SPS and UL SPS may be different, resource reservation configurations for NR DL and UL SPS may not be the same. |
| Qualcomm | Option 3, Option 1 would also be acceptable. |
| Nokia, NSB | Option 3 |
| Ericsson | Option 3 |
| Huawei, HiSilicon | Option 3. |
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# Question 3

***Question 3: For NB-IoT and eMTC, which, if any, parameters are likely to be the same in neighbour cells on the same carrier frequency?***

* **Ericsson, ZTE:** It cannot be assumed that any parameters are likely to be the same.
* **Huawei:** If the same SSB pattern is configured in neighbor cells, resource reservation are the same in the same carrier frequency.
* **Qualcomm:** In some cases, the same resource reservation may be present in the same carrier frequency, but it should be possible to override (e.g. with delta configuration)

**Q3-1: Can parameters be common across neighbor cells?**

* + **Option 1: They are likely to be common, but they may be different.**
  + **Option 2: They may be common depending on the deployment and configurations.**
  + **Option 3: None of these values are likely to be common.**

**In all cases, RAN2 should provide signaling support to indicate different patterns.**

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| **Company name** | **Comment** |
| ZTE | Option 3  Different neighbour cells on the same carrier frequency may have different coexistence scenario. |
| Qualcomm | Option 2. |
| Nokia, NSB | Option 2 |
| Ericsson | Option 2 may have some truth to it, but if the response to RAN2 is along the lines of Option 2 then it would not be good if RAN2 interprets this as if the signaling solution can assume that the configurations in neighboring cells are the same, so perhaps the safer answer here is Option 3. |
| Huawei, HiSilicon | Option 3  It is related to the NR configuration in neighbour cells, e.g. SSB configuration. Thus eNB should configure these parameters independently.  And from configuration point of view, independent configuration may happen to be the same but it belongs to eNB’s implementation which cannot be an assumption for RAN2’s signalling design. |
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# Draft LS response

***Question 1: For NB-IoT, which, if any, resource reservation parameters for NR are likely to be the same across different carriers?***

It should be possible to configure different parameters for different carriers but, in some cases, some of the parameters may be common (the likelihood depends on the deployment scenario). At least periodicity and startPosition may be common in some cases. In order to reduce the overhead at least for cases where some of the parameters are common, RAN2 may consider a signaling scheme in which a limited set of resource reservation configurations are signaled, and each is applied to one or more carriers.

Finally, it can be noted that it may be a reasonable assumption that the subframe-level bitmap (valid-subframe-config-DL/UL) and the slot/symbol-level bitmaps (slot-reserved-resource-config-DL/UL, symbol-reserved-resource-config-DL/UL-first-slot, and symbol-reserved-resource-config-DL/UL-second-slot) are not likely to need to be possible to configure simultaneously.

***Question 1.1: If some resource reservation parameters for NR can be same across different NB-IoT carriers then can all the parameters be the same for all the NB-IoT carriers configured via dedicated signalling?***

In some cases, all the parameters may be the same, but it should be possible to configure different parameters for different carriers.

***Question 2: For NB-IoT and eMTC, which, if any, parameters are likely to be the same for uplink and downlink?***

None of the parameters are likely to be common in most cases.

***Question 3: For NB-IoT and eMTC, which, if any, parameters are likely to be the same in neighbour cells on the same carrier frequency?***

None of the parameters are likely to be common in most cases.